

Cambridge Judge Business School

Centre for Risk Studies 5th Risk Summit

THE PULSE OF RISK: FROM BIG DATA TO BUSINESS VALUE

23-24 June 2014

Cambridge Judge Business School
University of Cambridge

Centre for
Risk Studies



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CAMBRIDGE**
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Institute of Catastrophe Risk Management

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The on-line version of this brochure can be found at www.risk.jbs.cam.ac.uk

Organising Committee

Chair

Dr Michelle Tuveson, Executive Director, Cambridge Centre for Risk Studies

Members

Professor Daniel Ralph, Academic Director, Cambridge Centre for Risk Studies, University of Cambridge Judge Business School & Professor of Operations Research

Simon Ruffle, Director of Technology Research and Innovation, Cambridge Centre for Risk Studies

Dr Andrew Coburn, Director of the External Advisory Board, Cambridge Centre for Risk Studies and Senior Vice President, RMS

Dr Sven Heiligtag, Principal, McKinsey & Company

Dr Martin Pergler, Principal, McKinsey & Company

Manan Shah, Programme Manager, Lockheed Martin

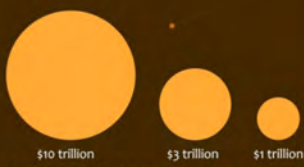
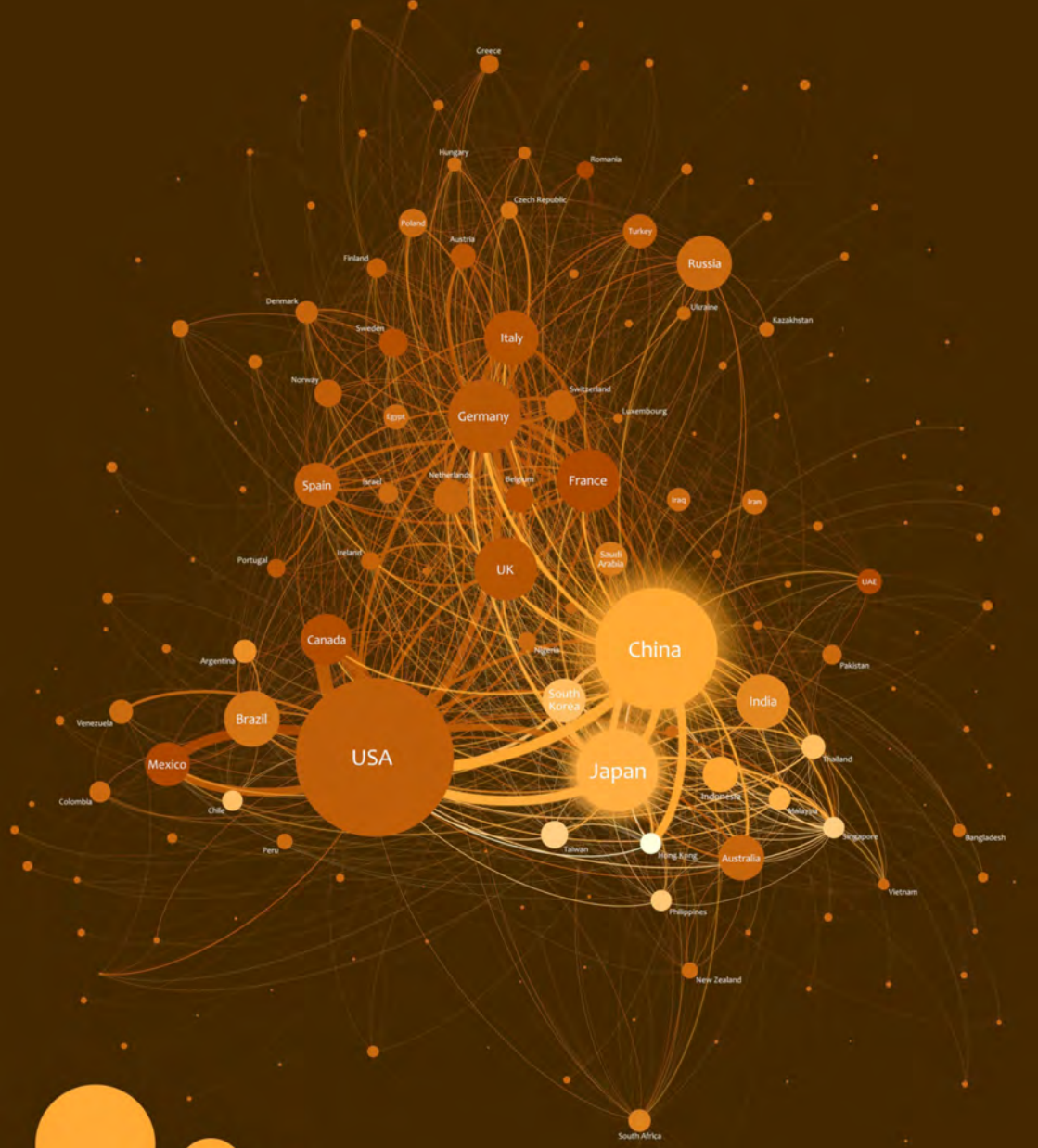
Anna-Marie Greenaway, VP Science and Technology BP-Cambridge, BP plc

Alan Smith, Global Head of Risk Strategy and Chief of Staff, HSBC Holdings PLC

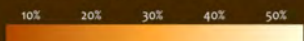
Smriti Gurjar, Manager Risk Appetite, HSBC Holdings PLC

In June 2014 the Cambridge Centre for Risk Studies will bring together leaders and decision makers from businesses, governments, intergovernmental organisations, academia and NGOs to explore salient topics in risk management. The summit will be held at the University of Cambridge Judge Business School, with a conference dinner following at Emmanuel College, Cambridge.

This year's summit theme will explore implications of 'Big Data' and its opportunities and risks to businesses. The democratisation of information access has provided enormous opportunities for individuals and organisations while creating growing debate on its consequential use. Big data holds potential for research, innovation and productivity, while posing complex questions of ownership, value, aggregation, and the broader benefits to society.



National GDP (nominal USD)



Economic impact of geopolitical conflict scenario: Reduction in national GDP

Day 1: Monday 23 June 201409:00-15:00 **Special Topics Seminar**

09:00 Registration opens

09:30 **The Cambridge CRS Risk Framework: Scenarios, threats, and business decisions**
Professor Daniel Ralph, Academic Director,
 Cambridge Centre for Risk Studies

10:10 **Systems of Systems: Mapping global exposure networks**
Dr Andrew Skelton, Risk Researcher,
 Cambridge Centre for Risk Studies

10:30 **Cyber Catastrophe – an interlinked systemic risk**
Simon Ruffle, Director of Technology
 Research & Innovation, Cambridge Centre for
 Risk Studies

10:50 Coffee break

11:30 **Catastronomics: The economics of catastrophes**
Dr Scott Kelly, Research Associate,
 Cambridge Centre for Risk Studies

11:50 **Understanding financial catastrophes**
Dr Fabio Caccioli, Research Associate,
 Cambridge Centre for Risk Studies

12:10 **Data for risk analysis: Exposure and vulnerability**
Dr Roxane Foulser-Piggott, Research
 Associate, Cambridge Centre for Risk Studies

