Mitigating Global Supply Chain Risks through Corporate Social Responsibility (CSR)

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Outline of Presentation

- CSR - Definitions and Terminology
- Core CSR Issues
- Globalization and CSR
- CSR as Risk Management Tool
- CSR - Multi-S takeholder Global Supply Chain Model
- Results
- Managerial Insights
CSR - Definitions and Terminology

Business in the Community defines CSR as:

“a company’s positive impact on society and the environment, through its operations, products or services and through its interaction with key stakeholders such as employees, customers, investors, communities and suppliers.”

Many terms used interchangeably

- Corporate social responsibility
- Corporate citizenship
- Social programs / social investments
- Community outreach / social outreach
CSR Stakeholders

Current drivers

- Consumers
- NGOs
- Trade unions
- Media
- Shareholders
- Risk reduction
- Brand
- Reputation
Core CSR Issues

- governance
- legal
- environment
- stakeholder
- product/service
- human rights
- health & safety
- community
- anti-corruption

Issues
Why is CSR Rising Globally?

- Rapid globalization of businesses
  - Human right abuses, misconduct, ecological damages etc.
- Continued business scandals and misconduct on global basis
- Diversified stakeholders and growing concerns over corporate behavior and misconduct
- Proliferation of Internet and increase in media campaign have accelerated situations
CSR Globally

No. of CSR related Articles covered by Newspaper in Japan

(Based on Nikkei Telecon21)

Newspapers: Nikkei, Nikkei Sangyou, Nikkei Ryuutsuu, Nikkei Kinyuu, Asahi, Yomiuri, Sankei, Nikkan Kogyou
CSR Pressure...

Support Community Trade

Against Animal Testing

Defend Human Rights

Protect Our Planet

profits with principles

SLAVERY

GAP

Everybody in Sweatshops

Abuse is in style at H&M

WAL*MART

CORPORATE THUGS

GUILTY

11/13/10

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Leadership, Market Positioning or just more Greenwashing?

We understand that our responsibilities go beyond regulation. This is why we have a multi-functional approach to environmental issues throughout the company.

- From Chevron Canada Website

Striving to buy, sell and use environmentally friendly products.
What are Impacts on Companies?

- Growing discussions, government actions, legislation and CSR standards/codes and etc.
- Expanding assessment and monitoring on CSR
  - Socially Responsible Investment (SRI)
  - Growing stakeholder activism (NGOs as watchdogs for companies)

Integrated into supply chain management.

CSR has become a global business issue.
CSR - Expanded Risk Management

Poverty

Terrorism

Environmental Social Governance

Geopolitical Regulatory Currency Miscellaneous
CSR & Supply Chain

Factors:
- Legal requirements
- Pressure from consumers
- Changing consumer preferences

Results:
- Attempt to minimize their emissions
- Produce more environmentally friendly products
- Establish sound recycling network systems
- Managing the corporate social responsibilities of their partners within the supply chain
Operational benefits realized by improving environmental and working conditions performance
- Lower energy cost
- Less waste
- Increased productivity
- Improved safety
- Decreased turnover and training cost
- Brand risk management
CSR Research Themes

- From 1953 to 1970:
  - Responsibility of the businessman (Bowen, 1953).
- From 1970 to 1980:
  - Characteristics of socially responsible behavior (Davis, 1973; Carroll, 1979)
- In the 1980s:
  - Stakeholder theory (Freeman, 1984)
  - Business ethics (Frederick, 1986)
  - Corporate social performance (Drucker, 1984)
- In the 1990s:
  - Empirical studies attempted to correlate CSR with financial performance (Clarkson, 1991; Waddock and Graves, 1997; Berman et al., 1999; Roman et al., 1999)
- Today CSR is:
  - A prominent research theme
  - Found in corporate missions and value statements (Svendsen et al., 2001)
Global Supply Risk Model

**CSR as Risk Management Tool**

![Diagram showing supply-side, exchange rate, demand-side, and social risks]

Figure 1: Global Supply Chain Risk Model
Global Supply Chain Network Model

Figure 2: The Structure of the Global Supply Chain Network
Assumptions of the Model

- Establishing levels of social responsibility activities incurs some costs.

