Inventory Productivity:
Missing Link Between
Supply Chain Management and Sales

Jonathan L.S. Byrnes
jlbyrnes@mit.edu
http://mit.edu/jlbyrnes

Copyright © 2012 Jonathan L.S. Byrnes
Today’s Menu

• The Power of Systems Thinking: Paradigm Change in Inventory Management
• Islands of Profit in a Sea of Red Ink
• Baxter – Cardinal Health
• Nalco
• Product Flow Management
• Service Differentiation
• Partnering with Sales, Marketing, and Finance
• Transformational Leadership
The Power of Systems Thinking:
Paradigm Change in Inventory Management

- Optimization vs. Management

- Waterskiing
  behind the business vs. Driving the boat

- Cost minimization vs. ROIC maximization
### Cost vs. ROIC

<table>
<thead>
<tr>
<th>Cost</th>
<th>ROIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory expense</td>
<td>Inventory asset productivity</td>
</tr>
<tr>
<td>Inventory carrying cost</td>
<td>Net margin / inventory asset value</td>
</tr>
</tbody>
</table>

#### Cost Components:

- **Revenues**:
  - Cost of goods sold
  - Gross margin

- **Sales cost**
- **Supply chain cost**:
  - Inventory cost
  - Activity cost
  - Transportation cost
  - Facility cost
- **Overheads cost**

#### ROIC Components:

- **Revenues**: Cost of goods sold
- **Gross margin**

- **Sales cost**
- **Supply chain cost**:
  - Inventory cost
  - Activity cost
  - Transportation cost
  - Facility cost
- **Overheads cost**

<table>
<thead>
<tr>
<th>= major impact</th>
</tr>
</thead>
</table>

jlbyrnes@mit.edu
Copyright © 2012 Jonathan L.S. Byrnes
From Optimization to Management

Optimize inventory

Manage the factors that affect inventory

Manage the factors that affect cost of goods sold and other company expenses

Maximize revenues and strategic differentiation by increasing customer inventory productivity and profitability
Islands of Profit in a Sea of Red Ink

Profitability

Accounts/Products/Orders
Three Eras of Markets

- Inchoate Markets
- Mass Markets
- Precision Markets

1900  2000
New View of Value Creation

Our Company

Our Customers

Mass Markets

Precision Markets
New Locus of Value Creation

- Mass Markets
- Watershed
- Precision Markets

Locus of Value Creation
- Product
- P&G – Wal-Mart Alliance
- Baxter-Cardinal

Go-to-Market Process
- General Foods
- Watershed
- Precision Markets

jlbyrnes@mit.edu
Copyright © 2012 Jonathan L.S. Byrnes
• Stuck in the Mud

• What Business Are We In?

• Major Cost Reductions – Foreseen and Unforeseen

• Surprise Revenue Increases

• Pile On!
Baxter-CardinalHealth ROIC

Revenues
- Cost of goods sold
  Gross margin

- Sales cost
- Supply chain cost
  Inventory cost
  Activity cost
  Transportation cost
  Facility cost

- Overheads cost
  Net margin

ROIC

Sales rose, hospital costs lowered
Reduced demand variance

Less expediting, sales relationship pathway, better relationships

Inventory reduced, obsolescence reduced
Eliminated double handling
Regular schedule, eliminated expediting
More lead time, less inventory

Net margin rose, inventory value reduced
• Distributing Chemicals
• Efficiency Measures
• Aha!
• Major Financial and Strategic Advantage
# Nalco ROIC

<table>
<thead>
<tr>
<th>Revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Cost of goods sold</td>
</tr>
<tr>
<td>Gross margin</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sales cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Supply chain cost</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>- Overheads cost</td>
</tr>
<tr>
<td>Net margin</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ROIC</th>
</tr>
</thead>
</table>

Sales rose, customer profitability rose  
Production cost reduced, demand variance reduced  
More value, easier price increases  
Reduced demand variance  
Reduced orders  
Eliminated expedited deliveries  
More lead time  
Sales rose, inventory value dropped
Product Flow Management

- Product Flow
- Reorganization
- Results
- ROIC
Manufactured Product – Customer Shipments

Product A – Region 1

Cases

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Shipments – Average
Large Use (23) vs Small Use Hospitals