12:30 **Mapping Geopolitical Risk**
Joshua Wallace, Cytora

12:50 Lunch

Day 1: Monday 23 June 2014 *continued*

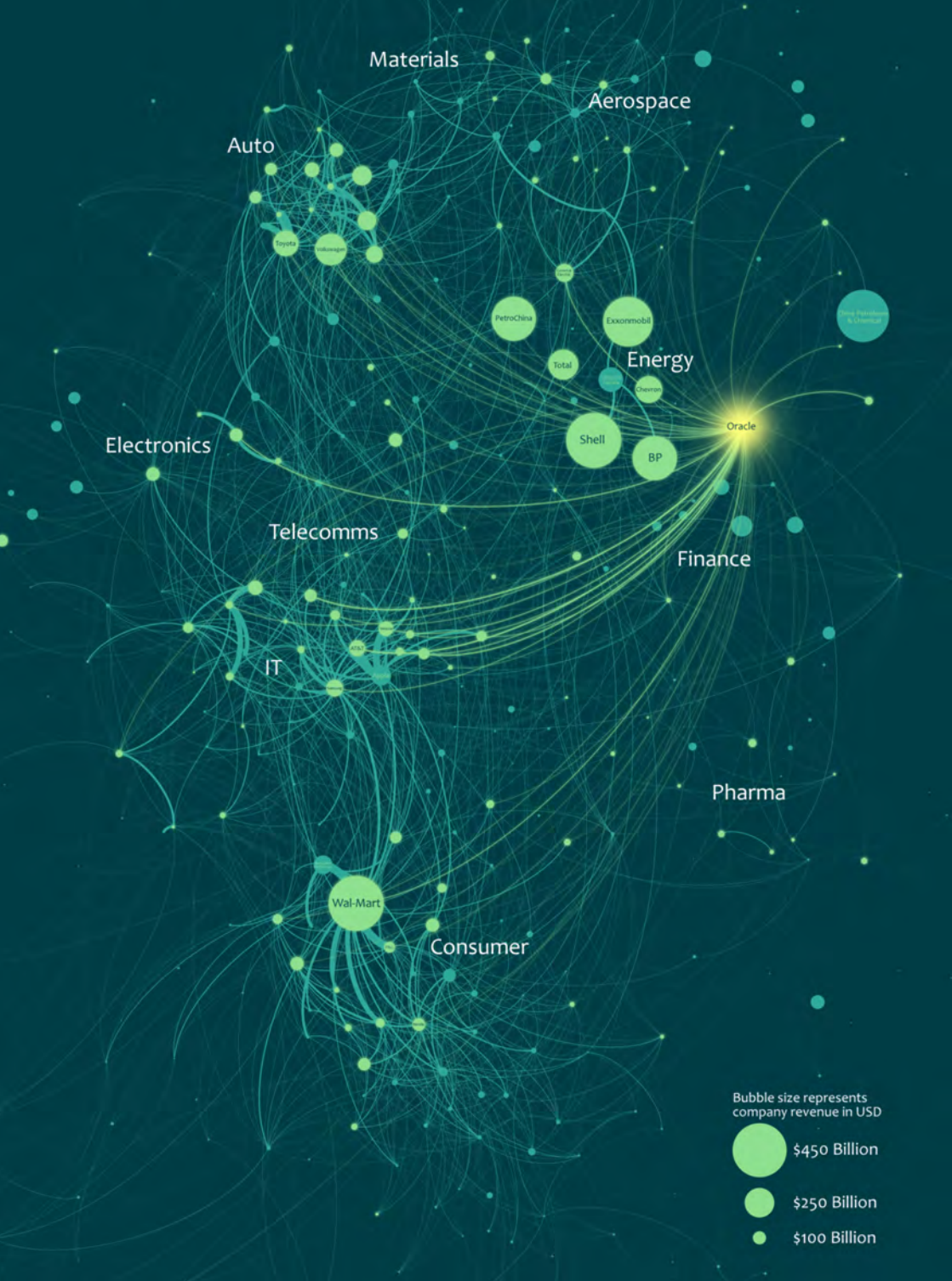
14:00 *Chair: Professor Tso-Chien Pan,*
Executive Director, Institute for Catastrophe
Risk Management, Nanyang Technological
University, Singapore

**Catalysing risk management innovation
through openness**

Paul VanderMarck, Chief Products Officer,
Risk Management Solutions

14:30 **Cambridge Centre for Risk Studies**
Research Agenda 2015
Dr Andrew Coburn,
Director of External Advisory Board,
Cambridge Centre for Risk Studies

15:00 **End of pre-conference session**



The Pulse of Risk: From Big Data to Business Value

Programme and Agenda

Day 1: Monday 23 June 2014 *continued*

15:30-16:00 Risk Summit registration and coffee/tea

16:00-16:15 **Risk Summit welcome**

Dr Michelle Tuveson,
Executive Director,
Cambridge Centre for Risk Studies

16:15-17:00 **Plenary Session 1:
Globalisation and systemic risk**

**Keynote: The butterfly defect: Why
globalisation creates systemic risks and
what can be done**

Professor Ian Goldin, Professor of
Globalisation and Development at the
University of Oxford and Director,
Oxford Martin School

17:00-18:00 **Risk Summit Day 1 Panel**

Moderated by:

- Dr Michelle Tuveson**, Executive Director,
Cambridge Centre for Risk Studies
- **Dr Michael Maran**, Chief Science Officer,
Catlin Group
 - **David Harding**, Founder and President,
Winton Capital Management
 - **Professor Daniel Ralph**, Academic Director,
Cambridge Centre for Risk Studies,
University of Cambridge Judge Business
School & Professor of Operations Research
 - **Alan Smith**, Global Head of Risk Strategy
and Chief of Staff, HSBC Holdings
-

18:00-19:00 **Drinks reception**
at Cambridge Judge Business School

19:15-21:30 **Risk Summit dinner** at Emmanuel College

The Pulse of Risk: From Big Data to Business Value*Programme and Agenda***Day 2: Tuesday 24 June 2014**

09:00-09:30 Coffee and registration

09:30-09:35 **Risk Summit welcome and introductions**Dr Michelle Tuveson, Executive Director,
Cambridge Centre for Risk Studies09:30-11:00 **Plenary Session 2:****Enhancing the understanding of risk***Chair:* Simon Ruffle, Director of Technology
Research and Innovation, Cambridge Centre
for Risk Studies09:30-10:00 **Innovation for a secure future**Dr Ray Johnson, Chief Technology Officer,
Lockheed Martin10:00-10:30 **A diverse ecosystem of risk views:
Implications for risk management**Paul VanderMarck, Chief Products Officer &
Group Executive, Product Management, RMS10:30-11:00 **Global Differences: New Credit-risk Models
for the Unbanked**Dr Tobias Baer, Master Expert, Risk Practice,
McKinsey & Company

11:00-11:30 Coffee break

11:30-13:00 **Plenary Session 3:****Disruptive changes to the views of risk***Chair:* Dr Andrew Coburn, Director of the
External Advisory Board, Cambridge Centre
for Risk Studies and Senior Vice President, RMS11:30-12:00 **Driving without hands on the wheel:
Facing the new challenges of a high speed
interconnected complex world**Dr Mike Lynch, Founder & Technology
Entrepreneur, Invoke Capital Fund12:00-12:30 **Financial cartography**Dr Kimmo Soramäki, Founder & CEO,
Financial Network Analytics

Day 2: Tuesday 24 June 2014 *continued*

12:30-13:00 *Panel Discussion:*

Big data disruptions and the evidence for business value

- **Dr Mike Lynch**, Founder & Technology Entrepreneur, Invoke Capital Fund
- **Dr Kimmo Soramäki**, Founder & CEO, Financial Network Analytics
- **Dr Louise Pryor**, Risk Researcher, Cambridge Centre for Risk Studies
- **Juan Carlos Castilla-Rubio**, Founding CEO, Planetary Skin Institute

McKinsey Risk Prize announcement

Dr Sven Heiligtag, Principal,
McKinsey & Company

13:00-14:00 Lunch at Cambridge Judge Business School

14:00-15:00 **Plenary Session 4:**

Taking the pulse of risk

Chair: **Andrew Freeman**, Director,
The Finance Foundation

14:00-14:30 **Energy economic forecast**

Paul Appleby, Head of Energy Economics,
Group Economics Team, BP

14:30-15:00 **Risk and Responsibility in a
Hyperconnected World**

Joseph Hubback, Associate Principal,
McKinsey & Company

The Pulse of Risk: From Big Data to Business Value*Programme and Agenda*

Day 2: Tuesday 24 June 2014 *continued*

15:00-16:00 **The 'Big' Debate**

Debate motion: **This house believes that 'big data' is the new currency and holds societal benefits.** Following the 'Oxford-style' of debate, the value of 'big data' will be debated. The debate format will feature motions in support or in opposition of the house motion. Attendees will participate in a pre-debate vote on the motion. Each panellist will present an opening statement followed by questions from the audience. In conclusion, each panellist will deliver a closing argument, and the meeting participants will provide a final vote.

