Automation Trends in Global Supply-Chain

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By

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Managing Director, Accu-Sort Asia Pacific

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**Overview of Supply Chain Council**
- Overview of Supply-Chain
- Recent Issues in Supply Chain Industry
- Challenges faced by the Industry

**Current Automation in Supply-Chain**
- Automated Supply-Chain Operation
- Assessing the Potential Benefits of Using RF-ID in your Supply-Chain

**New Technologies for the Next Generation of Supply-Chain**
• The SCC is an independent, not-for-profit, global corporation with membership open to all companies and organizations interested in applying and advancing state-of-the-art supply chain management systems and practices.
  
  o Over 900+ Company Members
  
  o Cross-industry representation
  
  o Chapters in Australia/New Zealand, Brazil, Europe, Japan, North America, Southern Africa, South East Asia and Greater China with petitions for additional chapters pending.

• The Supply-Chain Council (SCC) has developed and endorsed the Supply Chain Operations Reference-model (SCOR) as the cross-industry standard for supply chain management
SCC Organization - Chapters and Staffing

Greater China Chapter
Shanghai, Hong Kong, Taiwan

Japan Chapter
Tokyo, Japan

South East Asia Chapter
Singapore

South Africa
Johannesburg, South Africa

SCC Global Headquarters
Washington, USA

North America
Chapter

North America
Chapter

Brazil Chapter

Europe
Oslo, Norway

Greater China Chapter
Shanghai, Hong Kong, Taiwan
SCC Leadership Teams

Greater China
BAX Global Limited – C
IBM China Group – VC
Tatung Co. – VC
GS1 Hong Kong
PricewaterhouseCoopers
Eprogistics
Techtronic Industries Co
The University of Hong Kong
Newell Rubbermaid GSA
British American Tobacco
Fountain Set (Holdings)
 Pricerite
Walt Disney

South East Asia
Sembcorp Logistics
Modus Media International
Accu-Sort Asia Pacific - C
iCognitive
SAS Asia Pacific
BearingPoint Inc (SEA)
Konsortium Logistik
The Polyolefin Company -VC
SNT Global Solutions

Japan
NEC - C
Chubu Electric Power - VC
Japan Business Create - VC
Mitsui & Co
Olympus Corporation
IBM Japan
Tokyo Electric Power Company
Hokkaido University
Matsushita Electric Industrial
Hitachi, Ltd. PERL
Nihon Unisys
Yamaha Corporation
PeopleSoft Japan K.K.
BearingPoint
Saitama Institute of Technology

Australia/New Zealand
Competitive Capabilities
International – C
Health Purchasing Victoria – VC
BHP Steel
Mi Services Group
RMIT
Oracle Corporation (ANZ)
EAN Australia
SCC Leadership Teams

Europe
- JohnsonDiversey – C
- Siemens AG – VC
- ModusLink Corporation
- Supply Dynamics
- Borealis
- EDS UK and SA
- Swiss Federal Inst. of Technology (ETH)
- SAP
- Grundfos A/S
- META Group (EUR)

North America
- IBM Corp - C
- SAP America
- Raytheon Company
- Avicon
- Air Products and Chemicals Inc.
- PRTM
- Michigan State University
- Pelion Systems
- Gillette Company
- AT Kearney
- Pragmatek
- Boeing

Brazil
- Hewlett Packard

Southern African
- Chapter Liaison

SCORboard
- McCormick & Company, Inc. – C
- JohnsonDiversey – VC
- Georgia Institute of Technology
- IBM Corp. (NA)
- Singapore Technologies Logistics
- UTi Worldwide
- SCE Limited
- Philips Lighting B.V.
- AMR Research
- Hewlett Packard Brazil
- Oracle
- PRTM
- Medtronic, Inc
- Competitive Capabilities International
- Parks & Resorts
- NEC Corp.
- Hewlett Packard
- BASF Corp.
- BP Chemicals
- Microsoft Business Solutions
- BAX Global (China)
- DaimlerChrysler/MOPAR
- Eaton Corporation
Membership

Member by Type

Members by Region

- 900+ SCC members,
- **Composition**
  - 40%: Practitioners
  - 25%: Enabling Technology Providers
  - 20%: Consultants
  - 15%: Universities, Associations, Government Organizations
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New Technologies for the Next Generation of Supply-Chain
Overview of Supply-Chain

