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Tokyo
Black Swan Events

- High impact - Hard to predict - Extreme Outliers - Complex disasters
- Mother Nature + Physics = Unpreventable & Unpredictable
- Fukushima = Black Swan
A Cascading Event

- Natural Event leads to Artificial Event, a Human Tragedy, and leads to a Crisis Systems Failure
  - Earthquake damaged Infrastructure - Large scale disaster management (DM) needs
  - Began isolation of nuclear plant
  - Tsunami = Loss of 1st responders
  - Stretched DM resources - Lost sea ports
  - Nuclear plant further isolation and destruction
  - Human Tragedy Increased scale of DM
  - Loss trust/confidence
Crisis Systems Failure

- Overwhelmed Onsite
  - National Government & Corporate Stepped in to take command
  - Caused additional complexities
Crisis Systems Failure

- The symptoms of crisis systems failure
  - Leadership confusion (panic/confusion/vacuum & plant isolationism)
  - Who has the ultimate decision authority? Unified command?
  - Responding to the impossible
  - Response incrementalism, i.e., keeping up, instead of keeping ahead of the crisis
  - Failure in the capability curve
Crisis Systems Failure

- Leadership
  - Lack of clarity at the top
  - No formal communication between government representatives at site and senior government leadership
  - Island/isolated response at site
  - Confused mission clarity
Lessons Learned

- Black Swans are Real and Crisis Systems Failure Happen
  - Overwhelming local/prefectural & National resources
  - Must have a fundamental belief (possibilistic analysis)
  - Worse on worse drills/exercises
  - Organism chart v. organizational chart
  - Leadership inversion from collaborative to authoritarian needed to cope with system failure
Lessons Learned

- Emergency Management Issues
  - Stretch capability curve both technical and human
    - Capability response centers
      - Plan for long-term response
    - Lifeline for other technical resources
- Resilience
  - Evacuations much more difficult than thought beforehand, e.g. contamination of bodies
  - Include the population affected to assist - avoid victimology
Learning Lessons (Learned lessons)

- Learn right lessons of the past otherwise built-in Latent Organizational Weaknesses
- Learning the wrong lessons can be worse than learning no lessons
Learn tomorrow's lessons today

- Consider Emotion state of leaders
- Improve Crisis leadership skills
- One lesson is contingency planning. Have we thought through the crisis leadership abilities of the nuclear industry and government?
- Social media/transboundary nature of crisis
- Need scholarly research
- No more heroes Daiini heroism
Crisis Systems Failure Insights
Cynefin Framework

Source: HBR A Leader’s Framework for Decision Making, Snowden and Boone, Nov 2007
## Decisions in Multiple Contexts

<table>
<thead>
<tr>
<th>Context's Characteristics</th>
<th>The Leader's Job</th>
<th>Danger Signals</th>
<th>Response to Danger Signals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeating patterns and consistent events</td>
<td>Sense, categorize, respond</td>
<td>Complacency and comfort</td>
<td>Create communication channels to challenge orthodoxy</td>
</tr>
<tr>
<td>Clear cause-and-effect relationships evident to everyone; right answer exists</td>
<td>Ensure that proper processes are in place</td>
<td>Desire to make complex problems simple</td>
<td>Stay connected without micromanaging</td>
</tr>
<tr>
<td>Known knowns</td>
<td>Delegate</td>
<td>Entrained thinking</td>
<td>Don't assume things are simple</td>
</tr>
<tr>
<td>Fact-based management</td>
<td>Use best practices</td>
<td>No challenge of received wisdom</td>
<td>Recognize both the value and the limitations of best practice</td>
</tr>
<tr>
<td><strong>Simple</strong></td>
<td>Communicate in clear, direct ways</td>
<td>Overreliance on best practice if context shifts</td>
<td></td>
</tr>
<tr>
<td>Expert diagnosis required</td>
<td>Understand that extensive interactive communication may not be necessary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cause-and-effect relationships discoverable but not immediately apparent to everyone; more than one right answer possible</td>
<td>Sense, analyze, respond</td>
<td>Experts overconfident in their own solutions or in the efficacy of past solutions</td>
<td></td>
</tr>
<tr>
<td>Known unknowns</td>
<td>Create panels of experts</td>
<td>Analysis paralysis</td>
<td>Encourage external and internal stakeholders to challenge expert opinions to combat entrenched thinking</td>
</tr>
<tr>
<td>Fact-based management</td>
<td>Listen to conflicting advice</td>
<td>Expert panels</td>
<td>Use experiments and games to force people to think outside the familiar</td>
</tr>
<tr>
<td><strong>Complicated</strong></td>
<td>Flux and unpredictability</td>
<td>Temptation to fall back into habitual, command-and-control mode</td>
<td>Be patient and allow time for reflection</td>
</tr>
<tr>
<td>No right answers; emergent inductive patterns</td>
<td>Probe, sense, respond</td>
<td>Temptation to look for facts rather than allowing patterns to emerge</td>
<td>Use approaches that encourage interaction so patterns can emerge</td>
</tr>
<tr>
<td>Unknown unknowns</td>
<td>Create environments and experiments that allow patterns to emerge</td>
<td>Desire for accelerated resolution of problems or exploitation of opportunities</td>
<td></td>
</tr>
<tr>
<td>Many competing ideas</td>
<td>Increase levels of interaction and communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A need for creative and innovative approaches</td>
<td>Use methods that can help generate ideas; open up discussion (as through large group methods); set barriers; stimulate attractors; encourage dissent and diversity; and manage starting conditions and monitor for emergence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pattern-based leadership</td>
<td><strong>Complex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Chaotic</strong></td>
<td>High turbulence</td>
<td>Act, sense, respond</td>
<td>Applying a command-and-control approach longer than needed</td>
</tr>
<tr>
<td>No clear cause-and-effect relationships, so no point in looking for right answers</td>
<td>Look for what works instead of seeking right answers</td>
<td>“Cult of the leader”</td>
<td>“Cult of the leader”</td>
</tr>
<tr>
<td>Unknowables</td>
<td>Take immediate action to reestablish order (command and control)</td>
<td>Missed opportunity for innovation</td>
<td>Missed opportunity for innovation</td>
</tr>
<tr>
<td>Many decisions to make and no time to think</td>
<td>Provide clear, direct communication</td>
<td>Chaos uninterrupted</td>
<td>Chaos uninterrupted</td>
</tr>
<tr>
<td>High tension</td>
<td>Pattern-based leadership</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: HBR A Leader's Framework for Decision Making, Snowden and Boone, Nov 2007
## Crisis Event Response