Chair: **Andrew Freeman**, Director,
The Finance Foundation

For the debate motion:

John Scott, Chief Risk Officer,
Zurich Global Corporate
Richard Ward, Government Relations,
IBM Europe

Against the debate motion:

Professor Zoubin Ghahramani,
Professor of Information Engineering,
University of Cambridge
Dr David Good, Fellow,
King's College, Cambridge

16:00-16:15 **Summary and conclusions**

Professor Daniel Ralph, Academic Director,
Cambridge Centre for Risk Studies,
University of Cambridge Judge Business
School and Professor of Operations Research

Cambridge - McKinsey Risk Prize Overview

The Cambridge Centre for Risk Studies, in conjunction with McKinsey & Company, is pleased to award the “Cambridge - McKinsey Risk Prize”. This award recognises the best submission on risk management by a current student at the University of Cambridge Judge Business School.

Judges include members of McKinsey’s Global Risk Practice, the Editor-in-Chief of the McKinsey Working Papers, and members of the Cambridge Centre for Risk Studies at the Cambridge Judge Business School.



Cambridge - McKinsey Risk Prize 2014 Finalists

- **Trevor Bruce, CJBS MBA Candidate:** Managing Environmental, Social, and Government (ESG) Risk in the Mining Industry: The Emerging Relevance of ESG Risk and the Dangers of Getting it Wrong
- **Joe Crawford, CJBS MBA Candidate:** Infrastructure and Risk: Identification, Management & Transfer of Risk by HM Treasury
- **Campbell Hennessy, CJBS MPhil Candidate:** An Enduring Workforce: Fatigue Risk Management in Marine Search and Rescue and its Potential Applications to Knowledge-Based Work

Infrastructure and Risk: Identification, Management & Transfer of Risk by HM Treasury: Large infrastructure projects have a reputation for being costly and risky. I wanted to examine the processes that the UK Government has in place for managing these risks and understand to what extent they are contributing to infrastructure cost overruns. As a structural engineer, I have been involved in project-level risk management on large construction projects. This project was a great opportunity to understand how this fits into the broader business-case risk management process. *Joe Crawford*

Managing Environmental, Social, and Government (ESG) Risk in the Mining Industry: The Emerging Relevance of ESG Risk and the Dangers of Getting it Wrong. A description of how the primary risk in the mining industry has fundamentally shifted from relatively manageable "technical risks" to ESG risks, which are substantially more difficult to predict and control. ESG risks have emerged due to the combination of heightened public social/environmental awareness and increased mining activity in more remote, and politically unstable, regions of the world. Unfortunately, the mining industry has been slow to respond to this shift and continues to encounter serious problems. *Trevor Bruce*

An Enduring Workforce: Fatigue Risk Management in Marine Search and Rescue and its Potential Applications to Knowledge-Based Work: This paper describes how approaches to fatigue management in maritime search and rescue may be applied to knowledge based business. It uses the construct of the 'knowledge worker' to identify the risks that fatigue poses within business and the constraints upon any proposed fatigue controls. Fatigue risks in business are associated with reduced situational awareness and a decreased capacity for employees to assess risk and make ethical decisions. Ultimately, I explore potential modifications to the United States Coast Guard's Crew Endurance Management programme that could make it an effective control for business. *Campbell Hennessy*

**Paul Appleby**

Head of Energy Economics, BP Group Economics Team

Paul Appleby leads the analysis of long term energy market developments for BP. His career at BP spans 29 years, and includes a variety of roles in BP's gas and alternative energy businesses. Most recently he was the custodian of the investment appraisal process for BP's gas, power and renewables businesses worldwide.

He received his theoretical training in economics at the University of Cambridge (MA and MPhil), and served a practical apprenticeship as a Fellow of the Overseas Development Institute, posted to Malawi. He is an associate lecturer in energy economics at the University of Surrey, and a member of the Council of the British Institute of Energy Economics.

Work experience:

- Head of Energy Economics, 2009-
- Head of Global Gas Market Analysis, 2008-2009
- Senior Advisor, Investment Appraisal, 2004-2007
- Senior Strategy Advisor, Gas Power & Renewables, 2001-2004
- Commercial Manager, UK Gas & Power, 1999-2002
- Director, Strategy & Planning, BP Solar, 1998-1999
- Senior Economist, Group Economics Team, 1992-1998
- Market Analysis Team Leader, European Gas, 1989-1992
- Senior Economist, BP Australia, 1987-1989
- Economist, BP Group Corporate Planning, 1984-1986
- Planning Economist, Government of Malawi, 1981-1983 (Fellow of the Overseas Development Institute)

**Dr Tobias Baer**

Master Expert, McKinsey & Company's Risk Management Practice

Tobias is a Master Expert of McKinsey & Company's Risk Management Practice and Leader of the company's Credit Risk Advanced Analytics Service Line as well as the Risk Modeling Center in India. He serves clients globally, including leading financial institutions in Europe, North America, and Australia, and fast-growing organisations in Asia, Latin America, Eastern Europe and Africa, focusing on innovation in risk modelling, non-traditional and big data, analytics-enabled business transformations, and the creation of new lending businesses. Tobias holds a PhD from the University of Frankfurt and drives research & development in rating methodology, decision systems, and economic capital.

**Dr Fabio Caccioli**

Research Associate, Centre for Risk Studies

Fabio Caccioli is a postdoctoral research associate at the Centre for Risk Studies. He also continues to be involved in research activities at the Institute for New Economic Thinking, Oxford Martin School, University of Oxford, and was previously a postdoctoral fellow at the Santa Fe Institute in Santa Fe, New Mexico (USA).

He holds a PhD in Statistical Physics from the International School for Advanced Studies in Trieste (Italy).

His research mainly focuses on systemic risk and financial stability. Other research interests include complex networks and non-equilibrium statistical mechanics. His contribution to the study of systemic risk includes the study of financial contagion due to overlapping portfolios and the study of the impact of derivatives for financial stability.

**Juan Carlos Castilla-Rubio**

Founding CEO, Planetary Skin Institut

Founding CEO of the Planetary Skin Institute, an independent research & development US corporation co-founded between Cisco and NASA tasked to incubate and start-up advanced risk management decision-support platforms that enable governments, industrial corporations, infrastructure players, utilities, resource commodity operators and financial market players for a step change in the proactive risk management of their mission critical assets, their natural resources supplies, their infrastructures and their supply chains. PSI was awarded one of TIME Magazine's Top Innovation Awards for 2009 and has been profiled in The Economist, the New York Times and Fast Company, amongst others.

Prior to his PSI role, Juan Carlos led the Cisco Global Resource/Risk Management Innovations team with global responsibility for programs incubating Big Data & Analytics, Internet of Things and cloud-based risk management platforms across multiple industries and sectors globally. Before that, he led Cisco's Emerging Markets Innovation Group focused on designing and operationalising large scale/complex technology-enabled innovation programs for governments and corporations emerging markets wide, with a focus in Brazil, Chile, India, South Africa, Mexico, South Africa, Gulf States, Turkey and China.

Prior to joining Cisco, Juan Carlos was a Partner for Oliver Wyman where he led the financial services and telecom practices in Latin America. Prior to Oliver Wyman, he was CEO for an innovative biotechnology start-up focused on next generation bio-fuel technologies and pharma research in the Amazon, an EVP Operations for a brewery group in Latin America (now SABMiller), a Managing Director for Corporate Strategic Development of a diversified financial services group in Latin America (Intercorp Group) and a senior consultant for McKinsey & Company in Brazil.

Juan Carlos is currently the Co-Chair of the World Economic Forum's Global Advisory Council on Measuring Sustainability and was a member of the World Economic Forum's Global Advisory Council on Climate Change; member of Duke Energy's International Strategy Advisory Council, a member of the World Economic Forum's Steering Boards for the Water Security, Resource Scarcity, New Energy Architecture and Big Data initiatives.



Dr Andrew Coburn

Director of External Advisory Board, Centre for Risk Studie

Andrew Coburn manages the External Advisory Board of the Centre for Risk Studies, coordinating the inputs of consumers of research into the Centre's risk agenda. Andrew is the principal coordinator of the research programme on 'System Shock' at the Centre.

Andrew is one of the leading contributors to the creation of the class of catastrophe models that over the past 20 years has come to be an accepted part both of business management in financial services and of public policy making for societal risk. He has extensive experience in developing models and using them for business decision support. Andrew has also provided research inputs into government policy, such as House of Congress legislation on terrorism risk management policy and urban planning for disaster mitigation in Mexico, Metro Manila, and Southern Italy.