Supply-Chain

logistics network, or supply network is a coordinated system of organizations, people, activities, information and resources involved in moving a product or service in physical or virtual manner from supplier to customer. Supply chain activities value chains or life cycle processes transform raw materials and components into a finished product that is delivered to the end customer. Supply chains link value chains
Associating information flow with the physical flow of products

Farmer ➔ Upstream supplier ➔ Supplier ➔ Warehouse ➔ Carrier ➔ Distribution ➔ Point of sale

Information Flow

Product Flow
Upstream Tracing/ Downstream Tracking
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New Technologies for the Next Generation of Supply-Chain
Recent Issues in Supply Chain Industry

In 2001, Cisco wrote off $2.2 b in unusable inventory, the largest inventory write-off in the world so far.
The prime reason was failure to track inventory across the supply chain accurately.

Nike, K-mart and several other companies suffered serious setbacks due to issues in supply chains
In 21st century, the competition is not just between the two companies but between Two Competing Supply Chains
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New Technologies for the Next Generation of Supply-Chain
Importance of Asia Pacific is growing...

- Asia Pacific region is "growth center" for the world
- Growing importance of consuming markets
- And.. Low cost production bases
- Increasingly getting integrated with global supply chains

Challenges faced by the Industry
# Challenges faced by the Industry

## Supply Chains in Asia-Pacific: Comparison By Key Countries

<table>
<thead>
<tr>
<th></th>
<th>China</th>
<th>India</th>
<th>Malaysia</th>
<th>Singapore</th>
<th>Thailand</th>
<th>Indonesia</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infrastructure</strong></td>
<td>Partially Developed/ Developing</td>
<td>Partially Developed/ Developing</td>
<td>Developed</td>
<td>Developed</td>
<td>Rapidly Developing</td>
<td>Underdeveloped</td>
</tr>
<tr>
<td><strong>Factors affecting supply chain</strong></td>
<td>Variance across provinces, source of delays and inefficiencies</td>
<td>Price war prevalent with more choices for the customers</td>
<td>Strong connectivity through ports and airports</td>
<td>Very efficient, well integrated</td>
<td>Airport, Free trade zones, FTAs aid in improving efficiency</td>
<td>Poor infrastructure, and unstable political climate affect the supply chain</td>
</tr>
<tr>
<td><strong>Supply Chain Characteristics</strong></td>
<td>Fragmented</td>
<td>Fragmented</td>
<td>Integrated in some end users</td>
<td>Integrated</td>
<td>Integrated in some end users</td>
<td>fragmented</td>
</tr>
<tr>
<td><strong>Key End-user Sectors</strong></td>
<td>Manufacturing, Automotive, Hi-tech Electronics</td>
<td>Automotive, FMCG, Retail</td>
<td>Automotive, Hi-tech Electronics</td>
<td>Hub for re-distribution, accumulations</td>
<td>Automotive, Hi-tech Electronics</td>
<td>Textile, FMCG</td>
</tr>
<tr>
<td><strong>Growth Opportunities</strong></td>
<td>Very High</td>
<td>Very High</td>
<td>High</td>
<td>High</td>
<td>Very High</td>
<td>Medium</td>
</tr>
</tbody>
</table>
India – The Road Ahead!

- Economic growth across various end-user sectors like automotive, hi-tech electronics
- Increasing FDI in sectors like retail, manufacturing
- Growing need to outsource logistics
- Government policy support for infrastructure development; like “Golden Triangle”, “Sethusamudram Project”.
- Geographically diverse needs that need to be met
- Stiff competition in pricing and more choices for clients

Indian retail chains would get integrated with global supply chains since FDI will bring in technology, quality standards and marketing.

