The Logistics/Supply Chain Product

“Logistics/Supply Chain managers are ‘owners’ of the product-flow process from raw material sources to final consumers, not activity administrators.”

Product in the Planning Triangle

- **Transport Strategy**
  - Transport fundamentals
  - Transport decisions

- **Inventory Strategy**
  - Forecasting
  - Inventory decisions
  - Purchasing and supply scheduling decisions
  - Storage fundamentals
  - Storage decisions

- **Location Strategy**
  - Location decisions
  - The network planning process

**Customer service goals**
- The product
- Logistics service
- Ord. proc. & info. sys.
Nature of the Product

- Product classification
  - Convenience goods
  - Shopping goods
  - Specialty goods
  - Industrial goods

- The Product life cycle and Pareto’s law
  - An empirical relationship for the 80-20 curve is
    \[ Y = \frac{(1+A)X}{A+X} \]
    where
    \[ Y = \text{cumulative fraction of sales} \]
    \[ X = \text{cumulative fraction of items} \]
    \[ A = \text{constant to be determined} \]
    The constant is found by
    \[ A = \frac{X(1-Y)}{Y-X} \]

Product Life-Cycle Curve

- Sales volume
- Time
- Introduction
- Growth
- Maturity
- Decline
### ABC Classification for 14 Products

<table>
<thead>
<tr>
<th>Product Number</th>
<th>Product Rank by Sales(^a)</th>
<th>Monthly Sales (000s)</th>
<th>Cumulative Percent of Total Sales(^b)</th>
<th>Cumulative Percent of Total Items(^c)</th>
<th>An ABC Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-204</td>
<td>1</td>
<td>$5,056</td>
<td>36.2%</td>
<td>7.1%</td>
<td>A</td>
</tr>
<tr>
<td>D-212</td>
<td>2</td>
<td>3,424</td>
<td>60.7</td>
<td>14.3</td>
<td></td>
</tr>
<tr>
<td>D-185-0</td>
<td>3</td>
<td>1,052</td>
<td>68.3</td>
<td>21.4</td>
<td>B</td>
</tr>
<tr>
<td>D-191</td>
<td>4</td>
<td>893</td>
<td>74.6</td>
<td>28.6</td>
<td></td>
</tr>
<tr>
<td>D-192</td>
<td>5</td>
<td>843</td>
<td>80.7</td>
<td>35.7</td>
<td></td>
</tr>
<tr>
<td>D-193</td>
<td>6</td>
<td>727</td>
<td>85.7</td>
<td>42.9</td>
<td></td>
</tr>
<tr>
<td>D-179-0</td>
<td>7</td>
<td>451</td>
<td>89.1</td>
<td>50.0</td>
<td></td>
</tr>
<tr>
<td>D-195</td>
<td>8</td>
<td>412</td>
<td>91.9</td>
<td>57.1</td>
<td></td>
</tr>
<tr>
<td>D-196</td>
<td>9</td>
<td>214</td>
<td>93.6</td>
<td>64.3</td>
<td></td>
</tr>
<tr>
<td>D-186-0</td>
<td>10</td>
<td>205</td>
<td>95.1</td>
<td>71.4</td>
<td></td>
</tr>
<tr>
<td>D-198-0</td>
<td>11</td>
<td>188</td>
<td>96.4</td>
<td>78.6</td>
<td></td>
</tr>
<tr>
<td>D-199</td>
<td>12</td>
<td>172</td>
<td>97.6</td>
<td>85.7</td>
<td></td>
</tr>
<tr>
<td>D-200</td>
<td>13</td>
<td>170</td>
<td>98.7</td>
<td>92.9</td>
<td></td>
</tr>
<tr>
<td>D-205</td>
<td>14</td>
<td>159</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Monthly sales in thousands of dollars
\(^b\) Cumulative percent of total sales
\(^c\) Cumulative percent of total items

Total sales: $13,966

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### Cumulative 80-20 Curve

![Cumulative 80-20 Curve Image]

- **A items**: 0 to 20% of items, 80% of sales
- **B items**: 20 to 80% of items, 10% of sales
- **C items**: 80% of items, 0% of sales

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**Nature of the Product (Cont’d)**

**Example** Suppose that in an inventory of 10 items, 15% of the items account for 80% of the sales volume. The total sales of all 10 items is $90,000 per year. How much inventory can be expected if turnover for A items = 8, B items = 5, and C items = 2?

