INTERNATIONAL CENTER for DECISION and RISK ANALYSIS

ICDRiA

The School of Management

The University of Texas at Dallas

MISSION

ICDRiA is established to perform interdisciplinary research and develop international cooperation in risk management and decision-making by exchanging scholastic knowledge and practical experience among academia, industry, and public agencies.

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The Institution

➢ **An initiative of the School of Management**
  - As a part of its development and growth plan
  - Similar to initiatives of major Business schools
  - On the model of SOM existing centers

➢ Open to other schools at UTD, and to external partners

RISK MANAGEMENT: A RAPIDILY DEVELOPING FIELD

➢ **Risks are prevalent everywhere**

➢ **Risk is the core issue in the financial services sector**
  - Banking, insurance and investment management

➢ **Tentative Typology:**
  - Risks in the government sector
  - Risks in the industrial sector
  - Risks in mixed economy and public-private partnership

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TYPOLOGY OF RISK

- ➢ **Risks in the government sector**
  - ▪ New risks arising from terrorist activities
  - ▪ Natural hazards

- ➢ **Risks in the industrial and economic sector**
  - ▪ New technologies
  - ▪ New applications and markets
  - ▪ Large financial investments

- ➢ **Risks in large infrastructures carried out by industry with public funding:** (Defense, Space, Transportation)
  - ▪ **Cost Over-runs**
  - ▪ **Missed deadlines**
  - ▪ **Security aspects**

Security: A Major Concern

➢ **9/11 has added a new dimension**

➢ **Cybersecurity, Information security, a prevalent concern**

➢ **The new risks are low probability, but high catastrophe**

Remarkable Development of Financial Engineering

➢ **Stochastic models to evaluate the probability of default, losses, death**

➢ **Financial tools to mitigate the risks, (hedging, options, portfolios,…)**

➢ **Optimization of economic decisions (net present value, utility, efficient frontier,…)**

➢ **Modeling market behaviors**

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Risk Approach in Industry

➤ **Reliability Theory**

➤ **Quality Control**

➤ **Probability and Severity of Events (PRA: Probabilistic Risk Assessment)**

➤ **Lean Processes**

➤ **Six Sigma**

➤ **Systems Analysis and Engineering**

➤ **Spiral Development**

Convergence of the two Approaches

➢ **Technical Risk Management is not enough**

➢ **Pure Financial Approach not sufficient for Industry**

➢ **Technical and Economic Aspects are integrated**

Convergence of the two Approaches

➤ **Industrial Projects incorporate:**
- **Big Investments in Development and Production**
- **Innovative Technologies**
- **New uncertain Markets**
  - ❖ **New Applications**
  - ❖ **New foreign Markets**
- **New Competition**

➤ **External Risks must be taken into consideration: environment, security, global economy…**

➤ **Management is becoming more and more the management of risks.**

Convergence of the two Approaches

➢ **Can industry make use of financial engineering tools?**

- ▪ **Real options, portfolio analysis,..**
- ▪ **Insurance against industrial project risks**

➢ **Can finance sector learn from industry?**

- ▪ **Systems approach**
- ▪ **Operational risks**

Risk Approach in Security

	Government	Sector	Firm / Organization
Policy / Strategy	Developing tiered investments strategy (Fed, state, city,..) in public security	Internet mediated hacking threat to energy distribution	Impact of security investment on corporate patronage of city airport
Design	Developing security awareness media campaign	Minimizing catastrophic risks in cargo transfer across airlines	Coordinated security in multi location operations
Operation	Assessing efficacy of threat level system at national airports	Recovery program for catastrophes	Evacuation of children from school premises facing security threat

Actions at Government, Policy/ Strategy Level

- **Social Cost Benefit Analysis (SCBA) of national / state / municipality level security investments**

- **Security regulations governing use, misuse and abuse of public resources**

- **Identification and security of critical public goods**

- **International cooperation in research and intelligence**

Actions at Government, Design Level

- **Develop data banks to support security initiatives**

- **Develop security awareness campaign programs**

- **Monitor public systems using technology**

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Actions at Government, Operation Level

