Warehouse Management Systems 2020: That Was Then – This is NOW.

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WMS Market Remains Very Active

Drivers of New WMS Projects:

- New Facility
- Companies Experiencing Rapid Growth
- Companies Making Significant Logistics Strategy Changes
- Companies Consolidating Facilities
- Companies Significantly Increase DC Automation
- Rising Distribution Costs
- Current WMS Technology is Really Old ("Burning Platform")
- New Omnichannel Fulfillment Requirements
- Interest in Cloud-based System
Exciting New WMS Capabilities are Emerging

- 20 Years of Only Incremental Improvement in WMS Capabilities
- Market is Ready for Something New
Five Exciting New WMS Trends

- WMS in the Cloud
- Use of Templates and Wizards
- Integrated Support for Picking Sub-Systems
- Conversational Voice
- WMS + WES
#1: WMS Moves to the Cloud

- Despite Late Start, WMS Moving Rapidly to the Cloud
- Gartner: “By 2020, over 90% of Spending on Supply Chain Execution Systems will be for Cloud-based Solutions”
- Underlying Architecture Key to Flexibility
- Cloud, On-Premise, Hybrid
- Smart Mobile, Optimized RF Communications
Understanding Pricing and Deployment Options

Deployment Model

<table>
<thead>
<tr>
<th>Subscription/Transaction</th>
<th>On-Premise</th>
<th>Cloud</th>
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# Understanding Pricing and Deployment Options

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- **Hybrid**
  - Traditional Software Model
  - Hybrid

- **Most Common Cloud Model**
Understanding Pricing and Deployment Options

Application Management Model

Subscription/Transaction

License

Pricing Model

Vendor Managed

Customer Managed

Hybrid

Most Common Cloud Model

Hybrid

Traditional Software Model

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On-Premise

Cloud

Deployment Model

Understanding Pricing and Deployment Options

Application Management Model

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Pricing Model

Vendor Managed

Customer Managed

Hybrid

Most Common Cloud Model

Hybrid

Traditional Software Model

Hybrid

On-Premise

Cloud

Deployment Model
WMS Moves to the Cloud

The Promise: Varied Distribution Network – One WMS Solution

Move from On-Premise to Cloud with No Data Migration
WMS Moves to the Cloud

Support for Hybrid Deployment
# 2: Use of Templates and Wizards to Transform WMS Deployment

- WMS Deployments Remain Very Difficult, Costly and Risky
- Many WMS Providers have tried Using Templates - Never Worked Very Well
- Now - New Approaches that Not Only Reduce Effort/Costs - Prevent Mistakes
High Interest in a Variety of MHE Technologies

- High Automation
- Mid-Level Automation: Voice, Smart Carts, Pick-to-Light, Put Walls, Mobile Robots, etc.

Current Approach is Limited

- Throw Orders “Over the Wall” to Sub-Systems, Receive Confirmations Back
- Limits Flexibility, Optimization and Exemption Handling

A Better Way has Emerged
Each Sub-system with its Own Control Software

- **Voice Server**
  - *Order Release Logic*
  - Voice terminals

- **Pick Cart Control System**
  - *Order Release Logic*
  - Smart carts

- **PTL Control System**
  - *Order Release Logic*
  - Pick-to-light

- **Put Wall Control System**
  - *Order Release Logic*
  - Put walls

- **Robot Control System**
  - *Order Release Logic*
  - Mobile robots
Each Sub-system with its Own Control Software

Issues:
- High Cost Hardware
- Cannot Optimize End-to-End Picking Processes
- Subsystems Operate in Silos
The Better Way

WMS

Real-Time API Integration

Voice terminals
Smart carts
Pick-to-light
Put walls
Mobile robots

Real-Time API Integration
Example: Robotic Helper Task

Scenario: Piece Picking from Forward Pick Areas Only
Example: Robotic Helper Task

- Picker Arrives at Pick Location
- Expected Inventory not There
- Cluster Picks for One or More Orders Must be Skipped
- Can be “Short Picked” or Skipped
Example: Robotic Helper Task

- System Generates High Priority Cycle Count
- Associate Confirms Inventory Shortage
- High Priority Replenishment Task is Generated
Picker Works on Remaining Picks
If Complete, Picker Takes Totes to Packing, where Totes with Missing SKUs are Directed to “Hospital” Area
Example: Robotic Helper Task

- Original Picking Location is Replenished
Example: Robotic Helper Task

- Robot Arrives at Original, Now Replenished Forward Pick Location
- As New Picker Approaches Location, He/She is Given a New Task – Pick the Shorted Item and Put on Robot
- Robot Match Confirmation RTLS
- The “New Task Interleaving”
Example: Robotic Helper Task