First, find A.

\[ A = \frac{.15(1-.80)}{.80 - .15} = 0.0462 \]

Then, using \( A = 0.0462 \) and the first item (1/10), we project the sales volume to be:

\[ Y = \frac{(1+.0462).10}{.0462 + .10} = 0.7156, \text{ or } 71.6\% \text{ of the sales.} \]

The inventory for this item is expected to be \( 0.716(90,000)/8 = $8,055 \).

Continue for the remaining items and generate the following table.

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**Example (Cont’d)**

<table>
<thead>
<tr>
<th>Item no. (X)</th>
<th>Cumulative fraction</th>
<th>Projected cumulative sales fraction</th>
<th>Projected cumulative sales (Y)</th>
<th>Projected item sales (Z)</th>
<th>Turnover ratio</th>
<th>Average inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.10</td>
<td>.716</td>
<td>$64,440</td>
<td>$64,440</td>
<td>8:1</td>
<td>$8,055</td>
</tr>
<tr>
<td>2</td>
<td>.20</td>
<td>.850</td>
<td>76,500</td>
<td>12,060</td>
<td>8:1</td>
<td>1,508</td>
</tr>
<tr>
<td>3</td>
<td>.30</td>
<td>.907</td>
<td>81,630</td>
<td>6,630</td>
<td>5:1</td>
<td>1,170</td>
</tr>
<tr>
<td>4</td>
<td>.40</td>
<td>.938</td>
<td>84,420</td>
<td>2,790</td>
<td>5:1</td>
<td>558</td>
</tr>
<tr>
<td>5</td>
<td>.50</td>
<td>.958</td>
<td>86,220</td>
<td>1,800</td>
<td>5:1</td>
<td>360</td>
</tr>
<tr>
<td>6</td>
<td>.60</td>
<td>.971</td>
<td>87,390</td>
<td>1,170</td>
<td>2:1</td>
<td>585</td>
</tr>
<tr>
<td>7</td>
<td>.70</td>
<td>.981</td>
<td>88,290</td>
<td>900</td>
<td>2:1</td>
<td>450</td>
</tr>
<tr>
<td>8</td>
<td>.80</td>
<td>.989</td>
<td>89,010</td>
<td>720</td>
<td>2:1</td>
<td>360</td>
</tr>
<tr>
<td>9</td>
<td>.90</td>
<td>.995</td>
<td>89,550</td>
<td>540</td>
<td>2:1</td>
<td>270</td>
</tr>
<tr>
<td>10</td>
<td>1.00</td>
<td>1.000</td>
<td>90,000</td>
<td>450</td>
<td>2:1</td>
<td>225</td>
</tr>
</tbody>
</table>

\[ \frac{90,000}{10} = $9,000 \]

\[ \frac{90,000}{13} = $6,923 \]

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Nature of the Product (Cont’d)

- **Product characteristics**
  - Weight-bulk ratio
  - Value-weight ratio
  - Substitutability
  - Risk

- **Product packaging**

- **Product pricing**
  - F.o.b. origin
  - F.o.b. destination
  - Zone pricing
  - Single and uniform pricing
  - Quantity discounts
  - Deals

Effect of Weight-Bulk Ratio on Logistics Costs

![Graph showing the effect of weight-bulk ratio on logistics costs](image)
Effect of Value-Weight Ratio on Logistics Costs

Total costs (transport + storage)

Storage costs

Transportation costs

Value-weight ratio

Logistics costs as a percent of sales price

Effect of Transport Service and Inventory Level on Logistics Costs

Total costs (transport + lost sales + storage costs)

Lost sales

Storage costs

Transport costs

Improved transportation service

Average inventory level

Logistics costs as a percent of sales price

(a)

(b)
Effect of Product Risk on Logistics Costs

- Total costs (transport + storage)
- Transport costs
- Storage costs

Logistics costs as a percent of sales price

Increasing degree of risk in the product

Reasons for Product Packaging

- Facilitate storage and handling
- Promote better utilization of transport equipment
- Provide product protection
- Promote the sale of the product
- Change the product density
- Facilitate product use
- Provide reuse value for the customer
Product Pricing

• Geographic pricing methods
  - F.o.b. pricing
  - Zone pricing
  - Single, or uniform, pricing
  - Freight equalization
  - Basing point pricing

• Incentive pricing
  - Quantity discounts

A Variety of Pricing Arrangements
Per-Case Logistics Costs as a Justification for Price Discounts

UPS Pricing Zones