Smart robotics on the rise - Status Quo and Future Visions

Presented by:
John Santagate
| 1. | Introduction and trends |
| 2. | Drivers of adoption of modern robotics |
| 3. | Warehousing and fitness of robotics |
| 4. | Data as a value driver |
Minneapolis, Bellingham, Bloomfield, Colorado Springs, Denver, Plymouth
Shanghai, Markham, Moncton

EUROPE
SMB WMS
Enterprise 3PL
Voice

LATAM
Enterprise/SMB, 3PL & automotive WMS
Robotics
Simulation and modelling
Voice
Warehouse control system

APAC/ANZ & ROW
Enterprise/SMB, 3PL & automotive WMS
Robotics
Simulation and modelling
Voice
Warehouse control system

POWERED BY POSSIBILITIES.
Robotics is About More Than Automation

**Robotics**
- Designed to perform a variety of tasks, capable of retooling and reprogramming to perform different tasks
  - Multi-task Capable
  - Task flexibility
  - Mobile (some)
  - Intelligent

**Automation**
- Designed to carry out a specific task, optimized for the task and process being performed
  - Process Optimization
  - Repetitive Task
  - Fixed
Robotic Capability Evolution

- Cognitive Capabilities
- Movement & Dexterity
- Interaction

Industrial Applications

Wide Spread Adoption
Robotics Market Trends

Market expansion with many new entrants

Applicability and growth across many industries

Focus is at the task level

Emerging use cases

Technology interplay with AI, machine learning, IoT, cloud

Increasing capital investment into the market – 2017 saw over $15Bn in VC investment in the robotics market

Smart, collaborative, and mobile robots
Drivers Towards Flexible Automation

**Labor**
- Shortage
- Increasing Cost
- Seasonal needs
- Mis-connected

**Need for Speed**
- Customers expect rapid delivery times
- Rapid flexibility

**Cost**
- High labor cost
- Reduced cost of robotics
- Robot-as-a-Service

**Modernization**
- Digital Transformation
- Connected Operations
- Visibility
- Integration
In the United States, there are approximately 7.4 million open jobs. 1.34 million of these open jobs are in the industry segment: Trade, Transportation, and Utilities. There are more open jobs in the US than there are people seeking work.
Collaborative AMR Market Growth Timeline

- 2012
  • AMZN acquires Kiva Systems
- 2015
  • New competitors emerge, existing competitors get vocal
  • Market awareness is the focus
- 2017
  • Increased Proof of Concept / Pilot
- 2018
  • Early Stage Orders / First Movers
- 2019
  • Market Acceptance / Growing Pains
- 2020+
  • Scale / Rapid Growth
### Traditional Warehousing Options

#### Manual Operation

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
<th>Flexibility</th>
<th>Scalability</th>
<th>Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliant upon human workers to move material</td>
<td>Driven by labor cost, increasing wages driving cost up</td>
<td>High, can reallocate workers as necessary</td>
<td>High, can add workers as necessary</td>
<td>No modification, easy to change</td>
</tr>
</tbody>
</table>

#### Fixed Asset Based Automation

<table>
<thead>
<tr>
<th>Description</th>
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<th>Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigid/fixed infrastructure: eg: AS/RS or Conveyance</td>
<td>Very high, big investment in fixed assets</td>
<td>Very low, equipped for a specific use and facility design</td>
<td>Very low, capacity built into design</td>
<td>Significant investment in fixed infrastructure</td>
</tr>
</tbody>
</table>
# Mobile Robot Enabled Warehousing Options

## Constrained Mobile Asset Based Automation

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
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<th>Scalability</th>
<th>Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rack based goods to person, fixed picking stations</td>
<td><strong>Medium</strong>, lower than fixed automation</td>
<td><strong>Medium</strong>, can make changes, just not quickly or easily</td>
<td><strong>Low</strong>, additional infrastructure required to increase capacity</td>
<td>Dedicated area of warehouse, semi-fixed infrastructure</td>
</tr>
</tbody>
</table>

## Flexible Mobile Robot Enabled Automation

<table>
<thead>
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<th>Scalability</th>
<th>Infrastructure</th>
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</thead>
<tbody>
<tr>
<td>Robots autonomously navigate and move material</td>
<td><strong>Low</strong>, variable, option as-a-service</td>
<td><strong>High</strong>, can easily make changes to operating environment</td>
<td><strong>High</strong>, easily add more robots</td>
<td>Little to no infrastructure modifications required</td>
</tr>
</tbody>
</table>
## Comparison of Warehousing Approaches