India has risen as a stiff competition to the lowest cost manufacturing in China
### Challenges faced by the Industry

<table>
<thead>
<tr>
<th>Issues Addressed</th>
<th>Singapore</th>
<th>Malaysia</th>
<th>Thailand</th>
<th>India</th>
<th>China</th>
<th>Indonesia</th>
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</thead>
<tbody>
<tr>
<td>Manpower</td>
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<tr>
<td>Infrastructure</td>
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<td>▲</td>
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<tr>
<td>Technology</td>
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<td>Service quality</td>
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<td>▲</td>
</tr>
<tr>
<td>Supply chain integration</td>
<td>▲</td>
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<td>Regulations</td>
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<tr>
<td>Economic and Political Stability</td>
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<tr>
<td>Industry consolidation</td>
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<td>▲</td>
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</table>

**Current Status**

- **Established**
- **Collaborative**
- **Proactive**
- **Reactive**
- **Progressive**
- **Formative**

▲: Mainly Addressed  △: Partially Addressed  ▲: Not Addressed
Challenges faced by the Industry

Where is the problem?

Industry Challenges

• India is highly fragmented market in terms of geography, economy, culture, language, and governmental and custom regulations.
• Distribution channels are multi layered with many intermediaries, making supply chain management complex.
• A shortage of human resources and training system in logistics
• Lack of expertise of system providers, insufficient infrastructure, and educational rudiments obstruct the use high-level services such as supply chain event management, inventory track and trace, reconciliation between systems, and Electronic Data Interchange (EDI).
• Customer requirements have become more stringent and they demand bundled services at lower rates
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Automated Supply-Chain Operation
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New Technologies for the Next Generation of Supply-Chain
Current Automation in Supply-Chain

Supply Chain Segments

- Manufacturing
- Wholesale and Distribution
- Transportation and Logistics
- Retail
Manufacturing Applications

• Raw Material Control
  – Correct Items for Manufacturing
• Production
  – T & A, scheduling, Process control (WIP), QC
• Stock Control and Warehousing
  – FIFO principle, Space allocation, JIT
• Shipping
  – QA, Batch # and Serial # tracking
Even Primary industry manufacturing utilize AIDC products to control raw materials. In this case the control is not only the raw materials but the necessary tasks required to produce the raw materials.
Production Applications

• *Time and attendance* is a crucial part of all businesses, in particular the manufacturing segment.
• Fixed terminals are used to control employees’ start and end of work shift.
• Trying to manage this function without data collection terminals is a nightmare.
• Data error rate is reduced if not eliminated, data processing is immediate and the cost savings associated with the capture of this data is almost insignificant.
Production Applications

• Production Batch control (WIP) is one of the most important aspects of manufacturing.
• The need to track faulty components to a finished product starts at the production line.
• Line stations are equipped with Fixed data collectors to enable the capturing of important information in the manufacturing or assembly of a product.
• This allows us to track components in a product even the operator who worked on it and enables a higher quality control to be implemented, ensuring that products are of the highest quality and fault free.
• If a faulty batch of components is found at a later stage we are able to identify every product using that component batch and recall it.
Wholesale and Distribution
Wholesale and Distribution Applications

• Warehousing
  – Receiving
  – Put away
  – Order Entry
  – Picking and Packing
  – Dispatch
• Direct Sales
  – Merchandising
  – Route Accounting (Van Sales)
Warehousing Applications

- Receiving
- Put away
- Order Entry
- Picking and Packing
- Dispatch
Direct Sales Applications

• Merchandising:
Manufacturers or Wholesalers take care of product displays in stores
To enable the prominent position of promoted products for a special period.
• This application has been in use for decades, however the use of mobile computers has brought new life to it.
• Better success for the manufacturer or wholesaler, less effort for the service representative and higher sales to the retailer.
**Direct Sales Application**

- **Van Sales**
  - Direct to retailers
  - Stock rotation of chilled perishables
  - Requirement for a verifiable audit trail on a daily basis
  - Order compilation
  - Cash Collection
Direct Van Sales Application

- “BlueTooth” Data Terminal
- BT Belt Printer
- Mobile Phone with BT
Transportation and Logistics
Transportation & Logistics Applications

• Manifests and Routes
  – Scheduling of routes and customers
  – Load analysis
• Delivery
  – Tracking deliveries
  – Shipping
• Fleet Management
  – Efficiency, maintenance, running costs
Manifests and Routes Applications

- Identify Truck or Van
- Set up Route
  - Identify Customers
  - Identify Products
- Load product onto vehicle
Delivery Applications

In today’s world every one wants to know where their goods are and when they will arrive.