- Higher levels of social responsibility activities
  - Reduce transaction costs
  - Reduce demand side risk
  - Reduce supply side risk
  - Social Risk

- Multicriteria decision-makers
  - Manufacturers and retailers try to:
    - Maximize net revenue
    - Minimize risk
Features of the Model

- Captures multi-tiers
  - Manufacturers
  - Retailers
- Captures interactions among individual decision-makers
  - Competition at the same tier
  - Coordination among different tiers
- The model captures:
  - Supply-side risks
  - Demand side risks
  - Social risks
  - Exchange rate risks
- Determines
  - Production quantities, shipments, price levels of CSR activities
Manufacturer’s Problem

The expect production cost function

\[ \hat{F}^{il}(q^i, \eta^i) \equiv \int_{\xi^il} f^{il}(q^i, \eta^i, \xi^il) dF^{il}(\xi^il), \quad \forall i, l, \]

The expect social risk function

\[ \hat{SR}^{il}(q^i, \eta^i) \equiv \int_{\xi^il} sr^{il}(q^i, \eta^i, \xi^il) dF^{il}(\xi^il), \quad \forall i, l, \]

The maximization Problem

Maximize:

\[ \sum_{k=1}^{K} \sum_{h=1}^{H} \sum_{\tilde{l}=1}^{L} \left( \rho_{1kh\tilde{l}}^* \times e_h^* \right) q_{khl}^* - \hat{F}^{il}(q^i, \eta^i) - b^i(\eta^i) - \hat{SR}^{il}(q^i, \eta^i) - \omega^i \left[ V_F^{il}(q^i, \eta^i) + V_{SR}^{il}(q^i, \eta^i) \right] \]

subject to: \( q_{khl}^* \geq 0 \) and \( 0 \leq \eta_{il}^* \leq 1 \) for all \( k, h, \tilde{l} \).
Retailer’s Problem

- Random demand with Probability distribution
  \[
P_{k\ell i}(x, \rho_{3k\ell i}) = \tilde{P}_{k\ell i}(\hat{d}_{k\ell i} \leq x) = \int_0^x F_{k\ell i}(x, \rho_{3k\ell i})\,dx.
  \]

News vendor model:
- Excess supply (inventory)
- Excess demand (shortage)
- Expected Value

\[
\Delta^+_{k\ell i} \equiv \max\{0, s_{k\ell i} - \hat{d}_{k\ell i}\}
\]
\[
\Delta^-_{k\ell i} \equiv \max\{0, \hat{d}_{k\ell i} - s_{k\ell i}\},
\]

\[
\pi^+_{k\ell i}(s_{k\ell i}, \rho_{3k\ell i}) \equiv E(\Delta^+_{k\ell i}) = \int_0^{s_{k\ell i}} (s_{k\ell i} - x) F_{k\ell i}(x, \rho_{3k\ell i})\,dx,
\]
\[
\pi^-_{k\ell i}(s_{k\ell i}, \rho_{3k\ell i}) \equiv E(\Delta^-_{k\ell i}) = \int_{s_{k\ell i}}^{\infty} (x - s_{k\ell i}) F_{k\ell i}(x, \rho_{3k\ell i})\,dx.
\]

Total expected penalty
\[
E(\lambda^+_{k\ell i} \Delta^+_{k\ell i} + \lambda^-_{k\ell i} \Delta^-_{k\ell i}) = \lambda^+_{k\ell i} \pi^+_{k\ell i}(s_{k\ell i}, \rho_{3k\ell i}) + \lambda^-_{k\ell i} \pi^-_{k\ell i}(s_{k\ell i}, \rho_{3k\ell i}).
\]
Retailer’s Problem

- The expected social risk function

\[ \hat{S}_{r_{kh\ell}}(s_{kh\ell}, \eta_{kh\ell}) = \int_{\xi_{kh\ell}} s_{r_{kh\ell}}(s_{kh\ell}, \eta_{kh\ell}, \xi_{kh\ell}) dF_{kh\ell}(\xi_{kh\ell}), \quad \forall i, l. \]

