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>
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## Understanding Pricing and Deployment Options

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### Pricing Model
- Subscription/Transaction
- Transaction/License

### Deployment Model
- On-Premise
- Cloud
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

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

- Large DC On-Premise
- Large DC On-Premise
- Mid-Size DC On-Premise
- Mid-Size DC Cloud
- Small DC Cloud
- Small DC Cloud
- Remote DC Hybrid
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
# 3 – Integrated Support for Picking Sub-Systems

- 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
- Pick Cart Control System
  - Order Release Logic
- PTL Control System
  - Order Release Logic
- Put Wall Control System
  - Order Release Logic
- Robot Control System
  - Order Release Logic

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

Real-Time API Integration

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

WMS
Example: Robotic Helper Task

Scenario: Piece Picking from Forward Pick Areas Only

Picker 1
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

- Picker 1

2. System Generates High Priority Cycle Count
   - Associate Confirms Inventory Shortage
   - High Priority Replenishment Task is Generated
Example: Robotic Helper Task

- 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

| WMS | WCS |

- [Image of a brain]
- [Image of a covered wagon]
Some Implementations

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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<th>WCS</th>
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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

Condition and Event Monitor
Advanced Scheduler

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

Process Channels

Orders

Dynamic Order Orchestration & Optimization

ERP
Ecommerce (Web)
Customer Service

Pallet Pick
Case Pick
Each Pick
PTL
Odd Size Pick
Cluster Pick
Pick to Belt
Case Replenishment
Pallet Replenishment

Packing/Pack Stations

Shipping

Shipping Prep
Putwall
Parcel
Sorter
P&D

LTL/TL
Parcel
Parcel
LTL
Parcel
Parcel
LTL
Parcel

Powered by Possibilities.
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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