Day 2: External Expert Panel

10:30-10:40
Introduction of panelists and purpose of panel

10:40-11:15
Introductory remarks by panelists

11:15-11:45
Moderated discussion between panelists

11:45-12:00
Audience Q&A
John McWilliams

Kenneth Wee

Ned Morse

Enterprise risk management

Learnings from risk management in financial services

Safety and operational risk management in oil and gas industry
John McWilliams
Enterprise risk management
Understanding the Distribution of Risk

[Diagram showing a normal distribution (bell curve) with standard deviations and fat tails highlighted.]
Enterprise risk management maturity model

Key Characteristics

1. Risk Naive
   - No formal framework for risk management

2. Risk Aware
   - Scattered silo based approach to risk management

3. Risk Defined
   - Strategies and policies in place and communicated. Risk appetite defined.

4. Risk Managed
   - Enterprise wide approach to risk management developed and communicated.

5. Risk Enabled
   - Risk management and internal controls fully embedded in the operations.

6. Risk Decisions
   - Risk-based decision making including prioritized allocation of resources

Maturity Level
Kenneth Wee
Learnings from risk management in financial services
Leading institutions manage risk through a governance process linking risk management to business planning.

- **Risk Identification**: Identify risks and comprehensively describe them, especially emerging risks.
- **Risk Assessment and Inventory**: To assess and track how a risk might manifest in your footprint.
- **Risk Appetite**: How much of each Risk are you willing to take as part of your business model.
- **Risk Policy and Controls**: Set roles, control the risk to within your desired Appetite.
- **Learning & Stress testing**: Ensure they can withstand certain extreme events.
- **Business Planning**: Bringing risk awareness into the next round of strategic planning.
A comprehensive risk management strategy needs to target both everyday losses and infrequent events that can lead to large losses.

Sources of everyday data
- Loss database: banks maintain records of operational risk losses
- Manager self-assessments: managers are required to create Risk Control Self-Assessments

Tail risk events and data
- Investment needs to be made in understanding how big events happen and increasing resiliency to those
- With climate change tail risk can only go up, either in frequency or severity of tail events

Examples of risks with long tails: internal fraud, cyber risk, market illiquidity, concentration risk, unexpected correlations, wrong-way risk
Tail Risk can be hard to identify!

“Right now everything on my screen is flashing red. That doesn't make me nervous... The machine works.”

Former CRO of Bear Stearns, June 2006
Model risk: How confident are you in the model and the data behind it? Disciplined model risk management is now in place at most large banks

<table>
<thead>
<tr>
<th>Company</th>
<th>Event Description</th>
<th>Year</th>
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<tbody>
<tr>
<td>GE Capital</td>
<td>Liability modeling and assumptions were flawed and remained unresolved over years in the long-term care insurance which resulted in $15B additional reserves</td>
<td>2018</td>
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<tr>
<td>Transamerica</td>
<td>Charged $98M by the SEC - &quot;for their failure to take reasonable steps to ensure the models worked as intend and for contributing to the company’s compliance failings&quot;</td>
<td>2018</td>
</tr>
<tr>
<td>JPMorgan Chase &amp; Co.</td>
<td>Flawed risk management models allowed a trader to accumulate huge short positions on CDX products distorting market prices. $6.2B loss incurred by the company and congressional hearings and investigations by the Federal Reserve, SEC, FBI followed</td>
<td>2012</td>
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</table>

When you use a model, do you know what its key assumptions are? Do you know its limitations? How much data was it built on? What manual adjustments does it contain (to data, coefficients, etc.?) Do you know when it needs re-calibrating?
An ideal scenario analysis process links risk factors to the value of business and mitigation strategies, to aid in capital allocation.

1. Risk Identification
   - E.g. Wildfires, climate change, fraud, cyber, counterparty risk

2. Mega Trends
   - E.g. Urbanization rate, migration patterns, demographics

3. Environmental Scenarios...
   - E.g. Land use, temperatures, rainfall

4. Macroeconomic and Market Responses
   - E.g. Changes in Housing Prices by county

5. Modeled P&L & Balance Sheet outcomes
   - E.g. Impact on EBITDA 2020-40 in three scenarios

6. Value of different adaptation and mitigation strategies

... and Socioeconomic Scenarios
   - E.g. Growth path of MSAs and industry
   - E.g. Changes in Employment by sector
   - E.g. Impact on EBITDA 2020-40 in three scenarios
   - Value of different adaptation and mitigation strategies
What can we do to improve risk management throughout an industry?

- Encourage data collection and pooling
- Publish best practices, conduct horizontals
- Invest in technology, front-to-back reporting
- Tone-from-the-top: risk governance is important
- Embed risk management into operational culture
- Create KRI's and a link to compensation
- Creating consistency in stress scenarios
- Taking a risk-based selective approach
Ned Morse
Safety and operational risk management in oil and gas industry
Dramatically improved safety at major West Coast refinery
Achieving 2 years without a recordable employee injury\(^1\)

Injury rate of employees

![Graph showing injury rate of employees over years](image)

- **Year 1**: 0.9
- **Year 2**: 1.6
- **Year 3**: 0.8
- **Year 4**: 0.5
- **Year 5**: 0.2
- **Year 6**: 0.0
- **Year 7 YTD\(^1\)**: 0.0

Behavior based culture change launched

0.5 considered world class performance\(^3\)

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1. YTD at time analysis conducted
2. Injuries per 200,000 hours worked
3. Per Solomon benchmark report for EDC group 5 & 6
Reduction in number of injuries to contractors at major West Coast refinery

Injury levels of contractors

Year 3
- 1st half: 8 injuries
- 2nd half: 8 injuries

Year 4
- 1st half: 11 injuries
- 2nd half: 6 injuries

Year 5
- 1st half: 3 injuries
- 2nd half: 1 injury

Year 6
- 1st half: 1 injury
- 2nd half: 1 injury

Behavior based culture change launched

Moving average

Oil refinery 1
Sustained decline in recordable injury rate in very large Gulf Coast refinery

Recordable injury rate at a refinery

- Behavior based culture change launched
- Employees only
- Employees + Contractors

Recordable injury rate

Oil refinery 2
Oil major able to drive down LOC events and spills (I)

Tier 1 and Tier 2 Loss of Containment (LOC) Count
Oil major able to drive down LOC events and spills (II)
Discussion and Q&A