<table>
<thead>
<tr>
<th>Approach</th>
<th>Cost</th>
<th>Flexibility</th>
<th>Scalability</th>
<th>Speed</th>
<th>Ease of Implementation</th>
<th>Efficiency</th>
<th>Human/machine Collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual Operations</td>
<td><img src="image" alt="Cost" /></td>
<td><img src="image" alt="Flexibility" /></td>
<td><img src="image" alt="Scalability" /></td>
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<td>Fixed Asset-Based Automation</td>
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</table>

### Symbols
- **High**
- **Low**

*Powered by Possibilities.*
Autonomous Mobile Platform Robotics Driving Business Value

• Increase Throughput
• Flexible Automation
• Enhanced Scalability
• Improve Working Conditions/Safety
# AMR Ecosystem by Workflow

<table>
<thead>
<tr>
<th>Each Picking</th>
<th><img src="image" alt="AMR Ecosystem Logos" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>Goods to Person</td>
<td><img src="image" alt="AMR Ecosystem Logos" /></td>
</tr>
<tr>
<td>Mobile Manipulation</td>
<td><img src="image" alt="AMR Ecosystem Logos" /></td>
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<tr>
<td>Put Away/Replen</td>
<td><img src="image" alt="AMR Ecosystem Logos" /></td>
</tr>
<tr>
<td>Robot Enabled AS/RS</td>
<td><img src="image" alt="AMR Ecosystem Logos" /></td>
</tr>
<tr>
<td>Sortation</td>
<td><img src="image" alt="AMR Ecosystem Logos" /></td>
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<tr>
<td>Components Shuttling</td>
<td><img src="image" alt="AMR Ecosystem Logos" /></td>
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<tr>
<td>Bulk Material Movement</td>
<td><img src="image" alt="AMR Ecosystem Logos" /></td>
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<tr>
<td>Legacy Equipment Augmentation</td>
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</tbody>
</table>
### Scale of Benefits Achieved by Key Metrics

<table>
<thead>
<tr>
<th>Metric</th>
<th>0%-5%</th>
<th>6%-10%</th>
<th>11%-15%</th>
<th>16%-20%</th>
<th>&gt;20%</th>
<th>Don’t Know/NA</th>
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<tbody>
<tr>
<td>Increased Capacity</td>
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<tr>
<td>Productivity Improvement</td>
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<tr>
<td>Efficiency Improvement</td>
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<td></td>
<td></td>
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<tr>
<td>Increased Operational Speed</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Increased Customer Service Level</td>
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<tr>
<td>Increased Inventory Turnover</td>
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<tr>
<td>Reduced Operating Costs</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Reduced Labor Costs</td>
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<tr>
<td>Waste Reduction</td>
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<td></td>
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<tr>
<td>Reduction in Worker Injury Incidents</td>
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</table>

Across most metrics, more than **70%** of users noted **double-digit** KPI improvements.

N = 99
Source: Commercial Service Robotics Survey IDC, July, 2018
Robotic Enabled Picking

Flexible handling

Intelligent cataloging

Remote piloting
Delivering More Than Task Automation

- **Integration Delivers More Than Task Level Automation**
  - Automated data flows
  - Increased visibility
  - Automated process flows
  - Process execution data
  - Process execution analytics
  - Real-time inventory optimization
Enabling the Warehouse of the Future

- Disconnected Current State

WMS
Enabling the Warehouse of the Future

• The Vision
Enabling the Warehouse of the Future

• The Vision

- Common data platform
- Cross process optimization
- Single integration point to WMS
- Allow for workflow alignment across disconnected processes
- Deeper level of analytic capabilities
Why Körber Entered The AMR Space

74% of HighJump customers surveyed indicated a current or planned investment in automated material handling equipment within the coming 5 years*. 

Körber Logistics delivers technologies that improve our customers' warehouse and supply chain operations. AMR is an innovative technology that aligns to our current portfolio of products.

Pick & Pack Robotics market growth forecast to reach over $23bn by 2023**

*HighJump Warehouse Automation Survey
**IDC Robotics and Drones Spending Guide Forecast 2018H2
Key Take Aways

• Robotic technology is enabling material handling operations to automate low-value tasks

• Remember, robots are tools meant to improve the operation

• It is possible to start small, build experience, and scale

• New delivery models, such as Robot-as-a-Service (RaaS), increases the availability of this technology to new markets
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          www.northamerica.koerber-logistics.com

Or visit MODEX Booth #7678b