The 21st Century Warehouse: Automation Prepares for the Future

Sponsored by: The Automation Alliance

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Automated Storage/Retrieval Systems

Automatic Guided Vehicle Systems

Conveyor & Sortation Systems

Integrated Systems & Controls Council

Order Fulfillment Solutions
Automation Prepares for the Future

*Trends, constraints, and regulations which are driving the changes in the warehouse, and the technologies that are available to make them run more efficiently.*

*Where to go to learn more…..*
Increasing Supply Chain Complexity

- Regulatory Compliance
- Low-Cost Country Sourcing
- Shifting World Demographics
- Operational Efficiencies
- Aging Workforce
- Consumer Demands
- Expanding IT Capabilities
- Energy/Sustainability Forces

Global Market Drivers
Global Market Drivers

- Increasing Supply Chain Complexity
- Regulatory Compliance
- Low-Cost Country Sourcing
- Shifting World Demographics
- Operational Efficiencies
- Energy/Sustainability Forces
- Aging Workforce
- Consumer Demands
- Expanding IT Capabilities
• **Retail ➔ RILA Annual Supply Chain Conference**
  • RILA represents the leading retail corporations in the US

![RILA Retail Membership by retail type](image)

• **Key conference presentations**
  • State of the Retail Supply Chain Study
  • Retailing 2015 - New Frontiers
**Retail Market Trends**

- **Increasing Complexity & Speed of Change**
  - Shifting demographics
  - Better educated consumers
  - New channel formats
  - Customized 'standard' product offerings
  - Faster Product introductions
  - Shorter life-cycles

- **Breaking the 80/20 Rule**
  - No longer will 20% of SKU's be 80% of sales
  - 'Longer tale' demand items
    - increasing share of sales & profits
Regional Distributor ~ 6 million cases/year

- Convenience & Grocery Stores
- Restaurants
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2009 – “We don’t need to stock more than ~350 SKUs, there is only so much room on the shelves at our customers”
Regional Distributor ~ 6 million cases/year

- Convenience & Grocery Stores
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2009 – “We don’t need to stock more than ~350 SKUs, there is only so much room on the shelves at our customers”

2012 – “Now we are stocking ~600 SKUs as the market for small brands has really taken off”
Retail Runway ‘Runs Out’
- Major retailers running out of room in core concepts
- Growth rates slowing or shrinking

New growth from:
- New Concepts/Categories
- New Customer Segments
- Multi-Channel Experience
Retail Market Trends

Shopping Center Blues

Vacancy rates for big-box centers

Annual rental rate per square foot for big-box centers

Source: CoStar

The Wall Street Journal

December 2011

Retail Isn't Broken. Stores Are

An Interview with Ron Johnson by Gardiner Morse

Wealth Wire

Is the Big Box Store Dead?

June 12, 2012, 5:03 p.m. ET

Big-Box Space Remains Hard to Fill
Sustainability Drives Downsizing

- Increased demands for localization, segmentation and customization
- Different packaging/delivery
- Urbanization, smaller format

### Formats with Above Average Sales Growth Outlook

<table>
<thead>
<tr>
<th>Format</th>
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<th>Non-auto Retail Sales Growth Forecast</th>
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<td>Book Stores</td>
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• ‘Sustainability’ Drives Downsizing
  • Increased demands for localization, segmentation and customization
  • Different packaging/delivery
  • Urbanization, smaller format

• Supply Chain Evolution
  • Past driven by mass merchandising
  • Future more niche oriented
  • Focus on ‘fast movers only’ will result in *Lost Sales*
On Monday, Wal-Mart announced it is bringing back thousands of products that were unceremoniously dumped from stores, saying it is ready to roll up its sleeves to win the lowest-price battle with its rivals.

- 2009 – Retailers reduce product offerings in wake of the recession
- NEW YORK (2011) – On Monday, Wal-Mart announced it is bringing back thousands of products that were unceremoniously dumped from stores, saying it is ready to roll up its sleeves to win the lowest-price battle with its rivals.

- 8500 SKUs added back
ORDER FULFILLMENT IMPLICATIONS

• Less single SKU pallets, more case storage & handling

• Less case storage at point of sale, move to more piece handling

• High and ever growing SKU environment

• Smaller scale, more distributed operations

➢ “Superior distribution will help define retail success in an era of global reach, niche retailing and accelerated lifestyles”
Historical Perspective – 1847
Historical Perspective – 1847

"Everything comes if a man will only wait."