WAN enabled terminals are the best choice for this task because the information is in REAL TIME.
Shipping Applications

• Identify the product
• Identify the carton
• Identify the Pallet
• Identify the container
Fleet Management Applications

• GPS and vehicle monitoring unit can help identify all necessary information required for accurate analysis.
• This include:
  – Speed, Distance traveled, Time take, Breaks taken, Route driven.
Retail
Retail Applications

- Order Entry
- Stock Control
- Price Auditing
- Customer Service
- Point Of Sale
Order Entry

- Operator scans shelf item if low stock on shelf
- Software checks backroom for stock, if it's there data is sent to the operator to replenish from the backroom to the shelf. If no stock, it will place the order in the system for more product
- A simpler form of order entry is to just scan the item and required quantity, once the complete store has been checked the data is then transmitted to the wholesaler as an order.
Stock Control

- Portable data collection terminals are widely used to get accurate stock control in most businesses.
- Whether its retail, wholesale or manufacturing, controlling stock is controlling profits and overheads as well as ensuring availability of products.

- Stock control can be done in either batch or real-time.
- The trend today is Wireless mobile computers.
- This offers real-time data control at the point of collection.
- Its Fast, Easy, accurate and very efficient.
Price Audit

• Retailers want to ensure that the price marked on items is the correct price at the register.

• This can be done in two ways: Batch mode, where the file is loaded into the terminal and pricing info is verified against the loaded file; and Wireless where the data is validated against the store’s database.
Customer Service Applications

• A booming application in Retail is Stock Checking. This application developed as more retailers noticed that once a customer asked for an item not on the floor, such as different color, size, etc. the sales person had to leave the customer and go to the back room to check. At which time the customer walked out of the store and no sale was done.

• Scan the item with a wireless terminal, and the backroom stock is checked online and all combinations that are available are displayed to the sales person whilst with the customer

• Typical retailers: shoes, clothing, furniture
Point Of Sale

The final Stage of supply chain management is now achieved, the product is in the hands of consumers

Self Checkouts and Queue busters are becoming very popular in Retail Outlets
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Assessing the Potential Benefits of Using RF-ID in your Warehouse

New Technologies for the Next Generation of Supply-Chain
## Automated Supply-Chain Operation

<table>
<thead>
<tr>
<th>Conventional Reliance on Manpower</th>
<th>Semi-Automated</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.jpg" alt="Conventional Reliance on Manpower" /></td>
<td><img src="image2.jpg" alt="Semi-Automated" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Automated</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3.jpg" alt="Automated" /></td>
<td><img src="image4.jpg" alt="Future" /></td>
</tr>
</tbody>
</table>

???
Conventional Approach

- Receiving
- Put Away
- Let Downs
- Picking
- Shipping
Semi-Automated

• Identify Truck or Van
• Set up Route
  o Identify Customers
  o Identify Products
• Load product onto vehicle
Semi-Automated

- Receiving
- Put away
- Order Entry
- Picking and Packing
- Dispatch
### What Current inefficiencies arise due to lack of technology?

<table>
<thead>
<tr>
<th>Supply-Chain</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Excessive inventory</td>
</tr>
<tr>
<td>- Stock outs</td>
</tr>
<tr>
<td>- Delay in shipments</td>
</tr>
<tr>
<td>- No control over inflow/outflow of goods</td>
</tr>
<tr>
<td>- Loss of goods</td>
</tr>
<tr>
<td>- Delay in delivery</td>
</tr>
<tr>
<td>- No vehicle traceability</td>
</tr>
<tr>
<td>- Excess documentation</td>
</tr>
<tr>
<td>- Incorrect order fulfillment</td>
</tr>
<tr>
<td>- Goods pass through many intermediaries</td>
</tr>
<tr>
<td>- Inaccurate data leading to use of expensive manpower</td>
</tr>
<tr>
<td>- Transaction data errors</td>
</tr>
<tr>
<td>- Data duplication across various levels in the value chain</td>
</tr>
<tr>
<td>- Information sharing becomes difficult</td>
</tr>
</tbody>
</table>
Automated Supply-Chain Operation

Need to integrate entire supply chain based on customer demand
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New Technologies for the Next Generation of Supply-Chain
RFID Tag Anatomy