Dr Andrew Coburn is a member of the senior management of Risk Management Solutions, the leading provider of catastrophe risk models to the insurance industry.



Andrew Freeman

Risk Fellow, Centre for Risk Studies

Andrew Freeman is the Founder and Managing Director of Cambridge Research Associates, a research and advisory

company that specialises in risk-related work for global clients. Over a 25-year career he has written numerous articles and books, first as a journalist on The Economist and latterly in his role as a Senior Knowledge Expert in Risk at McKinsey. Between 2009 and 2011 he was Executive Director of the Center for Financial Services at Deloitte LLP, overseeing its research programme on the financial services industry. In 1998 he published "Seeing tomorrow: rewriting the rules of risk", co-authored with Ron Dembo, founder of Algorithmics.

Andrew is a graduate of Balliol College, Oxford and was also elected a Domus Senior Scholar at Merton College, Oxford.

**Dr Roxane Foulser-Piggott**

Research Associate, Centre for Risk Studies

Roxane Foulser-Piggott is a post-doctoral research associate at the Centre for Risk Studies, working on the vulnerability of the systems of the global economy and the global landscape of risk.

Roxane trained as an earthquake engineer, specialising in vulnerability assessment and post-earthquake damage assessment techniques. She has worked on insurance applications of risk assessment and has published on ground motion modelling and on remote sensing techniques for damage assessment.

Roxane completed her PhD on earthquake ground motion uncertainty at Imperial College London in 2012.

A director of Cambridge Architectural Research, Roxane has research interests in GIS, spatial statistics, structural vulnerability and ground motion modelling.

**Professor Zoubin Ghahramani**

Professor of Information Engineering, University of Cambridge

Zoubin Ghahramani is Professor of Information Engineering at the University of Cambridge, where he leads a group of about 30 researchers. He studied computer science and cognitive science at the University of Pennsylvania, obtained his PhD from MIT in 1995, and was a postdoctoral fellow at the University of Toronto. His academic career includes concurrent appointments as one of the founding members of the Gatsby Computational Neuroscience Unit in London, and as a faculty member of CMU's Machine Learning Department for over 10 years. His current research focuses on nonparametric Bayesian modelling and statistical machine learning. He has also worked on applications to bioinformatics, econometrics, and a variety of large-scale data modelling problems.

Professor Ghahramani has published over 200 papers, receiving 25,000 citations (an h-index of 68). His work has been funded by grants and donations from EPSRC, DARPA, Microsoft, Google, Infosys, Facebook, Amazon, FX Concepts and a number of other industrial partners. In 2013, he received a \$750,000 Google Award for research on building the Automatic Statistician. He serves on the advisory boards of Opera Solutions and Microsoft Research Cambridge, on the Steering Committee of the Cambridge Big Data Initiative, and in a number of leadership roles as programme and general chair of the leading international conferences in machine learning: AISTATS (2005), ICML (2007, 2011), and NIPS (2013, 2014)

**Professor Ian Goldin**

Director, Oxford Martin School, University of Oxford

Professor Ian Goldin is the founding Director of the Oxford Martin School at the University of Oxford and the Oxford University Professor of Globalisation and Development. The Oxford Martin School is the leading centre of

interdisciplinary research on key global challenges with over 300 Oxford researchers drawn from over 20 disciplines.

Goldin was until 2006 Vice President of the World Bank and the Bank's Director of Policy. From 1996 to 2001 Ian was Chief Executive and Managing Director of the Development Bank of Southern Africa and adviser to President Nelson Mandela. During this period, Goldin accompanied President Mandela on numerous state visits, served on several Government committees and Boards and was Finance Director for South Africa's Olympic Bid.

Previously, Goldin was Principal Economist at the European Bank for Reconstruction and Development (EBRD) in London, and Program Director at the OECD Development Centre in Paris, where he directed the Programs on Trade, Environment and Sustainable Development.

Born in South Africa, Goldin has a BA (Hons) and a BSc from the University of Cape Town, an MSc from the London School of Economics, and a MA and Doctorate from the University of Oxford.

He has published 17 books, the most recent of which are *Divided Nations: Why Global Governance is Failing, and What We Can Do About It* (Oxford University Press, 2013), *Globalisation for Development: Meeting New Challenges* (Oxford University Press, 2012), described by Nobel Laureate Joseph Stiglitz as "essential reading" and his widely acclaimed *Exceptional People: How Migration Shaped our World and Will Define our Future* (Princeton University Press, 2011). His forthcoming books *The Butterfly Defect: How Globalization Creates Systemic Risks and What Can Be Done* (Princeton University Press) and *Is the Planet Full?* (Oxford University Press) are currently in press for publication in spring 2014.

Professor Goldin has made wide-ranging contributions to development, for which he has been knighted by the French Government and nominated Global Leader of Tomorrow by the World Economic Forum. He is a Trustee

of Comic Relief, the Overseas Development Institute and other institutions. He is highly sought-after as an advisor and public speaker with his TED and other talks receiving widespread recognition.

**Dr David Good**

Director of Education for the School of Biological Sciences and Fellow of King's College, University of Cambridge

David Good is in the Department of Psychology at the University of Cambridge, and Director of Education for the School of Biological Sciences. He is also a Fellow of King's College. His research focusses on the application of a broad range of psychological theories and methods in a number of different areas. These include:

- the design of new technologies on which he collaborates with Alan Blackwell of the Computer Laboratory through the Crucible Network which they founded in late 2000
- the assessment of various professional skills and competencies with Fiona Patterson and Peter Kutnick
- the structure of belief systems and their moderation with Sara Savage

He also works closely with the Centre for Science and Policy in Cambridge on the application of fundamental research to current policy challenges. He is a member of the University of Cambridge's senior governing bodies, and plays a similar role at the Royal College of Art.

**David Harding**

Chairman & CEO, Winton Capital Management

David Harding is the chairman and chief executive officer of Winton Capital Management, a successful global investment manager, an entrepreneur and an advocate for science education and physics research.

Since graduating from the University of Cambridge with a

First Class Honours degree in Natural Sciences specialising in Theoretical Physics in 1982, Mr Harding has started two of the world's leading alternative investment companies. Winton, which he founded in 1997, is a global leader in financial mathematics and scientific research into financial markets and one of the UK's most successful private companies, currently managing assets in excess of \$24 billion. In 1987 Mr Harding co-founded Adam Harding and Lueck (AHL), one of the first systematic trend-following CTAs in Europe, which was subsequently bought by the Man Group and remains one of the cornerstones of the FTSE-listed company.

David has made philanthropic donations to causes related to the furthering of science, risk literacy and education in the UK and is an Honorary Fellow of St Catharine's College, Cambridge. In November 2010 he pledged £20 million to the University of Cambridge's Cavendish Laboratory to fund the Winton Programme for the Physics of Sustainability which funds blue sky research in branches of condensed matter physics of relevance to energy capture and storage.

David has also endowed the Winton Professorship for the Public Understanding of Risk at the University of Cambridge, and the Harding Centre for Risk Literacy at the Max Planck Institute for Human Development in Berlin.

David was a member of the University of Cambridge's 800th Anniversary Campaign Board, and is currently a member of the Royal Society Advisory Board and the Create the Change Campaign Board, raising money for the Francis Crick Institute. He is also a member of the Board and Executive Committee of the Managed Funds Association.



Dr Sven Heiligtag

Principal, McKinsey & Company

Sven Heiligtag is a principal in McKinsey's Risk practice and the global leader of the Firm's Corporate Risk Service Line. Since joining the Firm's Hamburg office in 2001, Sven has

worked for clients in over 20 countries. Sven works primarily with clients from the energy and natural resources space and focuses strategic risk/return management and market and commercial risk, e.g., strategic portfolio management, scenario-based decision making, establishing trading and risk management strategies, organisational processes and governance mechanism. Sven is leading our corporate enterprise risk management survey as well as our commercial performance survey focus on trading and risk management approaches for market related risks. Next to his risk work, Sven is serving a variety of clients from the energy and natural resources space across the board on strategic, organisation, efficiency, corporate finance and leadership topics. Prior to joining McKinsey, Sven completed a PhD in chemistry at the University of Hamburg.