Product A – Region 1

Cases

Week

1 2 3 4 5 6 7 8 9 10

Large Small
# Product A – Region 1

## Customer Shipment Data

<table>
<thead>
<tr>
<th>Major Hospitals</th>
<th>Week Data</th>
<th>Total</th>
<th>Rel. Dev. from Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital 1</td>
<td>100</td>
<td>110</td>
<td>712</td>
</tr>
<tr>
<td>Hospital 2</td>
<td>48 173</td>
<td>193</td>
<td>1123</td>
</tr>
<tr>
<td>Hospital 3</td>
<td>100 50</td>
<td>100</td>
<td>550</td>
</tr>
<tr>
<td>Hospital 4</td>
<td>165 102</td>
<td>110</td>
<td>899</td>
</tr>
<tr>
<td>Hospital 5</td>
<td>128</td>
<td>128</td>
<td>1088</td>
</tr>
<tr>
<td>Hospital 6</td>
<td>50 65</td>
<td>60</td>
<td>290</td>
</tr>
<tr>
<td>Hospital 7</td>
<td>120 85</td>
<td>120</td>
<td>445</td>
</tr>
<tr>
<td>Hospital 8</td>
<td>1 80</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Hospital 9</td>
<td>80 63</td>
<td>100</td>
<td>560</td>
</tr>
<tr>
<td>Hospital 10</td>
<td>51</td>
<td>59</td>
<td>173</td>
</tr>
<tr>
<td>Hospital 11</td>
<td>24 10</td>
<td>38</td>
<td>24</td>
</tr>
<tr>
<td>Hospital 12</td>
<td>78 75 30</td>
<td>82</td>
<td>390</td>
</tr>
<tr>
<td>Hospital 13</td>
<td>40 20</td>
<td>25</td>
<td>191</td>
</tr>
<tr>
<td>Hospital 14</td>
<td>90 30 60</td>
<td>60</td>
<td>365</td>
</tr>
<tr>
<td>Hospital 15</td>
<td>10 20 15</td>
<td>10</td>
<td>92</td>
</tr>
<tr>
<td>Hospital 16</td>
<td>10 18 5</td>
<td>8</td>
<td>40</td>
</tr>
<tr>
<td>Hospital 17</td>
<td>3 24 24</td>
<td>12</td>
<td>113</td>
</tr>
<tr>
<td>Hospital 18</td>
<td>4 5 1</td>
<td>4</td>
<td>23</td>
</tr>
<tr>
<td>Hospital 19</td>
<td>6 6 20</td>
<td>12</td>
<td>44</td>
</tr>
<tr>
<td>Hospital 20</td>
<td>25 6 20</td>
<td>25</td>
<td>70</td>
</tr>
<tr>
<td>Hospital 21</td>
<td>3 6 8</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td>Hospital 22</td>
<td>4</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Hospital 23</td>
<td>10 10 15</td>
<td>15</td>
<td>50</td>
</tr>
<tr>
<td>Hospital 24</td>
<td>8 13 4</td>
<td>11</td>
<td>58</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Small Hospitals</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital 1</td>
<td>115</td>
<td>158</td>
<td>1363</td>
</tr>
<tr>
<td>Hospital 2</td>
<td>140</td>
<td>158</td>
<td></td>
</tr>
<tr>
<td>Hospital 3</td>
<td>119</td>
<td>166</td>
<td></td>
</tr>
<tr>
<td>Hospital 4</td>
<td>166</td>
<td>128</td>
<td></td>
</tr>
<tr>
<td>Hospital 5</td>
<td>82</td>
<td>156</td>
<td></td>
</tr>
<tr>
<td>Hospital 6</td>
<td>893</td>
<td>132</td>
<td></td>
</tr>
<tr>
<td>Hospital 7</td>
<td>530</td>
<td>167</td>
<td></td>
</tr>
<tr>
<td>Hospital 8</td>
<td>7412</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital 9</td>
<td>1025</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital 10</td>
<td>697</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital 11</td>
<td>8775</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital 12</td>
<td>936</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital 13</td>
<td>985</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital 14</td>
<td>954</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital 15</td>
<td>909</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital 16</td>
<td>770</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital 17</td>
<td>821</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital 18</td>
<td>1025</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital 19</td>
<td>697</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital 20</td>
<td>8775</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital 21</td>
<td>545</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital 22</td>
<td>936</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital 23</td>
<td>985</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital 24</td>
<td>954</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Subtotal: 998 405 778 866 808 781 698 936 985 954 909 770 821 1025 665 893 530 7412 0.919
Product A – National Customer Shipments

Week

Cases

1 2 3 4 5 6 7 8 9 10

Shipments Average

jlbyrnes@mit.edu
Copyright © 2012 Jonathan
Product A – Production Output

Cases

<table>
<thead>
<tr>
<th>Week</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>

- **Production**
- **Average**
The Solution...

