Shoppers’ price tag perceptions don’t add up
Bad decisions linked to ‘visual distortion’
ALARP DECISIONS

View of Delft after the Explosion of 1654
Egbert van der Poel

VROM

COMAH

SHELL CANADA ENERGY
Decision Balance Sheet Factors

- Codes & Standards
- Good Practice
- Engineering Judgement
- Risk Based Analysis
- Company Value
- Societal Values

Ref: UKOOA

Decision Aids

- Voting Methods
- Weighted Scoring Methods
- Cost - Benefit Analysis
- Mathematical Programming
- Payoff Matrix Analysis
- Decision Analysis
- Multiattribute Utility Analysis

Ref: CCPS “Making Acute Risk Decisions”
Which Aid to Use?

- Resource requirements
- Depth of analysis / complexity
- Logical rigor
- Group focus
- Quantitiveness
- Track record
DECISION SUPPORT FRAMEWORK

Means of Calibration
- Codes and Standards
- Verification
- Peer Review
- Benchmarking
- Internal Stakeholder Consultation
- External Stakeholder Consultation

Significance to Decision Making Process
- Codes & Standards
- Good Practice
- Engineering Judgement
- Risk Based Analysis (e.g., QRA, CBA)
- Company Values
- Societal Values

Decision Context Type
- A: Nothing new or unusual
  - Well understood risks
  - Established practice
  - No major stakeholder implications
- B: Lifecycle implications
  - Some risk trade-offs/ transfers
  - Some uncertainty or deviation from standard or best practice
  - Significant economic implications
- C: Very novel or challenging
  - Strong stakeholder views and perceptions
  - Significant risk trade-offs or risk transfer
  - Large uncertainties
  - Perceived lowering of safety standards

The Fictional Example

Company X will be installing a combustion turbine within Building 10. Company X has asked that you prepare a risk related decision to help them better understand the risk of this new installation. Should Company X

a) install a water spray protection system at the building’s ceiling level?

b) Install localized fire protection at the turbine?

c) Implement low-cost measures?

d) Do Nothing?
**DECISION SUPPORT FRAMEWORK**

- **Means of Calibration**
  - Codes and Standards
  - Verification
  - Peer Review
  - Benchmarking
  - Internal Stakeholder Consultation
  - External Stakeholder Consultation

- **Significance to Decision Making Process**
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Good Practice

- Inherently Safe Design Principles (e.g. elimination and minimization of hazards)
Engineering Judgement

03/06/2007 -

Offshore Oil and Natural Gas Field

A turbine failure triggered a fire alarm aboard the platform, and the turbine was quickly cooled by automatic extinguishers. The fire alarm shut down a roughly 150,000 barrel per day oil field and had 310 crew ready to evacuate. No one was injured in the incident and production was returning to normal. The crew was sent to their lifeboats as a precaution, and were able to return to their work stations after about 50 minutes.

<table>
<thead>
<tr>
<th>Company</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>N</td>
<td></td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>B</td>
<td>N</td>
<td></td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
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<td>N</td>
<td></td>
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<td>Y</td>
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<tr>
<td>H</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>N</td>
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</tbody>
</table>
Risk Based Judgment

- QUALITITATIVE TOOLS
- SEMI QUANTITATIVE TOOLS
- QUANTITATIVE TOOLS
Consider
Implement
Implement High
Consider, if risk high
Implement Medium
Do not implement
Do not implement
Consider Low
High Medium Low Effort (Time and/or Cost)
HAZID
EFFECT
DAMAGE
CBA

Overpressure (bar) | Fire and Blast Damage Allocation (%) for Heavy Machinery
---|---
.7 -.35 | 40

\[ NPV = 0 = \text{Initial Investment} + \sum_{t=1}^{N} \frac{C_t}{(1 + IRR)^t} \]

IRR = 20%
Ct = $143,680
T= 15 y
NPV = $670K
Company Values

Commitment to Sustainable Development

Shell Canada is committed to contribute to sustainable development. To our company, this means the integration of economic, environmental and social considerations in the decision-making process across all of our business activities. It means addressing both short-term and long-term needs.

<table>
<thead>
<tr>
<th>Commitment to Sustainable Development</th>
<th>Health, Safety and Environment Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our activities are guided by the following principles:</td>
<td>Shell Canada is committed to:</td>
</tr>
<tr>
<td>Generate robust profitability</td>
<td>• pursue the goal of no harm to people.</td>
</tr>
<tr>
<td>Successful financial performance is essential to our sustainable future and contributes to the prosperity of society.</td>
<td>• protect the environment and pursue the goal of prevention of pollution.</td>
</tr>
<tr>
<td>Deliver value to our customers</td>
<td>• use material and energy efficiently to provide our products and services.</td>
</tr>
<tr>
<td>Customers are the lifeblood of our business. We seek constantly to</td>
<td>• develop energy resources, products and services consistent with</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Severity</th>
<th>People</th>
<th>Assets</th>
<th>Environment</th>
<th>Reputation</th>
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<tbody>
<tr>
<td>0</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
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<tr>
<td>1</td>
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<tr>
<td>2</td>
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</tr>
<tr>
<td>3</td>
<td>Severe</td>
<td>Severe</td>
<td>Severe</td>
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<tr>
<td>4</td>
<td>Fatal</td>
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<table>
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<tr>
<th>CONSEQUENCES</th>
<th>INCREASING LIKELIHOOD</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
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<tr>
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<td>Never heard of in the industry</td>
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<tr>
<td>Minor</td>
<td>Heard of in the industry</td>
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<tr>
<td>Major</td>
<td>Has happened in the Organisation once per year</td>
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<tr>
<td>Severe</td>
<td>Has happened in the Organisation more than once per year</td>
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<tr>
<td>Fatal</td>
<td>Has happened more than once per year at the location</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SHELL CANADA ENERGY
Societal Values

Inquiry shows ... fires not related

Tue 23 Oct 2007
MCT Regional News

Section: General
Byline: By Wesley Loy, Anchorage Daily News, Alaska
Source: McClatchy-Tribune Regional News

... the investigation didn't turn up evidence of a fundamental fire problem in ... oil fields. However, one common thread among some of the fires is lube oil leaking or spraying onto hot turbines, ...
## Findings

<table>
<thead>
<tr>
<th>Codes</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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<tbody>
<tr>
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<td>✓</td>
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<table>
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<th>✓/✓</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Societal Values / General Risk Perception</th>
<th>✓</th>
<th>✓</th>
<th>✓</th>
<th>✓</th>
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</table>

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Improving the Quality of Decision Making

1. Decision Counselling
2. Decision Framework
3. Outcome Psychodrama
4. Emotional Inoculation Procedures
5. Standard Operating Procedure

Ref: I.L. Janis & L. Mann

*Decision Making: A Psychological Analysis of Conflict, Choice and Commitment*