<table>
<thead>
<tr>
<th>Crisis</th>
<th>Emotions</th>
<th>Decision Making</th>
<th>Crisis Response</th>
<th>Sensemaking</th>
<th>Leadership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple</td>
<td>Low</td>
<td>Collaborative</td>
<td>Readiness</td>
<td>Positive</td>
<td>Collaborative</td>
</tr>
<tr>
<td>Complex</td>
<td>High</td>
<td>Naturalistic</td>
<td>Resilience</td>
<td>Collective</td>
<td>Authoritarian/non-linear</td>
</tr>
<tr>
<td>Chaotic</td>
<td>Death Anxiety</td>
<td>Instinctual</td>
<td>Situational</td>
<td>Doubt &amp; Pessimism</td>
<td>Warrior Ethos</td>
</tr>
</tbody>
</table>

Source: Casto 2014
Continuing Policy Crisis

TIME TO RECOVERY

A detailed analysis of 16 well-known corporate crises found that while perceptions of management and brand equity value took just over a year (4.7 quarters) to rebuild, investment potential took nearly two years, and overall corporate reputation almost four years to recover.

FAVORABILITY, BROKEN DOWN INTO:
- PERCEPTIONS OF MANAGEMENT
- INVESTMENT POTENTIAL
- OVERALL REPUTATION
- BRAND EQUITY, $ VALUE

## Policy Crisis

<table>
<thead>
<tr>
<th>Crisis</th>
<th>Political</th>
<th>Public</th>
<th>Action</th>
<th>Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routine</td>
<td>Collaborative</td>
<td>Latent public: Problem is there, but public does not recognize it. Disinterested &amp; disengaged. Unaware.</td>
<td>Positive</td>
<td>Collaborative</td>
</tr>
<tr>
<td>Extreme</td>
<td>Authoritarian &amp; nonpartisan</td>
<td>Aware public: Groups recognizes that a problem exists. Interested &amp; engaged.</td>
<td>Hesitant</td>
<td>Trust/Confidence/Cooperation</td>
</tr>
<tr>
<td>Dangerous</td>
<td>Leadership Panic</td>
<td>Active public: Group is aware of the problem and organizes to respond to it.</td>
<td>Frozen in inaction</td>
<td>Stop the bleeding. reduce severity. Openness. Crisis Response (unity). Still in crisis.</td>
</tr>
</tbody>
</table>

Government Actions

- Cleanup Fukushima is essential to restart
- Must provide oversight to the NRA….this is key!!!!!!!
- Develop a Risk Policy Statement through public hearings
- Develop a Safety Culture Policy Statement
- Still in a policy crisis
Government Actions

