Is There ROI in RFID?

Video Conference

November 13, 2007
Who We Are

- Supply Chain Research
- Supply Market Forecasts
- Supply Chain Consulting
Agenda

- A note on the technology
- Experiences outside of libraries
- Library case studies
- Thoughts on privacy and security
- Recommendations
Technology – Important Distinctions

• RFID
  • Active vs. passive
    • Sensors: Temperature, Light, Humidity, Pressure, Vibration, Sound, Acceleration, Existence, Draw, Motion, Air exchange, Explosives, Location, Radioactivity
  • Read vs. read-write
  • Finite vs. rechargeable battery
  • Continuous vs. intermittent transmission
  • Middleware vs. Object Naming Service
  • Number of bits per tag: 75-1,024

• Bar codes

• Electro-Magnetic
Experiences outside of libraries
Early stage of adoption

- 65% have studied it
- 14% deployment rate
- 34% pilot studies
- 74% did not calculate any ROI
- 50% feel it will add “moderate” value
# The Wal-Mart Mandate

**LOGMARS and EPC Mandates**

- 2003 EPC standard
  - Albertson’s
  - Best Buy
  - Coca-Cola
  - Department of Defense
  - Gillette
  - Target
  - Wal-Mart

**Wal-Mart Current Status**

- Top 300+ suppliers → 600
- 23,753+ tagged pallets
- 663,912+ tagged cases
- 5 million+ tag reads
  - > 90% for cases on carts
  - 95% on conveyors in DCs
  - 66% on cases in pallets
- RFID data available to suppliers within 30 minutes via extranet
# Pilot Programs

<table>
<thead>
<tr>
<th>Non-Airline Deployments</th>
<th>Used For:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Chevrolet</td>
<td>• Tracking Equipment</td>
</tr>
<tr>
<td>• Good Shepherd Hospital</td>
<td>• Tracking Inventory</td>
</tr>
<tr>
<td>• Marks &amp; Spencer</td>
<td>• Deploying Labor</td>
</tr>
<tr>
<td>• MasterCard</td>
<td>• Tracking Production</td>
</tr>
<tr>
<td>• Pakistan passports</td>
<td>• Tracking Devices</td>
</tr>
<tr>
<td>• Port of Long Beach</td>
<td>• Monitoring Access</td>
</tr>
<tr>
<td>• Purdue Pharmaceutical</td>
<td>• Speeding Interactions</td>
</tr>
<tr>
<td>• Shanghai Masters Cup</td>
<td></td>
</tr>
<tr>
<td>• Tesco</td>
<td></td>
</tr>
<tr>
<td>• TNT Logistics</td>
<td></td>
</tr>
<tr>
<td>• UPS</td>
<td></td>
</tr>
<tr>
<td>• Velje bus terminal</td>
<td></td>
</tr>
<tr>
<td>• Virginia drivers license</td>
<td></td>
</tr>
</tbody>
</table>
Strong growth (on a small base)

- Security imperative
- Lower costs

**RFID Market Size**

<table>
<thead>
<tr>
<th>Year</th>
<th>Consumer convenience</th>
<th>Track emergency resources</th>
<th>Track inventory</th>
<th>Track equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2007</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2008</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2009</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2010</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Boston Logistics Group, Inc.
Note: Excludes consulting services
## Case Studies

<table>
<thead>
<tr>
<th>International</th>
<th>Domestic</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Implants</td>
<td>• Emergency or safety item location</td>
</tr>
<tr>
<td>• Consumer goods</td>
<td>• Picking management (warehousing)</td>
</tr>
<tr>
<td>• Retailing</td>
<td>• Security (chain of custody)</td>
</tr>
<tr>
<td>• Document management</td>
<td>• Quality management/manufacturing process control</td>
</tr>
<tr>
<td>• Perishable logistics</td>
<td></td>
</tr>
<tr>
<td>• Promotion management</td>
<td></td>
</tr>
<tr>
<td>• Fleet equipment</td>
<td></td>
</tr>
</tbody>
</table>
Inventory: Solid ROI for $ Items

- Orthopedic implants
- Problem: Pipeline stock of high-value items
- Solution and Cost: $260,000
  - 250,000 items tagged
  - 7 tunnel readers
  - Software
- Benefit: $250,000
  - 5% savings on $50M inventory @ 10%
  - 20% less overtime counting returned items
- ROI: 101%
Inventory: Solid ROI for $ Items

- Hospital
- Problem: Misplaced medical equipment inflates rental costs.
- Solution and Cost: $560,000
- Benefit: $1.2 million
  - 5% reduction in 5,400 30-day leases @ $4,500 each
- ROI: 107%
Inventory: Retail Collaboration

**Large CPG Company**
- Problem: Compliance
- Solution Cost: 1.0x
- Benefit: 0.08x
  - Labor savings at DCs
  - Deductions
  - More promo sales due to fewer out-of-stocks
- ROI: -7% to -5% *before* deductions, promos.