Conductive foil or Ink antenna is bonded to plastic substrate to form inlay

Copper foil antenna

Silicon Wafer

ASIC*
Silicon chip

Inlay can then be bonded to an adhesive backed paper tag

Silicon chip is bonded to antenna to complete the inlay

Or, the Inlay can be bonded to application-specific hardware

*application-specific integrated circuit
EPCglobal initiatives and successes in 2006

- Hardware Standards/Certification – Gen2 rollout
  - Gen2 RFID Tags:
    - Impinj was only initial supplier of silicon used in tags
    - Now also provided by Alien, TI, NXP (formerly Phillips Electronics), STMicroelectronics.
  - Gen2 RFID Readers:
    - Currently 9 companies have certified hardware
      - Alien, AWID, Impinj, Intermec, MaxID, Microelectronics Technology, Motorola, Sirit/Samsys, ThingMagic
EPCglobal initiatives and successes in 2006

- Software Standards/Certification - Interoperability
  - Reader Protocol Standard
    - How we talk to a reader
  - Reader Management Standard
    - How to check status
  - Application Level Events Standard
    - Business rules
  - Object Naming Service Standard
    - Data lookup for tag naming
  - Drug Pedigree Standard
    - ePedigree

Standards are in place!
General state of the RFID

- Retail
  - Wal*Mart, Target, Best Buy
  - WM = 600 stores, 5 DC’s
  - Target = DC done, stores being put online
  - Best buy = Interest in OTC and automatic in-line tagging
  - Tesco UK
- U.S. Department of Defense Update
  - 19 DC’s online
  - Suppliers come online at contract renewal time
- RFID pilots in other industries
  - Pilots coming up due to successes seen at retailers
- Airlines
  - IATA approved and adopted Gen 2 standard
Using RFID

• Work in process RFID applications
  o Pain Equals Lack Of Visibility into Production and Inventory
  o RFID Tagging Offers
    ▪ **Paperless transactions $$$$$**
    ▪ Traveling Electronic Identifier
    ▪ Real time process tracking
    ▪ **Customer Asset responsibility $$$$$**
    ▪ Online real time tracking
Dock door equipped receiving Warehouse

- RFID array installed at Dock Doors
  - RFID Tagging Offers
    - Automated receiving processes
    - Multiple pallets identified instantly
    - Immediate relief of customer asset responsibility $$$$
    - Real-Time Inventory $$$$
RF-ID Applications– Receiving and Despatch

- Reliable bulk read – speed up your logistics
- Option: direction control to avoid scanning empty fork lifts
RF-ID OTC Tracking

“Every inbound RFID carton at one of the major retailers passes through ASI RFID inbound and sortation tunnels”

<table>
<thead>
<tr>
<th>Features</th>
<th>System Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>HST (High Speed Tracking)</td>
<td>• ASI RFID Reader</td>
</tr>
<tr>
<td>&lt;600fpm at &gt;10” Box Spacing</td>
<td>• Typically 4 antenna and absorber structure</td>
</tr>
<tr>
<td></td>
<td>• Multi-protocol</td>
</tr>
<tr>
<td></td>
<td>• Up to 6 sides of a box</td>
</tr>
<tr>
<td></td>
<td>• Singulation</td>
</tr>
<tr>
<td></td>
<td>• Tracking Software</td>
</tr>
</tbody>
</table>
RF-ID Usage in Supply-Chain (What, Why, Where ???)

- Cost of RF-ID Tags
- Global Standardization (EPC Global Gen 2.0)
- Different Frequencies in different Countries
- No fall back if RF-ID Tags failed (Both RF-ID and Barcodes has to co-exist)
- Used in-house (Close Loop)
- Privacy Laws of local countries
- Other Factors
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New Technologies for the Next Generation of Supply-Chain
Current Technology Deployment

Stages of Development

Emerging

- India, Indonesia
- Basic bar coding, Computerization
- 2007-2009

Developing

- Malaysia, Thailand
- Fleet management, eLogistics vehicle tracking
- 2008-2010

Developed

- Singapore
- 2009-2010

Advanced

- China
- RFID, Simulation, ERP, GPS
- 2010-2012

- 2012-2015
New Technologies for Next Generation of Supply-Chain

- Fully Automated Sorting System
- Image Capture (CCD Technology)
- Video Encoding
- RF-ID Technology
Fully Automated Sorting System in a typical Distribution Center
Fully Automated Sorting System
Image Capture (CCD Technology)