**Joseph Hubback**

Associate Principal, McKinsey & Company

Joseph has been working in the cyber security practice in EMEA since its inception and has contributed extensively to McKinsey's knowledge development and client service in cyber security. Building on experience serving cyber security clients and his own prior knowledge, Joseph has helped developed McKinsey's unique insights into cyber security management and risk reduction. With a strong background in high-tech and telecom clients and 10 years working in industry Joseph is able to help clients bridge the gap between technology and business leadership.

Joseph has served many clients helping develop cyber-security self-protection and market entry strategies across:

- High-tech (supporting clients (HW, SW and services) on delivering double digit growth in EMEA)
- Financial services (rebuilding the cyber security strategy of a global institution to focus on assets at risk)
- Aerospace and defence (supporting the development of a global cyber product strategy), including assessment of

- physical security markets
- Public sector (including secure government, assisting a large government ministry to create and implement a cyber-security strategy, from corporate down to consumer grade security solutions)

Joseph created the McKinsey cross-industry benchmark for cyber-risk maturity, working with 20 global leading organisations to help define best-practice in cyber-security and build more cost-efficient strategies for protection, now used in more than 100 organisations globally. His publications include an Aspen Institute paper on national cyber security policy, McKinsey Quarterly on Government – IT Edition: “Can you hack it?” - Managing the cyber security challenge, McKinsey TMT Recall: Cyber safe: key elements to prevent and respond to security threats.

Joseph holds a Masters in Digital Communications and High Frequency Electronics Engineering from Oxford University. Prior to McKinsey, Joseph worked for ICI Plc in a variety of engineering, operational and commercial roles.



Dr Ray O. Johnson

Senior Vice President and Chief Technology Officer,
Lockheed Martin Corporation

Dr Ray O. Johnson is Senior Vice President and Chief Technology Officer of Lockheed Martin. In this role, he guides the Corporation’s technology vision, and provides strategic leadership in the areas of technology, engineering, production, supply chain operations, and programme management, which include more than 72,000 employees across approximately 4,000 programmes worldwide. Dr Johnson also leads Lockheed Martin’s Advanced Technology Laboratories, chartered with creating generation-after-next technology, as well as the Center for Innovation, a world-class facility for collaborative experimentation and analysis with customers and industry partners.

Before joining Lockheed Martin, he was the Chief Operating Officer of Modern Technology Solutions, Inc., of Alexandria, Virginia. Prior to that, he held a variety of increasingly responsible executive positions with Science Applications International Corporation (SAIC), including Senior Vice President and General Manager of the Advanced Concepts Business Unit. He also served in the US Air Force for more than 20 years.

Among his board affiliations, Dr Johnson chairs the USA Science and Engineering Festival Advisory Board, the US Council on Competitiveness Technology Leadership and Strategy Initiative, and is a Bureau Elected Officer of the International Astronautical Federation (IAF). He is a member of the Board of Directors for Sandia Corporation, the Governing Board of the Indo- US Science and Technology Forum, the Board of Directors of the American Associates of the Science and Technology in Society (STS) Forum, and the Board of Directors of the National Math and Science Initiative.

Dr Johnson is a member of the Advisory Board of the Georgia Institute of Technology, the Board of Visitors for the A. James Clark School of Engineering and the School of Computing, Mathematics, and Natural Sciences at the University of Maryland, the Dean's Advisory Council for the College of Engineering at Carnegie Mellon University, and the Governing Board of the Massachusetts Institute of Technology Energy Initiative.

He is a Full Academician of the International Academy of Astronautics (IAA), as well as a Fellow of the International Society for Optical Engineering (SPIE), the American Institute of Aeronautics and Astronautics (AIAA), and the Institute of Electrical and Electronics Engineers (IEEE).

Born in Kansas City, Missouri, Dr Johnson earned his Bachelor of Science degree in electrical engineering from Oklahoma State University and his Master of Science and PhD degrees in electrical engineering from the Air Force Institute of Technology.

**Dr Scott Kelly**

Research Associate, Centre for Risk Studies

Scott Kelly is a post-doctoral research associate in the Centre for Risk Studies. He holds research posts in the Centre for Climate Change Mitigation Research (4CMR) in the Department of Land Economy and the Electricity Policy Research Group in the Judge Business School at the University of Cambridge. He is a Junior Research Fellow of Darwin College.

At the Centre for Risk Studies Scott leads the research on macroeconomic modelling. Within the centre, macroeconomic models are used to describe the global and regional impacts that occur as a result of different risk scenarios developed as part of the Cambridge Risk Framework. Research includes estimating the economic impact of exogenous shocks and their propagation in global networks. Specific research areas include the analysis of international trade, supply chain analysis, sector analysis and the estimation of supply chain risk.

Prior to joining the Centre for Risk Studies research included modelling the macroeconomic impact of disasters, the economics of infrastructure, complex systems modelling, input output analysis, econometrics, energy systems modelling and sustainable development. Specialising in applied modelling approaches, expertise has been developed in a variety of different statistical techniques such as multiple linear regression, panel methods and structural equation modelling. More recently knowledge has been developed in the application input-output models, social network analysis and agent based models.

**Dr Mike Lynch OBE FREng**

Founder, Invoke Capital

Dr Mike Lynch is the founder of Invoke Capital, a company which invests in fundamental European technologies. He has long been regarded as a visionary figure in technology,

described by the Financial Times as “the doyen of European software” and by the Sunday Times as “Britain’s Bill Gates”. He advises the Prime Minister on matters of science policy through the Council on Science and Technology and is a Business Ambassador.

Dr Lynch has founded and advised a number of companies ranging from Neurodynamics to Blinkx. Dr Lynch is best known for founding Autonomy in 1996, the UK’s largest software company, member of the FTSE 100 with a market capitalisation of \$11bn, and was its CEO for 15 years until it was acquired by Hewlett Packard in 2011. He has invested in a number of start-ups, most recently Featurespace, and has also advised venture capital and private equity groups such as Apax Partners and the Carlyle Group.

During his career, Dr Lynch has received many awards and accolades. In January 2013 he was one of 100 people on The Times’ New Power List. In September 2012 he was inducted into the Digital Hall of Fame, alongside Tim Berners-Lee, Warren East and Stephen Fry. In 2011 he received the Outstanding Contribution award in the UKIT Industry awards and was named Most Influential Person in UK IT by Computer Weekly. He has been named Entrepreneur of the Year by Management Today magazine and by the CBI. He is an Honorary Fellow of Christ’s College, Cambridge, a Fellow of the Royal Academy of Engineering and Deputy Lieutenant of the County of Suffolk.

Alongside his entrepreneurial career, Dr Lynch has a number of board seats and advisory roles. He is currently a non-executive director of the British Library and Cambridge Enterprise. Previous roles include the BBC and Nesta. He is a council member of the Royal Academy of Engineering and of the Foundation for Science and Technology, of which he is also a trustee. He is a member of the advisory board of Tech City’s Investment Committee and of the “Create the Change” board at the Francis Crick Institute. He is an advisor to the Prince’s Trust technology group and a founding investor of Bridges Venturing, which is a social investment firm.

**Professor Tso-Chien Pan**

Professor and Executive Director, Institute of Catastrophe Risk Management, Nanyang Technological University, Singapore

Professor Tso-Chien Pan is the Executive Director and Founding Director of Institute of Catastrophe Risk Management (ICRM) at Nanyang Technological University, Singapore. He is the former Dean of the College of Engineering at NTU. Professor Pan specialises in the analysis and design of structures against dynamic loading. Over the years, he has carried out many research projects in the area of dynamic structural response to shock and blast loading, as well as earthquake excitations. As Founding Director, Professor Pan is leading the development of ICRM, a university-wide research institute, to look into the effects of natural and man-made disasters on the society

**Dr Louise Pryor**

Risk Researcher, Cambridge Centre for Risk Studies

Louise Pryor is a Risk Researcher at the Centre for Risk Studies. Louise Pryor's career has covered software, financial modelling, academia and financial regulation in a variety of roles. She has worked in the insurance industry as an actuary and software risk consultant, specialising in risk management, modelling and systems and controls. More recently she was Director, Actuarial Standards at the Financial Reporting Council, where she led the development of technical Actuarial Standards and was a member of the Board for Actuarial Standards. She is also an experienced software developer and development manager, and has a PhD in Computer Science. The common theme throughout her work is risk and uncertainty. She has been involved in the management of risk at all levels: operationally, in project management; conceptually, reasoning about and modelling risks in workflow management and financial services; and strategically, considering the pros and cons of policy initiatives.

