Supply Chain Management in the Cement Industry

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Agenda

• Introduction
  – Motivation
  – Research Questions

• Cement Supply Chain Characterization
  – Cement Industry
  – Cement Supply Chain Strategy
  – Cement Supply Chain Operating Model

• Case studies

• Conclusions
Motivation

• Sponsored by a strategic partner of the Center for Latin-American Logistics Innovation (CLI)
• Lack of research on SCM in the cement industry

<table>
<thead>
<tr>
<th>Database</th>
<th>“Supply Chain”</th>
<th>“Cement”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Source Complete</td>
<td>47,101</td>
<td>34</td>
</tr>
<tr>
<td>Compendex</td>
<td>4,224</td>
<td>37</td>
</tr>
</tbody>
</table>

– Focused on Manufacturing, Materials Management & Sustainability.
• Traditional cost reductions in manufacturing

SCM can be the new source of value creation in the cement industry
Four research questions

- What are the unique characteristics of SCM in the cement industry?
- Why SCM traditionally played an operational role in the cement industry?
- What is the right supply chain for cement?
- Can SCM generate value in the cement industry?
Methodology

1. Competitive Strategy (Porter, 1980)
2. The essence of excellence (Lapide, 2006)

Industry Analysis

Supply Chain Strategy

Supply Chain Operating Model

Processes Analysis

Product Analysis

3. SCOR Model
4. Four Types of SC Design (Reeve et al. 2005)
5. Push - Pull Boundaries (Simchi-Levi et al., 2008)
6. Demand Uncertainty Framework (Fisher, 1997)
8. Triple A Supply Chain Framework (Lee, 2004)
Cement Industry Analysis
Porter’s Five Forces Model

Emerging markets are attractive for cement companies

High
- Economies of Scale
- Capital Expenditure (CAPEX)
- Learning experience

Medium to Low
- Country regulations about subsoil
- Commodity market

Low
- Concrete substitutes

Medium
- Bargaining power of suppliers
- Pressure from substitutes

Low – Fragmented – Emerging markets
- High – Concentrated – Developed countries

Rivalry among competitors
- Oligopoly
- Growth concentrated in emerging markets
- High stakes & specialized assets
Asset utilization is given in the cement industry
## Cement Supply Chain Processes

<table>
<thead>
<tr>
<th>Plan</th>
<th>Source</th>
<th>Make</th>
<th>Delivery</th>
<th>Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Centralized</td>
<td>• Vertical integration with quarries</td>
<td>• Few SKU’s</td>
<td>• Heavy / low value-to-weight load.</td>
<td>• Uncommon</td>
</tr>
<tr>
<td>• <strong>Optimization oriented</strong></td>
<td>• Unlimited availability</td>
<td>• EoS</td>
<td>• <strong>Coverage Ratio: 300 km</strong></td>
<td>• Quality issues</td>
</tr>
<tr>
<td>• Aggregation of FG &amp; raw materials</td>
<td>• Government regulated</td>
<td>• Capital &amp; energy intensive</td>
<td>• Bulk / Bags</td>
<td></td>
</tr>
<tr>
<td>• APS supported</td>
<td>• <strong>Energy dependent</strong></td>
<td>• Continuous process highly automated</td>
<td>• Vertical integration.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Benefits from scale</td>
<td>• Make to stock</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Bulk / Bags
- Vertical integration.
The Right Cement Supply Chain?

- **Bulk Cement**
  - Developed Countries
  - Large construction companies & Government
  - Functional
  - Efficient Supply Chain

- **Bagged Cement**
  - Emerging Markets
  - DIY Customers & Small Contractors
  - Innovative
  - Responsive Supply Chain

- Statistical data:
  - 60% Sales, 40% Profits, 100 USD/Ton, 200
  - 90% of sales in the US
  - 80% of sales in EM

- Market segments:
  - Developed Countries: Large construction companies & Government
  - Emerging Markets: DIY Customers & Small Contractors
Cement Supply Chain Today
Build-to-Stock (BTS)
Proposed Cement Supply Chain
Grind-to-Order (GTO)

Fuel Suppliers
Quarries
Other Raw Materials Suppliers

Clinker Production → Clinker Storage → Grinding → Cement Bulk Storage → Packing → Cement Bags Storage

Concrete Companies
Wholesalers
Retailers

DIY Builders
Small & Individual Contractors

Government & Large Construction Companies

Raw Materials
Clinker
Cement in Bags
Cement in Bulk
Concrete

Push
Pull
SC Innovations in Commodity Industry

- **Single** 3PL (Third Party Logistics Provider) in the oil industry
  - 3PL cost reduction by 20%

- Concrete and cement supply chain collaboration in Cemex Colombia
  - Availability of mixers increased from 74% to 93%
  - Maintenance costs reduced by 25%

- **Collaborative** Port Operation Contract in the Steel Industry
  - Steel loading efficiency increased by 40%.
Conclusions

• SCM lack of importance
  – Oligopoly or Monopoly
  – Mature Companies
  – Restricted Coverage
  – Traditionally focused on Asset Utilization – Manufacturing

• SCM is an opportunity to create value in the cement industry.

• Emerging markets are a SC challenge…
  – Bulk vs. Bags
  – Efficient vs. Responsive

• Expand to mineral commodity extraction industry.
Q&A

Thank you !!!