- Assessment of threat level (e.g. R,Y,G) and public notification

- Early Warning System (EWS) and Emergency Management Response (EMS)

- Training (security and response)

- Periodic and event based performance evaluation of security systems

- Real time information sharing systems in air transport systems

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Actions at Sector, Policy/ Strategy Level

- Internet mediated hacking threat to energy generation and distribution systems

- Impact of regulation / policy on sector specific issues

- Inter sector exchange of information / cooperation in security measures

- Sector specific assessment of threats, vulnerabilities and countermeasures

Actions at Sector, Design Level

- Supply chain security

- Sector specific data / information system design

- Intra-sector cooperation (e.g. development of training programs across orgn[s.])

- Central authority for inspection

- Define metrics, declare standards

Actions at Sector, Operation Level

- **Recovery program for catastrophic security incidents**

- **Industry preparedness for emergency response**

- **Skeletal operation in the face of security threat**

- **Emergency shut down and personnel evacuation programs**

Actions at Firm/Organization, Policy/ Strategy Level

- **Defining organizational objectives in security domain**

- **Organizational risk bearing and sharing decisions**

Actions at Firm/Organization, Design Level

- **System design for checking response readiness and efficiency**

- **Ex-post analysis of security events**

- **Assessment of security methodologies**

- **Assessment of stakeholders' and employees' risk perception on organizational security**

- **Fail safe check points to avoid catastrophe**

Actions at Firm/Organization, Operation Level

- Personnel evacuation from public facilities, official complexes etc.

- Unobtrusive security inspection plans

- Implementation of detection technologies

- Failure analysis, recovery methods and interventions

STRATEGY OF ICDRIA

➢ **Contribute to the convergence of approaches between finance and industry**

➢ **Understand generic and sector specific aspects in risk management**

➢ **Analyze risks related to new technologies**

➢ **Integrate organizational and social aspects**

➢ **Conjugate risk assessment in decision processes**

➢ **Investigate the problems related to security**

OUR APPROACH

- ➢ Meeting point of experience for industry and academic community
- ➢ Center for interdisciplinary research
- ➢ Forum for cooperation among international players
  - ▪ Conferences and workshops
- ➢ Education program to generate talent and skill to sustain risk management interventions
  - ▪ Certificate, Masters and PhD level courses
- ➢ Develop experience on the field: Internships

THE TOOLBOX OF ICDRiA

- Operations Research
- Bayesian Analysis
- Game Theory and Differential Games
- Extreme Value Theory
- Statistical Modeling

- Stochastic Processes
- Probability
- Operations Management
- Mathematical Finance
- Reliability Theory
- Real Options

ADDITIONAL WORKS

➢ **Comparative studies across sectors**

➢ **Surveys**

➢ **Case studies**

➢ **Interviews**

➢ **Software tools**

ON GOING PROGRAMS

- ➢ **Comparison between sectors**
    - ▪ Telecommunications
    - ▪ Automotive industry
    - ▪ Software industry
- ➢ **Comparison between government projects and market-oriented industrial projects**
    - ▪ Space
    - ▪ Energy
- ➢ **Framework of comparison**
    - ▪ Methods and tools
    - ▪ Organizational issues

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ON GOING PROGRAMS

- ➤ **New Technologies**
  - ▪ Nanotechnologies
    - ❖ Nanoelectronics
    - ❖ Nanomaterials
    - ❖ Laser Optics
- ➤ Security
  - ▪ Security in Information Systems
  - ▪ Cost Benefit Analysis

PARTNERSHIP

➤ ESA: European Space Agency

➤ EADS: European Aeronautics Defense Space

➤ FX- Conseil and French Ministry of Research

➤ ALCATEL, NA

➤ French Atomic Energy Agency

➤ Blueline/Rediform

➤ EDS

➤ Future Wei

➤ Essilor

➤ National Science Foundation (NSF)

➤ State of Texas (TARP)