**Large Retailer**
- Problem: Out-of-stocks
- Solution and Cost: 8.2x
- Benefit: 3.4x
  - 10-20% fewer out-of-stocks (stock-outs = 3-8% of sales)
- ROI: 15% - 170%
Las Vegas Airport

- 73,000 bags per day
- 35,000 on RFID today
- $125 million program
  - 6 buildings, conveyors, RFID antennas
  - $94 million from Transportation Security Administration
- 100 million Matrics tags
  - 5-year agreement for Symbol tags and readers
  - Not EPCGlobal
- Cooperation with Amsterdam and Narita
- 99%+ read rate
Library case studies
Selected deployments

- Netherlands – countrywide deployment since 2002
- Vatican
  - 30,000 of 40m items tagged; 2m target
- Kent District MI
  - 4.5m items, 5 readers
  - Reduction of circulation staff through attrition
  - Rollout to branches
- Darien CT
  - 30% reduction in staffing at Circulation desk
- Falls Church, VA
  - 335,000 items
  - Check-in 56% faster
  - Check-out 38% faster
  - Shelf-reading accuracy up 23%
  - Lost items were found
Catholic University of Leuven

• Problem: New library

• Solution and Cost:
  • Solution implemented in 2002
  • 200,000 tagged, out of 1m books
  • $0.50/tag
  • 3 readers (2 check-out, 1 check-in)

• Challenges
  • Reading piles of books (distance from reader)
  • Multiple generations of tags
  • Taking inventory on shelves (bad read angles)
Olin College in Boston

• Problem: Looking for more efficiency & greater convenience for students

• Solution and Cost:
  • Since 2002
  • Self-checkout RFID for 24/7 access
  • 80 cents/tag

• Benefits:
  • Reduced labor costs
  • High level of accessibility

• Challenges
  • Can only check out 1 item at a time
University of Nevada at Las Vegas

• Problem: Missing books and lack of organization

• Solution and Cost:
  • Since 2002
  • 1,000,000 items tagged & tattle taped
  • 6 handheld readers
  • 5 readers at circulation desks
  • Software
  • Service contract

• Benefits:
  • Reduction in risk of loss ($40k based on finding items that were thought to be missing)
Libraries compared to other applications

• Longer tag life vs. consumer products logistics
• Shorter read range vs. leisure, transport, and other applications
• Fewer entry/exit gates than most security and supply chain situations
Common challenges

• Investment cost
• Interference
  • Anti-collision algorithms improved
  • Tagging several inches from the bottom prevents interference with metal shelves
• Privacy
• Standards
  • China: UHF 840 MHz-925 MHz
  • Europe: UHF 860 MHz
  • US UHF 920 MHz
  • ISO HF 18000-3 and UHF 18000-6 tags
Where benefits can be found

Range of Potential RFID Applications and Benefits

<table>
<thead>
<tr>
<th>Application</th>
<th>Benefit</th>
<th>Financial Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed transactions</td>
<td>Throughput ↑</td>
<td>Convenience ↑</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Revenues ↑</td>
</tr>
<tr>
<td>Security / access monitoring</td>
<td>Violations ↓</td>
<td>Losses ↓</td>
</tr>
<tr>
<td>Reduce inventory</td>
<td>Turns ↑</td>
<td>Working Capital ↑</td>
</tr>
<tr>
<td>Reduce labor</td>
<td>Productivity ↑</td>
<td>Costs ↓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Profits ↑</td>
</tr>
</tbody>
</table>
## Payback – worksheet