- Benjamin Disraeli
Historical Perspective – 1847

"Everything comes if a man will only wait."
- Benjamin Disraeli

Today

“Click on it, and get it now”
- Any consumer
Historical Perspective – 1847

"Everything comes if a man will only wait."
- Benjamin Disraeli

Today

“Click on it, and get it now”
- Any consumer
- With a credit card & internet access
CSCMP 2013 Annual Meeting – “Logistics of E-Commerce”

- Overall U.S. Status of DCs
  - Insufficient Fulfillment capacity for small orders
  - Outdated technology
  - Many Obsolete Bulk Distribution Systems
E-Commerce Challenges Warehouses

- Large SKU counts with a long, slow-moving tail
- High and unpredictable growth
- High penalty for poor performance (Brand damage)
- Uncertain business terrain that demands flexible and adaptive solutions
- Demand for real-time and accurate inventory visibility
- Small number of order lines per order
- High returns from end customer
- Extreme peak season volumes
Energy/Sustainability

- In 2010, GTM Research conducted a survey of 74 supply chain executives.
- 75% of respondents said their company’s environmental stance will significantly impact customer relationships within the next 3 years.
- Energy efficiency is by far the most popular sustainable supply chain activity due to:
  - Relative ease with which energy efficiency programs can be implemented.
  - Measurable cost savings.
  - Carbon footprint reductions.
  - Recent volatility in energy prices.
Many companies have not yet integrated the systems that manage their environmental information with those that manage their supply chain activities.

This is an opportunity for automated system integrators and suppliers to help companies improve energy savings in the 21st century warehouse.
• More companies view warehousing operations as a competitive advantage making operational efficiency more important than ever
• Warehouses are one of the most labor intensive parts of supply chains
• In the past, improving efficiency meant adding more people
• Today and in the future, it’s adding automation and software that enable fewer people to do more tasks with better information
• A recent Forrester Research survey found that 92% of participants cited “improving operational efficiency” as their top priority

• 46% of the same survey group named “changing processes and people behavior” as the most difficult obstacle to achieving their goals

• Companies saved money during the recession; money that could be spent on automating warehouses
Shifting World Demographics
• More of the world’s population can be regarded as “middle class” meaning they are now demanding and consuming products at a level not seen before

• This will lead to a significant increase in exports worldwide

• Companies must remain flexible and adaptable to meet those needs and stay competitive
• Constant changes in national and international regulations affect supply chain management

• Governments around the globe are imposing regulations affecting reverse logistics functions
  
  – European Union's End of Life Vehicle (ELV) Directive, which mandates recovery and recycling targets of 95% by 2015 for vehicles that are no longer usable

• Forces warehouses to be as flexible as possible for both forward and reverse supply chains
• In the U.S., by 2016, 40% of the work force will disappear
• Only 20% will be available to replace it
• 15-to-24 age bracket grew at an anemic 0.3% rate since 2005, generating less than 1/20 of total growth
Between 1977 and 2009, employment of workers 65 and older increased 101%.

The number of employed men 65 and older rose 75%, but employment of women 65 and older increased by nearly twice as much climbing 147%.

Older workforce will affect the warehouse in ergonomics and decreasing manual labor.
Projections show the labor force will grow by a so-so 1.2% annual rate from 2011 to 2015, down from 1.5% for 2006 to 2010, then fall to a feeble 0.7% from 2016 to 2020 and continue to decrease.

Even the most bearish economic report would forecast that demand for labor will grow at rates faster than that.
• Great boomer retirement wave
• No longer a “someday” problem but a reality here and now
• The average retirement age in 2010 was 62.1
• Late boomers, who are now 45 to 54, outnumber early boomers 55 to 65 by almost 1/4
• The retirement wave will rise throughout this decade, cresting around 2023
• However you respond to labor shortages, all you can do is soften their impact
• Shortages will increase, especially as the continuing shift to a knowledge-based economy places greater demands on employees
• New labor force will present a different skill set, more technology-enabled
Value Chain Analysis – Examines the processes and costs related to each element of the chain. It provides management with an understanding of which activity(ies) create or can create the company’s competitive advantage(s).

Supply Chain – The linked set of resources and processes that begins with the sourcing of raw materials and extends through the delivery of end items to the final customer.

Business Strategy – Is how the company is going to create a competitive advantage within the Value System that it is competing in.
In today’s market, only one thing remains constant: *Change*

- Global competition – *constant threat of new competitors*
- Growth of emerging markets – *opportunities or challenges*
- Existing competitors are changing or evolving
- Increased supply chain complexity
- Shorter product life cycles
- Dynamic material and logistic costs

Business strategies must **evolve** and **adapt** to the dynamic environment in order for companies to remain competitive

Supply chains need to evolve to compliment the business strategy changes in order to deliver the maximum value at the lowest possible cost
A new portal into supply chain visibility

- www.web.com, mobile apps, and social media
- Inventory availability
- Order status
- Product evaluation prior to purchase
- Consumer reviews and comments
A Changing Warehouse

In with the new, out with the old . . .