- The maximization problem

Maximize \[ E(\rho_{3kh\ell}^* \cdot \min\{s_{kh\ell}, \hat{d}_{kh\ell}\}) - E(\lambda_{khl}^- \Delta_{kh\ell}^+ + \lambda_{khl}^- \Delta_{kh\ell}^-) \]

\[ -b_{kh\ell}(\eta_{kh\ell}) - \sum_{i=1}^{I} \sum_{l=1}^{L} (\rho_{1khl}^i \times e_{h}^*) q_{kh\ell}^i - \hat{S}_{r_{kh\ell}}(s_{kh\ell}, \eta_{kh\ell}) - \omega_{kh\ell} V S_{r_{kh\ell}}(s_{kh\ell}, \eta_{kh\ell}), \]

subject to: \[ q_{kh\ell}^{il} \geq 0, \quad 0 \leq \eta_{kh\ell} \leq 1, \text{ for all } i, l. \]
The Market Stochastic Economic Equilibrium Conditions

\[
\hat{d}_{kh\ell}(\rho^*_{3kh\ell}) = \sum_{i=1}^{1} \sum_{l=1}^{L} q_{kh\ell}^{il*} \quad \text{a.e. \ if } \rho^*_{3kh\ell} > 0 \\
\leq \sum_{i=1}^{1} \sum_{l=1}^{L} q_{kh\ell}^{il*} \quad \text{a.e. \ if } \rho^*_{3kh\ell} = 0,
\]
The Equilibrium State

Definition: The equilibrium state of the network is one where the flows between the tiers of the network coincide and the product transactions, levels of social responsibility activities, and prices satisfy the sum of the optimality conditions and the equilibrium conditions.

The equilibrium state is equivalent to a VI of the form:

\[
\text{determine } X^* \in \mathcal{K} \text{ satisfying }
\]

\[
\langle F(X^*), X - X^* \rangle \geq 0, \quad \forall X \in \mathcal{K},
\]
Qualitative Properties

I have established

- Existence of a solution to the VI
- Uniqueness of a solution to the VI
Computational Studies

- The effects of CSR cost on levels of CSR
- The effects of levels of CSR on:
  - transaction costs
  - supply side risks
  - demand side risks
  - social risks
- The effects of levels of CSR on:
  - product prices
  - product transactions
### Results

<table>
<thead>
<tr>
<th>Variables</th>
<th>Example 1</th>
<th>Example 2</th>
<th>Example 3</th>
<th>Example 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Equilibrium Flows from Manufacturers to Retailers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$q_{111}^*$</td>
<td>97.50</td>
<td>0.78</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>$q_{211}^*$</td>
<td>97.50</td>
<td>0.78</td>
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<td>0</td>
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<tr>
<td>$q_{112}^*$</td>
<td>97.50</td>
<td>0.78</td>
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<td>0</td>
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<td>$q_{212}^*$</td>
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</tr>
<tr>
<td>$q_{111}^+$</td>
<td>97.50</td>
<td>128.92</td>
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<td>0</td>
</tr>
<tr>
<td>$q_{211}^+$</td>
<td>97.50</td>
<td>128.92</td>
<td>130.00</td>
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</tr>
</tbody>
</table>

**Manufacturers’ Equilibrium CSR Level**

| $\eta_{11}^*$ | 1 | 0.045 | 0 | 0 |
| $\eta_{21}^*$ | 1 | 1 | 1 | 0 |
| $\eta_{12}^*$ | 1 | 1 | 1 | 0 |
| $\eta_{22}^*$ | 1 | 1 | 1 | 0 |

**Retailers’ Equilibrium CSR Level**

| $\eta_{111}^+$ | 1 | 1 | 0 | 0 |
| $\eta_{211}^+$ | 1 | 1 | 1 | 0 |
| $\eta_{112}^+$ | 1 | 1 | 1 | 0 |
| $\eta_{212}^+$ | 1 | 1 | 1 | 0 |

**Retailers’ Equilibrium Prices**

| $\rho_{111}^*$ | 5.01 | $6.39 | $200.00 | $200.00 |
| $\rho_{211}^*$ | 5.01 | $6.39 | $4.98 | $200.00 |
| $\rho_{311}^*$ | 5.01 | $6.39 | $4.98 | $200.00 |
| $\rho_{321}^*$ | 5.01 | $6.39 | $4.98 | $200.00 |
The Perceived Benefits of Good CSR

- Risk management
- Staff recruitment and retention
- Cost reductions
- Enhanced reputation and image
- Market access
- Relationships with government, other businesses, stakeholders
Managerial Insights

- CSR in supply chain should be viewed holistically.
- CSR improvements can lead to economic benefits for companies.
- CSR can potentially reduce production inefficiencies, reduce cost and risk and at the same time allow companies to increase sales, increase access to capital, new markets, and brand recognition.
- Managing CSR in a global market is more demanding and requires that it is adapted to and contextualized for specific individual country.
Thank You!

Questions?