**Professor Daniel Ralph**

Director, Centre for Risk Studies

Professor Danny Ralph is a Founder and Director of the Centre for Risk Studies, Professor of Operations Research at Cambridge Judge Business School, and a Fellow of Churchill College.

Danny received his PhD in 1990 from the University of Wisconsin Madison. He was a faculty member of the Mathematics & Statistics Department at the University of Melbourne before coming to the University of Cambridge for a joint appointment in the Engineering Department and Cambridge Judge Business School.

Danny's research interests include optimisation methods, equilibrium models for electricity markets, and risk in business decision making. He is Editor-in-Chief of *Mathematical Programming (Series B)*.

**Simon Ruffle**

Director of Technology Research & Innovation, Centre for Risk Studies

Simon's main activity in the Centre focusses on the Cambridge Risk Framework research programme where he is leading the development of open source technology to support research into how complex global socio economic networks behave under extreme systemic macro shock conditions.

He is leading the development of the Substrate Data project - closely coupled to the framework - a set of business and economic networked data sets that provide an underpinning for the modelling and analysis of value flows and contagion.

In addition, he is leading the Cyber Threat research track.

Originally studying architecture at Cambridge, Simon has

spent most of his career in industry, developing software for natural hazards risk. He has worked on risk pricing for primary insurers, catastrophe modelling for reinsurers, and has been involved in placing catastrophe bonds in the capital markets. He has many years of experience in software development, relational databases and geospatial analysis and has worked in a variety of organisations from start-ups to multinationals.

**John Scott**

Chief Risk Officer, Zurich Global Corporate, Zurich Insurance Group

John Scott is Chief Risk Officer for Zurich Global Corporate. He joined Zurich in 2001 becoming Head of Risk Insight in 2007 and took on his current role in 2009. John leads the global, regional and local implementation of the Group's enterprise risk management strategy across Global Corporate. A graduate of Oxford University, with a PhD in geology, John's early career was in the upstream oil and gas industry, where he gained wide-ranging international experience with BP. In 1995 he gained his MBA at Cranfield and joined BOC, as a key member of the Group Strategy & Planning team, and then later became General Manager of BOC's Edwards business division. John is a member of the Institute of Directors in the UK and currently chairs the CCSA (Carbon Capture and Storage Association) group on risk.

**Dr Andrew Skelton**

Risk Researcher, Centre for Risk Studies

Andrew Skelton is an affiliate of the Centre for Risk Studies and holds a research post at the Centre for Climate Change Mitigation Research (4CMR) in the Department of Land Economy at the University of Cambridge.

With the Centre for Risk Studies, Andrew is helping to develop a dataset of the world's largest enterprises that

drive the global economy and their relationships with each other. Particular focus is being given to quantifying supply chain linkages across a network of multinational enterprises to gain insight into the potential impact of a cyber catastrophe scenario.

Andrew is also interested in the role played by major enterprises in driving (and mitigating) environmental impacts through indirect supply chain activities; work that falls at the intersection of economics, environmental science, international business and supply chain management. Previous research has included: the development of an approach for mapping and visualising flows of embodied greenhouse gas emissions through the global economy; the assessment of how different regions, industries and enterprises could mitigate emissions within their international supply chains; and, the development of a computational model for estimating the carbon footprint of a group of enterprises that removes double-counting caused by the presence of enterprises within each other's supply chains and deals with uncertainty introduced by incomplete information.

Andrew has an earlier background in product design and holds an MPhil in Engineering for Sustainable Development from the University of Cambridge and an MEng from the University of Durham.

**Alan Smith**

Global Head of Risk Strategy and Chief of Staff, Global Risk, HSBC

Alan Smith is Chief of Staff and Global Head of Risk Strategy within the Global Risk function at HSBC where he is responsible for overseeing the Risk Appetite, Risk Governance, Risk Measurement, Scenario Stress Testing and Pension Risk infrastructures for the Group, leading a global team of 300 staff. Alan is a member of the Global Risk Management Board which oversees the running of the Risk function of 30,000 plus people across the globe.

Alan has worked with HSBC for 17 years in a variety of senior finance, risk and capital management roles in the Group Management Office, in London and the Middle East. Prior to his current role, Alan was Group Head of Economic Capital from 2005 to 2007, and before that Head of Global Finance for HSBC's Corporate Investment Banking and Markets Division, where he was a member of its ALM and Operational Risk Management Committees. Alan worked with KPMG London from 1987 to 1994, latterly within its Financial Sector Advisory practice, advising global financial institutions on capital, risk and accounting. Alan started his career with PwC in Barbados.

Alan is a Fellow of the Institute of Chartered Accountants of England and Wales and has an MBA in Finance from Cass Business School, City University in London which he attended as a Commonwealth Scholarship winner. He completed his undergraduate degree at the University of the West Indies in Jamaica.

Outside of work, Alan has a keen interest in cricket, (representing Barbados at the Junior National level), theatre and travel. He is also actively involved in a number of faith based charities which focus on social engagement and development, and is an advisor to the boards of trustees of a range of charities.

**Dr Kimmo Soramäki**

Founder & CEO, Financial Network Analytics

Kimmo Soramäki is the Founder and CEO of Financial Network Analytics, a software platform that helps regulators and financial institutions gain insights from complex financial data through network analysis and visualisation. During the last 17 years he has worked in both public policy and advisory roles, and carried out multidisciplinary research at several central banks - including the European Central Bank and the Federal Reserve Bank of New York. He has published in major academic journals in the areas of statistical mechanics,

economics and operations research and is a frequent speaker at industry and academic conferences. Kimmo holds a Doctor of Science in Operations Research and a Master of Science in Economics.

**Dr Michelle Tuveson**

Executive Director, Centre for Risk Studies

Michelle Tuveson is a Founder and Executive Director at the Cambridge Centre for Risk Studies hosted at the University of Cambridge Judge Business School. Her responsibilities include the overall executive leadership at the Centre. This includes developing partnership relationships with corporations, governments, and other academic centres. Michelle leads the Cambridge CRO Council and she chairs the organising committee for the Cambridge Risk Centre's Annual Risk Summits. She is one of the lead organisers of the Aspen Crisis and Risk Forum. She is an advisor to a number of corporations and boards as well as a frequent conference speaker.

Dr Tuveson has worked in corporations within the technology sector for the majority of her career, with her most recent position in the Emerging Markets Group at Lockheed Martin. Prior to that, she held positions with management strategy firm Booz Allen & Hamilton, and US R&D organisation MITRE Corporation. She is involved in risk governance research associated with the role of the Chief Risk Officer and hosts roundtable topic discussions. She was awarded by the Career Communications Group, Inc. as a Technology Star for Women in Science, Technology, Engineering and Maths (STEM). She has degrees from the Massachusetts Institute of Technology, Johns Hopkins University, and the University of Cambridge. She is a member of Christ's College Cambridge.

**Paul VanderMarck**

Chief Products Officer, RMS

Paul VanderMarck is chief products officer of RMS. In this role, he has overall responsibility for developing the RMS(one) ecosystem. Since joining RMS in 1992, he has played a central role both in the development of RMS's global catastrophe modeling capabilities as well as in advancing the state of practice for using modelling to manage catastrophe risk. In 2003, Paul was recognized by the Earthquake Engineering Research Institute for his contributions to the field of earthquake risk mitigation and management with the Shah Family Innovation Award, and he serves as chairman of the board for Build Change, a non-profit organisation dedicated to reducing deaths, injuries, and economic losses caused by housing collapses due to earthquakes in developing countries. Paul holds a BS in civil engineering and an MS in structural and earthquake engineering, both from Stanford University.

**Joshua Wallace**

Co-Founder, Cytora

Joshua is a political scientist and co-founder of Cytora, providers of political risk analytics. A key subject matter specialist on geopolitical risk, he assists the Cambridge Centre for Risk Studies with the development of stress test scenarios for geopolitical conflict and social unrest. With a background in political science, management and IT consultancy and international development, Joshua is passionate about how new technologies can be applied to the world's most vexing problems. He co-founded Cytora, where he is head of research. His time in consultancy saw him advise some of the world's biggest companies such as GlaxoSmithKline while his development work has taken him to Ghana, Sierra Leone, Swaziland and India. Joshua has an MSc in Political Science from University College London and a BA in History from the University of Manchester.