The Warehouse of the Future:

- Delivers all three
  "You can have it fast, good, and cheap - pick any two."
  ~ Lawrence Dean Shemesh

- ... is automated
Automated Warehouse Flow

Food & Beverage / Retail

Product decompose

Order compose

Pallet Store

Manual replenishment

De-layering

Buffer & Dynamic Presentation

Base Pallets

Rainbow Pallets

Manual Picking Area

Full Pallet Flow

Order Consolidation

Dispatch

Palletizing
Pallet Store

- Pallet AS/RS Features
  - Fully Automatic Storage
  - Single / Double Mast
  - Single / Multiple Deep

- Pallet AS/RS Benefits
  - **Storage and Retrieval** - store, handle and retrieve with speed
  - **Improve order picking accuracy**
  - **Lean inventory management** - Reduce product spoilage or damage
  - **High-Density Storage** - The smallest building footprint with maximum product storage
Robotic De-Layering Features
- Gentle Handling of Product
- Speed – Up to 5 Layer Picks per Minute (1-3 Layers)
- Feeds ORMs, Case Buffer Storage Systems, Rainbow Pallet Building Systems

Robotic De-Layering Benefits
- Handles Wide Range of Products and Package Types (Corrugated, Open Top, Shrink, Trays, etc.)
- Increased Throughput due to Multiple Layer Picking Capability
- High System Availability and Easy Operation
Adaptive (Flexible and Scalable)

Parts Store – Robotic Bin Storage and Retrieval

High-Speed Picking
- High-speed, Goods-to-Person workstations can achieve 1000 picks per hour per person
- Workstations can be Pick only, or one step Pick & Pack.
- Multiple workstations have been integrated, including ‘batch-pick or put’ stations.

Inventory Solution
- Simple, modular system that is easy to install and expand
- Proven solution new to the North American market.
- Highest density inventory storage available

Highlights:
- Simple and Flexible solution with only two main components
- Workstations are designed with the specific customer needs in mind
- Easy expansion allows system to grow with your business
- Picking and Packing located adjacent to Storage.
Buffering and Sequencing

- Shuttle Technology Features
  - Multiple Shuttles Can Operate on 1 Level
  - Energy Efficient through Constant Power Regeneration
  - Can Sequence SKUs at Very High Rates

- Shuttle Technology Benefits
  - Dynamic Sequencing
  - Increased Throughput
  - Ease of Maintenance
Adaptive (Flexible and Scalable)

Buffering and Sequencing

• Mini-Load Technology Features
  ▪ Variety of Load Handling Methods
  ▪ Space Efficient
  ▪ Multiple Speed Options

• Mini-Load Technology Benefits
  ▪ Small Footprint
  ▪ Space Efficient
  ▪ Ease of Maintenance
Order Picking

- Manual Picking
  - Person to Goods
  - Zone to Zone
  - Goods to Person

- Automatic Picking
  - Robotic Picking
  - A-Frame
# Basic Principles of Picking Systems

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<tr>
<th>Principle</th>
<th>Person to Goods</th>
<th>Zone to Zone</th>
<th>Goods to Person</th>
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Adaptive (Flexible and Scalable)

Automatic Palletizing

- Layer Palletizing
  - Rainbow Palletizing
  - Layer Forming / Palletizing
  - Downstacking Palletizer

- Mixed Case Palletizing
  - Single Case Palletizing
  - Row Palletizing
Automated Sortation

- **Line Sorters**
  - Shoe Sorters
  - Pusher Sorters
  - Pop-Up Sorters

- **Loop Sorters**
  - Cross-Belt Sorters
  - Tilt Tray Sorters

- **Robotic Sorters**
  - Star Robot
  - FRS
Adaptive (Flexible and Scalable)

Automated Movement of Goods

- AGVs
  - Warehouse
  - Production
  - Packing
  - Shipping

- Mobile Bots
  - Parts Transport
  - Rack/Cart Transport
Methodology

- Discrete Orders
- Batch Orders
- Zone Routing
- Batch Pick and Consolidation

Order Filling (Piece Picking)

- Pick-and-Pass
- Shotgun Pick
- Bucket Brigade
- Batch Pick
- Pick-n-Put
- Goods-to-Person
- Pick-then-Sort
- Case Pallet Build
Adaptive Supply Chain

Summary

- Software, resource utilization
  - Workload planning / balancing
  - Work in progress
  - Adjust process
  - Inventory accuracy

- React to anomalies
  - Move order fillers
  - Trigger replenishment
  - Re-slot product

- Automation / Technology
  - Case & pallet store / picking
  - Robotic palletizing / depalletizing
  - Goods-to-person picking
  - Automated goods movement
  - Buffering & sequencing
  - Piece picking
  - Management software
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