- Establish a “backfit” process along with a 50.59 process to review current or updated analysis and determine whether the plants should be retrofitted based upon the new information.
- Establish a requirement for a full safety evaluation every 10 years (international community does this) to reconfirm the plant safety analysis.
- Impose severe accident management requirements on the industry. Add a requirement that each nuclear plant have a specific control room simulator, that is, a “site specific” simulator.
Utility actions

- Independent oversight in control room
- Create Independent/External Safety Review Boards.
- Require a “severe accident advisor” in each control room. This person would be extensively trained in severe accidents and would provide advice to the control room operators in the event of a severe accident. This would be temporary until secondary assessments are completed and appropriate countermeasures installed.
- Train operators NOW on extreme events
NRA Actions

- Convey risk Policy Statement
- Improve the employee pipeline source and competence of NRA
- Most importantly, establish an “international regulator academy” to educate new and experienced regulators on the techniques of regulation and inspection from international partners
NRA Actions

- Implement a “change management program” for the employees at the new NRA. Including revising the mission, values and vision statements.

- Add one site inspector for an interim period specifically to inspect severe accident management activities. This would be temporary until secondary assessments are completed and appropriate countermeasures installed.
NRA Actions

- Boost the quantity and competence of on-site inspectors. Improved training programs for this staff and require more stringent competence criteria. Also, compare the number of on-site inspectors to those in other nations to ensure that the number of inspectors assigned to the site is appropriate.

- Establish a “hotline” for accepting public comments and respond to those questions.

- Enhance severe accident training requirements for on-site inspectors.
Enhancing Public Confidence
The Domestication of the Second Fire

Only the elites had access to technology

The Sorcerer’s apprentice overtaken by his own invention

Source: The Domestification of the second fire: Pretre
The Domestication of the Second Fire

Nature was untainted and untouched until nuclear power

Seemingly no solution to nuclear energy and waste – no acceptable and accepted solution

Source: The Domestification of the Second Fire: Pretre
Public Opposition

Source: The Domestication of the second fire: Pretre
Controlling fear & panic

- How societal constraints impact solutions (social solutions v. technical solutions)
- Having the “will” to communicate with the public - Releasing SPEEDI - panic or rational behavior?
- Managing optimistic bias & defeatism
- The Role of Emotional Intelligence
- Victimology: responders as victims
Risk Perceptions Between American Students and Japanese Students – Much Alike, Some different

Figure 1: Location of 70 Hazards on Factors 1 and 2 for the American Student Sample
Americans – Unknown, new
Japanese – Known, old
Both – Dread

Figure 2: Location of 70 Hazards on Factors 1 and 2 for the Japanese Student Sample

Cognitive Representation of Risk Perceptions: A Comparison of Japan and the United States
Randall R. Kleinhesslink and Eugene A. Rosa
Gaining Public Trust, Confidence & Cooperation

- There are two forms of public trust
  - Relational
  - Confidence

- Studies conclude shared values immensely important to public trust

- Studies conclude that the function of confidence is control, based on knowledge of the past or constraints on the future.

NRA chairman questions utilities' attitudes toward nuclear safety
Kyodo News 2 July 2014

The utilities "have not taken the accident that occurred in Fukushima seriously enough," Nuclear Regulation Authority Chairman Shunichi Tanaka said at a press conference, adding that such an attitude has in part caused the delay in the NRA safety assessment of reactors.
Actions to improve Public Confidence

- Media tours/access/Embedded media (full access)
- Record all calls/video commitment to release future accidents transcripts
Actions to improve Public Confidence

- Fix emergency preparedness
  - Using social media...Twitter information sharing transparency
  - Enhance sheltering procedures
  - Realistic emergency planning & realistic evaluation drills
  - Real-time Telemetry of environmental conditions (radiological)
  - Text message for reactor shutdowns/emergency classifications/abnormal conditions/directions e.g. sheltering/evacuation (much like the earthquake notification system)
- Flex stockpile equipment (KI/dosimeters/Radiation pagers/PC’s etc)
- Annual notification of emergency preparedness status/actions
- Written certification/legal accountability/commitment from the government that the emergency measures are in place
University Research

- National competition on explaining health effects of radioactivity (scholarships)
- Research on impacts of Article 9 & crisis leadership
- University research: Moving from “peacetime leadership to a war-footing”; collaborative, adaptive & authoritative leadership
Conclusions

- What is regulator's role for restarting and safety operation of nuclear power in Japan?
  - Technical Evaluation
  - Confirmation of nuclear safety
  - Listening to the public
- How can Japanese government and nuclear energy industry restore the confidence of general public especially women?
  - Demonstrating shared values
  - Constraints on the future operation of nuclear power (risk acceptance)
- How can we make nuclear energy safe enough?
  - Conversations with the public on the level of risk acceptance
  - National government must provide oversight to the NRA on the level of risk acceptance