- A Standing Order System
- Major Accounts – Major Products
- Weekly Orders
- Contingency Backups
- Custom Pack
Manageability of Task

Product A - Region 1

- Total Hospitals: 120
- Major Hospitals: 23
- Problem Hospitals: 12
- Key Problem Hospitals: 4
Before and After Views
Product A – Region 1

Customer Shipments

Before

Cases

After

Cases

---

Shipments  Average

Shipments  Average
Before and After Views
Product A – National

Customer Shipments

Cases

Before

After

1 2 3 4 5 6 7 8 9 10

Shipments Average

Shipments Average
Before and After Views

Product A – Production Output

Cases

Before

Cases

After

1 2 3 4 5 6 7 8 9 10

Production Average

Production Average
Before and After Views

Product A – Region 1

Before

Weeks of Supply

1 2 3 4 5 6 7 8 9 10

After

Weeks of Supply

1 2 3 4 5 6 7 8 9 10

Central  Transit  Region 1

Average
## Channel Microeconomics

<table>
<thead>
<tr>
<th>Service</th>
<th>Cost Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Facility</td>
<td>75% Cost Reduction</td>
</tr>
<tr>
<td>Interwarehouse Freight</td>
<td>No Change</td>
</tr>
<tr>
<td>Customer Facing Warehousing</td>
<td>25% Cost Reduction</td>
</tr>
<tr>
<td>Freight to Customers</td>
<td>No Change</td>
</tr>
</tbody>
</table>

**Summary**

50% Cost Reduction
Additional Benefits

- No Stockouts – No Backorders
- Capital Program Avoided
- Custom Pack for Hospitals
- Enhanced Hospital Materials Management – Head Nurse Relations
- Stable Manufacturing
- Raw Materials Commitments
- Sales Productivity – Market Share Increase
Product Flow Management ROIC

Revenues
- Cost of goods sold
  Gross margin
- Sales cost
  Supply chain cost
    - Inventory cost
    - Activity cost
    - Transportation cost
    - Facility cost
  Overheads cost
  Net margin

Sales rose, no stockouts
Steady demand, reduced production cost
No expediting, terrific service
Greatly reduced flow through
Eliminated double handling
Eliminated expediting
Reduced facility size

Net margins rose, inventory value reduced
Service Differentiation

- No More “One Size Fits All”
- Always Keep Your Service Promises, but...
- Different Promises to Different Customers
- Matches Supply Chain Assets and Cost Structure to Account Potential
- Good for Customers – Can Plan Around a Consistent Level of Service
### Customer Service Matrix

<table>
<thead>
<tr>
<th>Products</th>
<th>Core</th>
<th>Non-Core</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers</td>
<td>3 days</td>
<td>5 days</td>
</tr>
<tr>
<td></td>
<td>1 day</td>
<td>3 days</td>
</tr>
</tbody>
</table>

Order Cycle Time
Service Differentiation ROIC

<table>
<thead>
<tr>
<th>Revenues</th>
<th>Sales rose, incentive to become core account, lower customer inventory</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Cost of goods sold</td>
<td>More predictable demand</td>
</tr>
<tr>
<td>Gross margin</td>
<td></td>
</tr>
<tr>
<td>- Sales cost</td>
<td>Clear menu-driven value, less expediting</td>
</tr>
<tr>
<td>- Supply chain cost</td>
<td>Increased lead time</td>
</tr>
<tr>
<td>- Inventory cost</td>
<td>Eliminated back orders</td>
</tr>
<tr>
<td>- Activity cost</td>
<td>Consolidated shipments</td>
</tr>
<tr>
<td>- Transportation cost</td>
<td>Smaller footprint, eliminated facilities</td>
</tr>
<tr>
<td>- Facility cost</td>
<td></td>
</tr>
<tr>
<td>- Overheads cost</td>
<td>Net margins rose, inventory value dropped</td>
</tr>
<tr>
<td>Net margin</td>
<td></td>
</tr>
</tbody>
</table>

ROIC
Partnering with Sales, Marketing, and Finance

• Profit Mapping
• Customer Relationship Definition
• Market Mapping
• Account Management and Service Differentiation
Transformational Leadership

Integrated Account Management
- Revenue focus
- Gross margin focus
- Which relationship? With whom?

Supply Chain Management
- Cost efficiency
- ROIC effectiveness
- Strategic differentiation

Functional Convergence
- Market mapping
- Building account relationships
- Managing change – internal and external

jlbyrnes@mit.edu
Copyright © 2012 Jonathan L.S. Byrnes
Inventory Productivity

Missing Link between
Supply Chain Management and Sales

Optimization \rightarrow Management
Cost Minimization \rightarrow ROIC Maximization

Use Systems Thinking to
Drive the Boat!