Location

Centre for Risk Studies is located within Cambridge Judge Business School.

By road

From the south: leave the M11 at Junction 11. This road will eventually become Trumpington Street.

From the north and west: leave the A14 at Junction 31. From the A1307, follow the ring road (A1134) round anticlockwise. Finally, turn left on to Trumpington Street.

Cambridge Judge Business School is located on the right hand side of Trumpington Street, shortly after two mini-roundabouts, just before the Fitzwilliam Museum.

By taxi

Blue Rose (executive private car): +44 (0) 1954 210441

Panther: +44 (0) 1223 715715

Camtax: +44 (0) 1223 242424

By rail

Fast direct trains run from London King's Cross and take just 50 minutes.

Direct trains also run from London Liverpool Street.

Cambridge Risk Centre is a ten minute taxi ride from Cambridge train station.

Visit the National Rail website for train tickets, times and fare information

By air

Cambridge is less than an hour's drive from London Stansted airport.

Regular coach services link Cambridge to Stansted, Heathrow and Gatwick airports – contact National Express for further information.

To book your accommodation, please contact the hotel directly. Any agreement for accommodation is between you and the hotel. Please check the hotel's terms and conditions of booking, particularly cancellation policy, before booking.

University Arms Hotel

£135 per night bed & breakfast (quote code judg230614; reduced rate available until 26 May)
Tel: +44 (0)871 222 4689

Cambridge City Hotel

£142 per night bed & breakfast (quote code RAC220614 for special delegate rate; only a limited number of rooms are available at this rate; the reduced rate is available until 5 June)

Regent Hotel

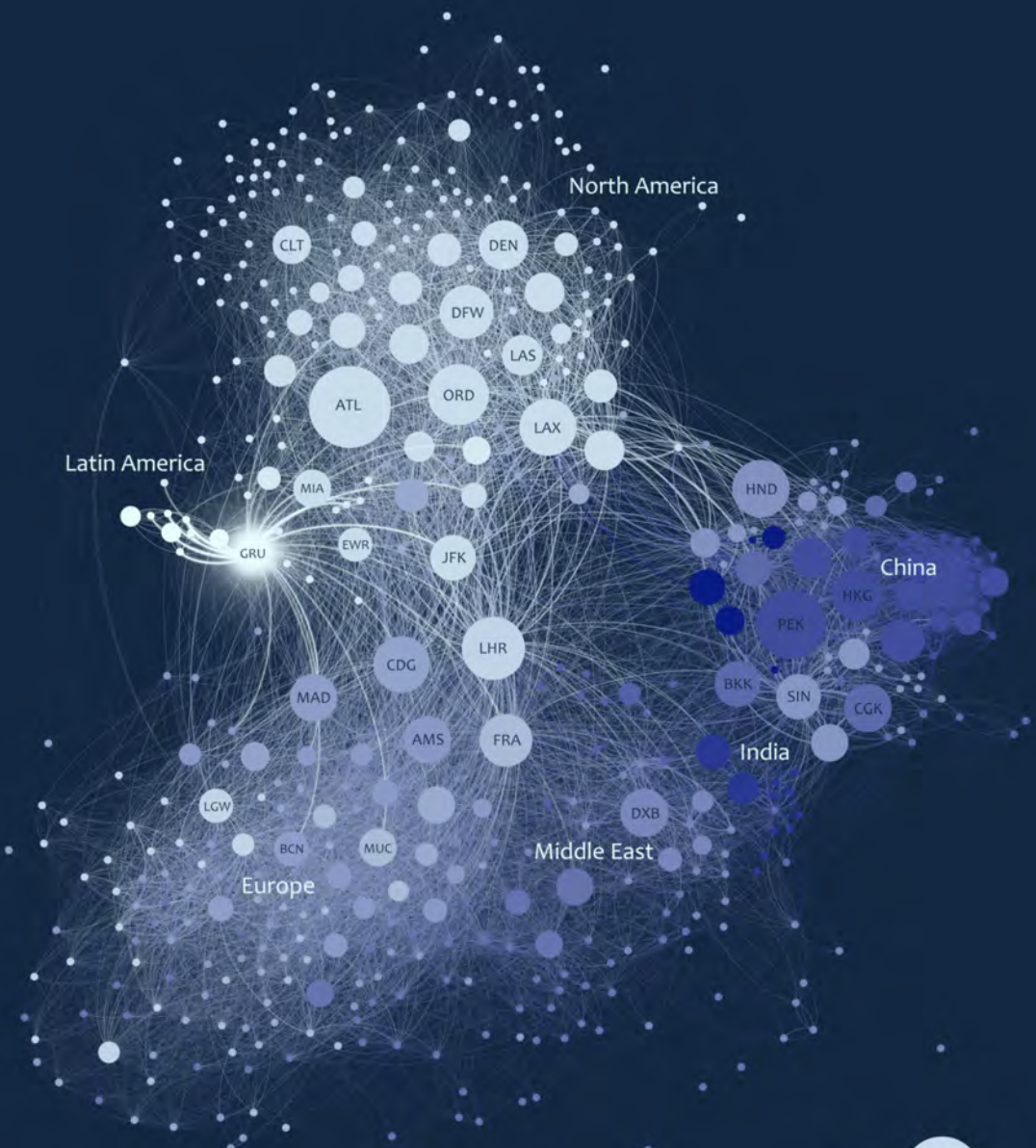
£117 (standard double) / £108 (small double) per night bed & breakfast
Tel: +44 (0)1223 351470

Hotel du Vin

Tel: +44 (0)844 736 4253
Doubletree by Hilton Hotel
Tel: +44 (0)1223 259988

University Rooms Cambridge

Accommodation available in selected Cambridge Colleges



10 September 2013

Global Landscape of Risks

Co-Hosted with Munich Re; CRS in conjunction with Munich Re, hosted a workshop on emerging risks in insurance.

http://www.risk.jbs.cam.ac.uk/news/events/other/2013/130910_global_landscape.html

16 September 2013

Emerging Risks and the Cyber Challenge

CRS Invited Speaker Presentation at Catlin Global Underwriting Conference 'Underwriting Matters'.

21 October 2013

**Disaster Risk Reduction and Structural Performance
Criteria – The Disconnect and it's Solution**

Dr George Walker, Honorary Research Fellow at Aon Benfield. CRS Understanding Risk: Lunchtime Seminar Series;

22 Jan 2014

**Perspectives on Counterparties: Diversification Impacts
on Financial Stability**

Cambridge CRO Council: Chief Risk Officer Round-table Discussions, London

http://www.risk.jbs.cam.ac.uk/news/events/cro/140122_perspectives.html

23 Jan 2014

Centre for Risk Studies Advisory Board Meeting

Research strategy review by the members of the Centre for Risk Studies Advisory Board.

http://www.risk.jbs.cam.ac.uk/news/events/other/2014/140123_advisoryboard.html

Feb 2014

The 2014 Cambridge – McKinsey Risk Prize

The Centre for Risk Studies, in conjunction with McKinsey & Company, 2014 annual risk prize for the best submission on risk management by a current student at the Cambridge Judge Business School.

http://www.risk.jbs.cam.ac.uk/news/news/1312_risk_prize.html

20 Mar 2014

Emerging Risk Scenarios for Risk Management

Seminar on risk management using scenarios of emerging risks, such as cyber catastrophe, pandemics, and geopolitical conflict.

http://www.risk.jbs.cam.ac.uk/news/events/other/2014/140320_emerging.html

9 Apr 2014

Insurability of Supply Chain Risk: Developing a Research Agenda

Workshop on assessing and managing the risks of disruption in international supply chains and risk transfer using insurance. Attendance by invitation only.

http://www.risk.jbs.cam.ac.uk/news/events/other/2014/140409_insurability.html

23-24 Jun 2014

Cambridge Centre for Risk Studies 5th Annual Risk Summit Conference

The Pulse of Risk: From Big Data to Business Value

The Risk Summit brings together leaders and decision makers from business, government, intergovernmental organisations, academia and NGOs to explore salient topics in risk management.