- Mobile Robot Takes Missing SKUs to Packing Hospital Zone, where they are Packed to Complete the Orders
- Alternatively, Robot Can Meet the Picker in Route if Picks are not Complete
Substantial Benefits from this Approach

- Use of Commodity Hardware for Carts, Walls and Lights Reduces Costs by as Much as 70%
- Put in your pocket, or add more carts/walls/light systems
- Use of Smart Phones and Voice App Saves Thousands of Dollars Per Unit
- Elimination of Interfaces to 3rd Party Software Simplifies Implementation and On-Going Maintenance, Reduces Costs
- Advanced Order Planning and Dynamic Release Drives Double Digit Productivity Gains
- Integrated Picking and Packing System Provides Operational Flexibility
- Customer Can Leverage What They Have, Add-On with Complete Modularity
# 4 – The Rise of Conversational Voice

- Use of Voice Beyond Order Picking
- Starts with Metrics and Status Update
- Evolved to more Full Blown Dialog
Will be the Primary Way Users Interact with the WMS

“I need a replenishment for Location CD05N2.”

“Where are we on the last wave?”
# 5 – The Integration of WMS and WES

- Warehouse Execution Systems (WES) Move Beyond Current Applications in Heavily Automated DCs
- Rise of the Warehouse Management and Execution System
- Simulation, Optimization and Orchestration
- Step Change in WMS Capabilities
- Headed to the New Era of the “Autonomous WMS”
How We Got Here

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<th>WCS</th>
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[Image of a brain and a wagon]
### Some Implementations

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**Why?**

- Lack of WMS Capabilities
- MHA Vendor in Control of Customer
- Agreements between WMS and WCS Vendor
New Dynamic in Some Scenarios

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Why?
- WES only Developed Due to Perceived Shortcomings in WMS
- True for Some, not for All
- Visibility to Process/Work Area Status
- Flow of Work Based on Capacities and Work Load
- “Waveless” Processing
WES Addresses Common Distribution Problems/Opportunities

- Lack of Granular Visibility to Throughput and Order Execution
- Labor Planning Challenges
  - Right Resources not in Right Place at Right Time
- Time/Cost/Approach of Adding Technologies (e.g., Picking Sub-Systems)
- Sub-Optimal Picking Execution
- Difficulty Meeting Carrier Cut Off Times/Ensuring SLAs
- High Variability in Materials Handling Equipment Utilization
- WMS Still Highly Reliant on Human Decision-Making
Fundamental New WES Value Proposition

- Enables Companies to Meet Customer Demand and Service Commitments at the Least Possible Cost
- Significantly Shrinks the Gap Between Theoretic and Realized DC/System Throughput
- Single System for Management and Control of Fulfillment Across the DC
- Integrated with WMS for Complete Solution
- Automated, Manual or Hybrid DCs
How WES Delivers Results

▪ Real-Time Visibility to Throughput, Bottlenecks and Events
▪ Direct Management and Optimization of Picking Sub-Systems
▪ Advanced, Configurable Optimization for Order Batching, Release, Picking and Replenishment
▪ Workload Balancing to Maximize Equipment Utilization and Flow
▪ Automated Order Release Based on Service Commitment, Shipping Schedules and Real-Time Condition Monitoring
▪ Use of Simulation to Plan, Re-plan and Allocate Resources
Dynamic “Aware” Pick Release Management

Sample criteria
- (Pick/Replen) Zone balancing
- Channel based priority
- Continuous Wave
- Carrier/Service Level based
- Capacity based (Resources)

Condition and Event Monitor
Advanced Scheduler
Demand v/s Capacity Dashboard from Simulation
Dynamic Capacity Management Using Simulation
Benefits of Next-Generation WES

- Double Digit Improvement in Labor Productivity
- Significant Reduction in Supervisory Overhead
- Reduced/Better Managed Overtime
- Improved Throughput
  - Closing Gap between Theoretic and Actual Throughput of a Facility
- Easily and Quickly Evaluate and Deploy New Sub-Systems/Technologies
- Consistently Meet Service Commitment with Little “Chaos”
- Improve MHE Utilization
  - Additional Throughput or Reduce Required Capacity

Benefits Applicable to Automated, Manual and Hybrid DCs!
Where We Are Headed

▪ **Beginning of an Era of Autonomous Warehouse Software**
  
  • Automated Decision-Making
  
  • Self-tuning (in part through use of AI/ML)

▪ **Advanced Focus on Product and Process Flow**
  
  • Reduce/Eliminate Process Bottlenecks and Dwell Times
  
  • Flow Distribution™
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