UTD PARTNERSHIPS

➢ UTD Centre of Excellence in CyberSecurity

➢ UTD Emergency Preparedness Institute

➢ UTD-SOM Center for Intelligent System Networks

POTENTIAL PARTNERSHIPS

➤ Public agencies in space, defense, and energy sectors

➤ Corporations in advanced technology sectors(e.g., aeronautics, telecom, energy, software technology, automotive, pharmaceutical…)

➤ Banking, financial services and insurance

➤ Institutional investors

TEAM

- ## Director
  - Alain Bensoussan, Distinguished Research Professor
- ## Academic Director
  - Sumit Sarkar, PhD
- ## Kurtay Ogunc
  - **Associate Director for Business Development**

- ## Center Coordinator
  - Holly Worrell

TEAM

➢ **Faculty**
- Metin Cakanyildirim, Assistant Professor
- Shun-Chen Niu, Professor
- Varghese Jacob, Senior Associate Dean & Professor
- Robert Kieschnick, Associate Professor
- Holly Lutze, Assistant Professor
- Syam Menon, Assistant Professor
- Vijay Mookerjee, Professor
- Suresh Radhakrishnan, Associate Professor
- Divakar Rajamani, Professor and Managing Director of C4ISN
- Young Ryu, Associate Professor
- Robert Serfling, Professor
- Suresh Sethi, Ashbel Smith Professor and Director of C4ISN
- Raghunathan Srinivasan, Associate Professor
- Kathryn Stecke, Professor
- Janos Turi, Professor
- John Wiorkowski, Professor and Vice Provost
- Wei Yue, Assistant Professor

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TEAM

➢ **Ph.D. Students**

- Tridib Bandopadhyay   **Research Associate, Post Doc**
- Nagihan Comez   - Andrew Royal
- Emre Demirel   - Ioane Muni Toke
- Sanjay Kumar
- Dengpan Liu
- Lama Moussawi
- Hulisi Ogut
- Xuying (Daisy) Zhao

➢ **MBA Students**
- Gregory Turi

Alain Bensoussan, Distinguished Research Professor, is the Director of ICDRiA. Professor Bensoussan has an extensive research background in stochastic control, probability and stochastic processes. He is Professor Emeritus at the University of Paris Dauphine.

He graduated from the Ecole Polytechnique in 1962, and obtained his Ph.D. degree from the University of Paris in 1969. He is a member of the French Academy of Sciences, of the French Academy of Technology, of the Academia Europae, and of the International Academy of Astronautics.

He is an IEEE fellow, and received the Von Humboldt award, as well as the NASA public service medal.

Professor Alain Bensoussan had important responsibilities in the French research system. He was President of INRIA (National Institute for Research in Computer Science and Control) from 1984 to 1996, and President of CNES, the French space Agency, from 1996 to 2003. He has been Chairman of the ESA (European Space Agency) Council from 1999 to 2002.

He is Officer of Legion d'Honneur from France and Officer Bundes Verdienst Kreuz from Germany.

Sumit Sarkar, is the Academic Director of ICDRiA.

Professor Sarkar is a Professor of Management Information Systems in the School of Management at The University of Texas at Dallas. He received his PhD in Computers and Information Systems from the University of Rochester, his MBA from the Indian Institute of Management Calcutta, and his BTech from the Indian Institute of Technology Delhi.

He serves as a Senior Editor for *Information Systems Research*, and is on the editorial board of *Management Science and Information Technology and Management.* He served as the program co-chair for the *International Conference on Information Systems* (ICIS) in 2001, and for the *Workshop on Information Technology and Systems* (WITS) in 1999. He has served on the steering committee for ICIS and WITS, on the board of the Information Systems Society for INFORMS, and on the Program Committee for numerous conferences and workshops.

His research has appeared in *Management Science, Information Systems Research*, *ACM Transactions on Database Systems*, *IEEE Transactions on Knowledge and Data Engineering, The INFORMS Journal on Computing, IEEE Transactions on Systems Man and Cybernetics*, and several other journals and conference proceedings.

Professor Sarkar is a member of the ACM, the AIS, the IEEE Computer Society, and INFORMS.

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