<http://www.risk.jbs.cam.ac.uk/news/events/risksummits/risksummit2014.html>

21-22 Jul 2014

Aspen Crisis and Risk Forum

The Governance Challenge: Board Leadership in the Global Risk Environment

Aspen, CO, USA (by invitation only)

September 2014

Financial Risk and Network Theory

Conference to present invited papers on the latest research that maps interconnections between financial institutions and markets and assesses their impact on financial risks and returns. The conference will be held in collaboration with Journal of Network Theory in Finance (JNTF).

Executive Team

Professor Daniel Ralph, Academic Director

Dr Michelle Tuveson, Executive Director

Dr Andrew Coburn, Director of External Advisory Board

Simon Ruffle, Director of Technology Research and Innovation

Research Team

Dr Gary Bowman, Research Associate, Centre for Risk Studies

Dr Fabio Caccioli, Research Associate, Centre for Risk Studies

Dr Scott Kelly, Research Associate, Centre for Risk Studies

Dr Roxane Foulser-Piggott, Research Associate, Centre for Risk Studies

Dr Louise Pryor, Risk Researcher, Centre for Risk Studies

Dr Andrew Skelton, Risk Researcher, Centre for Risk Studies

Dr Duncan Needham, Risk Researcher, Centre for Risk Studies

Associates

Andrew Freeman, Risk Fellow

Dr Alan Punter, Risk Associate

Dr Ruth Whaley, Senior Advisor, Corporations and Boards

Consultants and Collaborators

Institute for Catastrophe Risk Management, Nanyang Technical University, Singapore

Columbia Business School, New York

Oxford Economics Ltd.

Dr Kimmo Soramaki, CEO, Financial Networks Analytics Ltd.

Dr Samantha Cook, Chief Scientist, Financial Networks Analytics

Hannah Baker, Cambridge Architectural Research Ltd.

Richard Hartley, Co-Founder, Cytora Ltd.

Joshua Wallace, Co-Founder, Cytora Ltd.

Dr D'Maris Coffman, Director of the Centre for Financial History, University of Cambridge

Dr Adrian Leonard, Centre for Financial History, University of Cambridge

Dr Rob Watson, Cambridge Computer Labs, University of Cambridge

Dr Richard Clayton, Cambridge Computer Labs, University of Cambridge

Dr Frank Stajano, Cambridge Computer Labs, University of Cambridge

Eireann Leverett, I/O Active Ltd.

Andrew Auty, Re: Liability (Oxford) Ltd.

Dr Gordon Woo, RMS Inc.

Dr Mary Chang, RMS, Inc.

Dr Ivan Ureta, College of Economics and Political Science, Sultan Qaboos University, Oman

Antonios Pomonis, independent Consultant

Administration

Camilla Burgess, Events & Operations Manager, Centre for Risk Studies

Judge Business School - Finance, Legal and Administration Offices

The research programme of the Centre for Risk Studies focusses on business applications of management science to reduce risk. A number of interlinked research themes are being explored. They share a common approach and risk analysis framework – the ‘Cambridge Risk Framework’ – which has been developed at the Centre for Risk Studies to address the issues of complex risk.

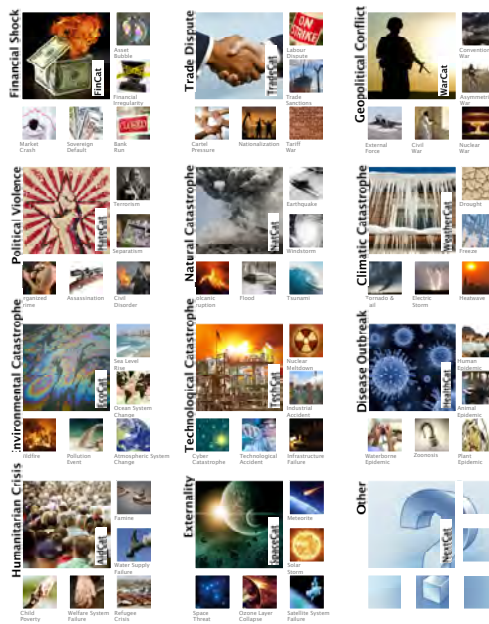
Cambridge Risk Framework

The Cambridge Risk Framework is an approach to evaluating complex risk, involving

- Developing a ‘Taxonomy of Threats’: Understanding the broad spectrum of potential causes of events that could impact an international business process or the global economic system. A threat definition (minimum thresholds of consequences) is used for inclusion, and a systematic approach taken to threat identification through historical and scientific source review. Threats are grouped by cause and categorized hierarchically.
- Compiling a review of the ‘state-of-knowledge’ for selected threat types by literature review with the identification of a Subject Matter Editor to provide expert insight. Threat evaluation is standardised across threat types by considering the frequency-severity distribution of the global magnitude of threats that can be expected, and benchmarking relative importance by assessing the severity of event with, e.g. 1% annual probability of exceedance – a ‘1-in-100’ event.
- Definition of a scenario for a threat class of interest that illustrates an example of the severity of an event with a benchmark probability (e.g. 1% annual probability of exceedance) for use as a stress test. A scenario consists of a detailed narrative, a timeline, a ‘footprint’ of geographical, sectoral or other impact, and a standardised data structure for estimating initial impact within the footprint.
- Assessing the impact consequences of the scenarios in how they affect specified categories of assets, liabilities and economic business sectors. This has entailed

developing models of how consequences flow through business networks, and macroeconomic and financial systems.

- Representation of global business systems as different networks of activity, using a standardised graph theory representation of networks and imposing a uniform data architecture. Compiling data on the global networks of the macroeconomy enables models and scenarios to be applied.



Resilient International Supply Chains

Ralph, D.; Bowman, G.; Coburn, A.; Ruffle, S.;
Cambridge Centre for Risk Studies Working paper 2013.01;
January 2013.
<http://cambridgeriskframework.com/getdocument/3>

**Cambridge Risk Framework: A Taxonomy of Threats for
Macro-Catastrophe Risk Management**

Andrew Coburn, Danny Ralph, Michelle Tuveson, Simon
Ruffle, Gary Bowman
Cambridge Centre for Risk Studies Working Paper
201307.20; July 2013
<http://cambridgeriskframework.com/getdocument/4>

**Survey of Leading Opinions: Developing a Research
Agenda for Understanding Financial Catastrophe Risk**

Andrew Coburn, Gary Bowman, Fabio Caccioli
Cambridge Centre for Risk Studies Working Paper
201303.31, Draft: May 2013
<http://cambridgeriskframework.com/getdocument/12>

**Cyber Catastrophe: Cambridge Risk Framework - Profile
of a Macro-Catastrophe Threat Type**

Simon Ruffle, Andrew Coburn, Danny Ralph, Gary Bowman
Cambridge Centre for Risk Studies Working Paper
201307.02, July 2013
<http://cambridgeriskframework.com/getdocument/9>

**Geopolitical Conflict: Cambridge Risk Framework -
Profile of a Macro-Catastrophe Threat Type**

Joshua L. Wallace, Richard G Hartley, Gary Bowman, Andrew
Coburn, Simon Ruffle
Cambridge Centre for Risk Studies Working Paper
201308.02; August 2013
<http://cambridgeriskframework.com/getdocument/17>

**Human Pandemic: Cambridge Risk Framework - Profile
of a Macro-Catastrophe Threat Type**

A. Coburn, M. Chang, D. Ralph, M. Tuveson, S. Ruffle, G.
Bowman
Cambridge Centre for Risk Studies Working Paper

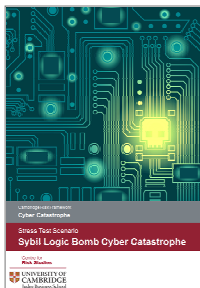
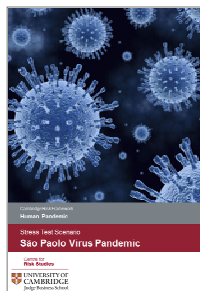
201303.01; Draft: March 2013
<http://cambridgeriskframework.com/getdocument/8>

Social Unrest: Cambridge Risk Framework - Profile of a Macro-Catastrophe Threat Type

Andrew Coburn, Joshua Wallace, Richard Hartley, Gary Bowman, Simon Ruffle

Cambridge Centre for Risk Studies Working Paper
201312.01; December 2013

<http://cambridgeriskframework.com/getdocument/5>



Resilience through the Management of Societal & Economic Risk

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