- **Technology offers:**
  - Higher read rates
  - 1D and 2D barcode reading
  - Ability to read poor quality and damaged codes
  - Image capture, archiving and offload
  - Dimensioning
  - Optical Character Recognition
  - Video Encoding
Image Capture CCD Cameras

Vision Cameras are Revolutionizing Auto-ID
Image Capture (CCD Technology)

- **Improved read rates**
  - Typical performance anywhere from 1% to 5% better than lasers
    - Lower costs to the customer because less recirculation, re-labeling and manual handling of packages and faster sort times
  - Lower cost of labels (by reducing necessary barcode size)
Image Capture (CCD Technology)

- **1D and 2D reading**
  - Cameras provide equal performance on 1D and 2D barcodes
  - Multiple codes and types per item
Image Capture (CCD Technology)

- **Read poor quality and damaged codes**
  - Fewer no reads, less customer “hands on” required to complete the sort
- **Image Capture, Archive and Offload**
  - Capture NO READ images for evaluation and analysis
  - Evaluate barcode / printing quality and consistency
  - Identify material handling problems
Image Capture (CCD Technology)

- **Dimensioning**
  - Integrated dimensioning capabilities in camera systems. Use with laser eye, tachometer to calculate package volume.
  - Smallest bounding box for irregulars.
  - Trailer cubing – fully load based on space, not weight.
Image Capture (CCD Technology)

Improved Performance on Damaged Labels

Improved Performance on Damaged Labels

Improved Performance on Shiny Surfaces!

Improved Performance on Low Aspect Ratio Codes!

Improved Performance on Severely Damaged Labels!

Improved Performance on Damaged Codes!
Quadrant Scanning

- Five-camera Side-quadrant configuration:
  - Dedicated top read
  - Redundant on four sides
  - Maximum read rate on squared and skewed packages
  - Modular configuration for easy diagnostics and maintenance
DC in Japan - Narita
DC in Japan - Narita
Video Encoding
RFID Technology

- Basic RFID System
  - Antenna or coil
  - Transceiver (with decoder)
  - Transponder (RF tag)
RFID labeling system

- Complete turnkey solution for labeling cases with RFID tag
- Includes bar code scanning, RFID, labeling, controls, and verification
- FastTag makes it easy to comply with Wal-Mart and other RFID initiatives

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Usage of Technology in Supply-Chain

- Basic Bar Coding: 48.4%
- Packaged ERP Software: 29%
- GPS/Vehicle Tracking: 22.6%
- Quality Check Systems: 19.4%
- Simulation/Decision Support Systems: 16.1%
- eCommerce Setup: 16.1%
- Supply Chain Software: 16.1%
- RFID/Smart Labelling: 16.1%
- eLogistics Systems: 6.5%
- Fleet Management Software: 6.5%
### What are the future Trends for supply chain industry?

<table>
<thead>
<tr>
<th>Time Frame</th>
<th>Trends</th>
</tr>
</thead>
</table>
| **Short Term (2007-2008)** | ▪ Educate and train people about systems approach of supply chain management  
                          ▪ Ease laws and regulations so as to increase the spend on organized logistics  
                          ▪ Plan for infrastructure improvements to be implemented in medium and long term  
                          ▪ Create awareness about the benefits of IT implementation  |
| **Medium Term (2009-2010)** | ▪ Create business models depending on the nature of economy, trade and available assets  
                          ▪ Improve infrastructure such as ports, airports and enable greater connectivity  
                          ▪ Develop long term relationships within industries by way of partnerships, alliances  
                          ▪ Implement and use advanced IT systems  |
| **Long Term (2011-2013)** | ▪ Integrate and optimize supply chain networks in Asia  
                          ▪ Minimize the involvement of unorganized participants in global supply chains  
                          ▪ Create performances measures for supply chain efficiency  
                          ▪ Develop functional expertise and build on them  |
Supply Chain

Q & A
Automated Sorting System For Apparel DC