### Costs

<table>
<thead>
<tr>
<th></th>
<th>Small Library</th>
<th>Large Library</th>
<th>Library Network</th>
</tr>
</thead>
<tbody>
<tr>
<td># Tags</td>
<td>20,000</td>
<td>1,000,000</td>
<td>5,000,000</td>
</tr>
<tr>
<td>Cost/Tag</td>
<td>$0.80</td>
<td>$0.30</td>
<td>$0.15</td>
</tr>
<tr>
<td>Tag Cost</td>
<td>$16,000</td>
<td>$300,000</td>
<td>$750,000</td>
</tr>
<tr>
<td># Readers</td>
<td>2</td>
<td>6</td>
<td>60</td>
</tr>
<tr>
<td>Cost/Reader</td>
<td>$2,500</td>
<td>$1,500</td>
<td>$1,300</td>
</tr>
<tr>
<td>Reader Cost</td>
<td>$5,000</td>
<td>$9,000</td>
<td>$78,000</td>
</tr>
<tr>
<td>Software</td>
<td>$500</td>
<td>$500</td>
<td>$2,500</td>
</tr>
<tr>
<td>Installation</td>
<td>$1,000</td>
<td>$50,000</td>
<td>$125,000</td>
</tr>
<tr>
<td>Power Supplies</td>
<td>$500</td>
<td>$3,000</td>
<td>$30,000</td>
</tr>
<tr>
<td>Total Investment</td>
<td>$22,500</td>
<td>$359,500</td>
<td>$955,500</td>
</tr>
</tbody>
</table>

### Benefits

<table>
<thead>
<tr>
<th></th>
<th>Small Library</th>
<th>Large Library</th>
<th>Library Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Annual Loss Rate</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Avg. Replacement Cost/Item</td>
<td>$25.00</td>
<td>$25.00</td>
<td>$25.00</td>
</tr>
<tr>
<td>Annual Total Loss Value</td>
<td>$5,000</td>
<td>$250,000</td>
<td>$1,250,000</td>
</tr>
<tr>
<td>FTEs Avoided</td>
<td>1</td>
<td>25</td>
<td>62.5</td>
</tr>
<tr>
<td>Fully Loaded Value/FTE</td>
<td>$30,000</td>
<td>$30,000</td>
<td>$30,000</td>
</tr>
<tr>
<td>Labor Avoidance Savings</td>
<td>$30,000</td>
<td>$750,000</td>
<td>$1,875,000</td>
</tr>
<tr>
<td>Total First Year Savings</td>
<td>$35,000</td>
<td>$1,000,000</td>
<td>$3,125,000</td>
</tr>
</tbody>
</table>

### Savings

<table>
<thead>
<tr>
<th></th>
<th>Small Library</th>
<th>Large Library</th>
<th>Library Network</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Year Net Savings</td>
<td>$12,500</td>
<td>$640,500</td>
<td>$2,169,500</td>
</tr>
<tr>
<td>Return on Investment (ROI)</td>
<td>56%</td>
<td>178%</td>
<td>227%</td>
</tr>
<tr>
<td>Payback Period (Years)</td>
<td>1.8</td>
<td>0.6</td>
<td>0.4</td>
</tr>
</tbody>
</table>
Thoughts on privacy and security
Security and Privacy

• Privacy – mostly benefiting the customers
  • For customers – subject matter not disclosed
  • For libraries – tracking of items

• Security
  • Dual systems keep collections secure
    • EM for security
    • RFID for tracking
  • “Theft bit” can trigger alarms
  • Intentional theft is always possible
    • Overlapping tags
    • Covering tags with foil
Recommendations
Action Plan

1. Target and measure improvements in customer satisfaction and loyalty

2. Conduct a preliminary ROI assessment to verify that volume and scale meet threshold requirements

3. Launch a pilot and independently validate the success and expansion potential
## RFID = convenience!

David Jacoby: djacoby@bostonlogistics.com

Boston Logistics Group helps supply chain executives make critical supply chain decisions that involve investment and risk by forecasting the evolution of supply markets and technologies. Our mission is to help our clients develop globally competitive supply networks that maximize Supply Chain Value.™ Our products and services include:

| Research that help investors and policy makers quantify the benefit of emerging technologies and decide whether or not to invest in them |
| Forecasts that help purchasing managers decide how, where, and when to buy critical externally-purchased materials and services |
| Consulting that supports high-stakes decisions such as acquisitions, outsourcing, off-shoring, and make-or-buy |

### Industries Served:

| Discrete Manufacturing: Machinery, Equipment, Vehicles, Parts, Mechanical and Electrical Devices |
| Transportation: Railroads, Ocean Shipping Lines, Airlines, Trucking Companies, Package Delivery, Intermodal |
| Logistics: Dedicated and Third Party Logistics, Ports, Stevedoring, Storage, Material Handling, Distribution, Maintenance, Retail |