

Warehouse Automation: How to Implement Tomorrow's Order Fulfillment System Today

October 2008

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Executive Summary

With increasing levels of uncertainty and the inability to predict supply and demand fluctuations because of global economic pressures, today's logistics executives find themselves scratching their heads in order to find balance in the supply chain. The first reaction may be to continue to tighten the belt to ride out the uncertainty and maintain as much status quo as possible. However, today's Best-in-Class executives are taking this as an opportunity to continue to attack inefficiencies inside the distribution center and identify areas to improve performance in order to create agility and flexibility and drive value to the bottom-line. In fact, expanding the use of existing technology infrastructure and investigating new opportunities to leverage additional technology to reduce fulfillment costs has allowed the Best-in-Class to reduce labor costs by over 3% while decreasing order turn-around time by 1%, setting the bar for others to admire.

Research Benchmark

Aberdeen's Research Benchmarks provide an in-depth and comprehensive look into process, procedure, methodologies, and technologies with best practice identification and actionable recommendations

Best-in-Class Performance

Aberdeen measured the metrics that drive efficiency in order to determine which companies are outperforming the others when it comes to leveraging technology to improve the order fulfillment process. Survey respondents were ranked according to three key performance criteria:

- **Percentage of orders picked accurately.** Best-in-Class companies are achieving 99.2% pick accuracy by focusing on reducing errors and increasing visibility.
- **Percentage of orders delivered with accurate items and quantities.** Best-in-Class companies are maintaining over 99% accurate deliveries helping to respond to customers' increasing levels of demand.
- **Warehouse labor cost (trend).** Best-in-Class companies have utilized process and technology improvements to drive down labor costs by over 3% year-over-year.
- **Order turn-around time (trend).** Despite the increased pressure from customers, the Best-in-Class were able to respond to demand and decrease order turn-around time by 1%.

Competitive Maturity Assessment

Survey results show that the firms enjoying Best-in-Class performance shared several common characteristics. The Best-in-Class are:

- Over two-times more likely than Laggard companies and almost 50% more likely than Industry Average companies to be leveraging ruggedized, mobile devices in the distribution center.
- Twice as likely as Industry Average companies and four-times as likely as Laggard companies to implement and leverage automated sortation equipment.

- 1.5- and 3-times as likely as Industry Average and Laggard companies to utilize conveyor based picking systems.

Required Actions

In addition to the specific recommendations in Chapter Three of this report, to achieve Best-in-Class performance, companies must:

- **Create a consistent flow in the warehouse and establish visibility.** Over 70% of Best-in-Class logistics executives have been able to establish a central direction of process control in the warehouse and to track warehouse transactions to specific employees.
- **Connect the workforce to the real-time business requirements.** Almost 75% of today's Best-in-Class companies are utilizing mobile devices with their workforce in order to guide distribution processes like order-picking.
- **Continue to lead the way in technology adoption.** Over 15% of Best-in-Class companies will continue to adopt warehouse automation (i.e. mobile devices, conveyor and sortation equipment, RFID, and AS/RS equipment) in the next 12 to 24 months. Clearly separating themselves from other survey respondents.

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Chapter One: Benchmarking the Best-in-Class

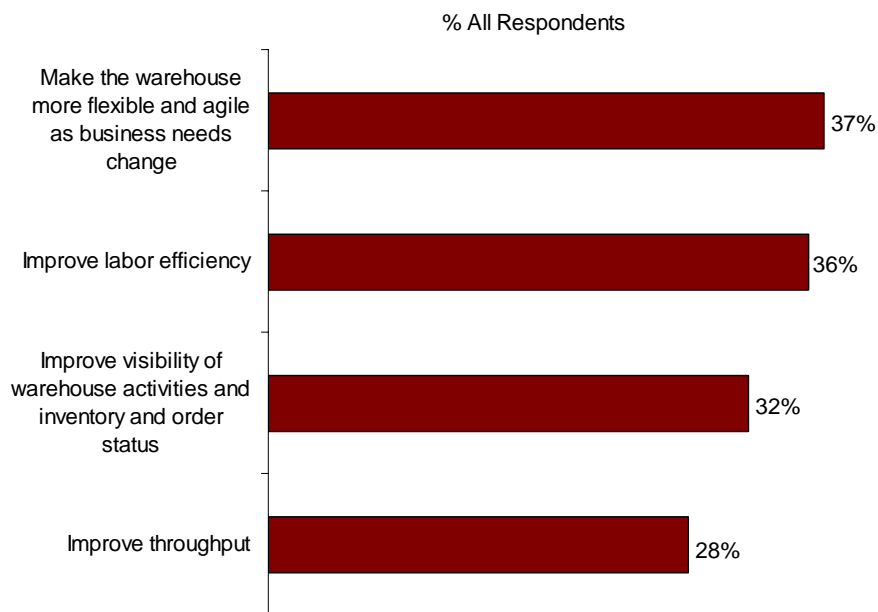
Business Context

SKU proliferation, increased multi-channel commerce, rapidly changing packaging configurations, and volatile product lifecycles are just a few of the pressures that make it very difficult to design an automated order fulfillment system that is flexible enough to withstand changing business needs. Despite the economic instability in the global supply chain, many of today's logistics executives are looking internally for opportunities to take action and attack inefficiencies (Figure 1). The adoption of warehouse automation technology to improve the order fulfillment process continues to increase in support of these actions.

Fast Facts - Best-in-Class Picking Methods:

- ✓ **73%** Discrete order-picking
- ✓ **65%** Cluster picking
- ✓ **50%** Zone picking

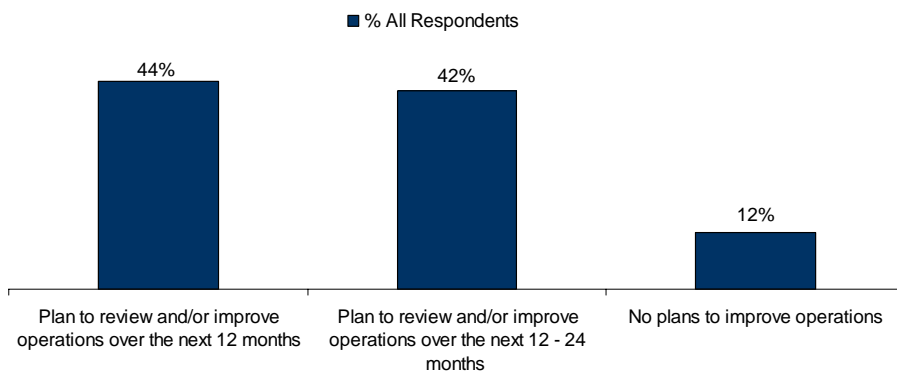
Figure 1: Top Actions Being Considered by Logistics Executives



Source: Aberdeen Group, October 2008

The decision has been made at the leadership level by almost 90% of the approximately 150 respondents to a recent Aberdeen Group survey to take some type of action in the next 12 to 24 months. Figure 2 illustrates that despite the uncertainty in the global economy, almost 50% of respondents will focus on operational improvements in the coming 12 months. In fact, almost 50% of Best-in-Class companies will be making improvements in the coming 12 months, while less than 40% of Industry Average companies will be investing over the same period of time.

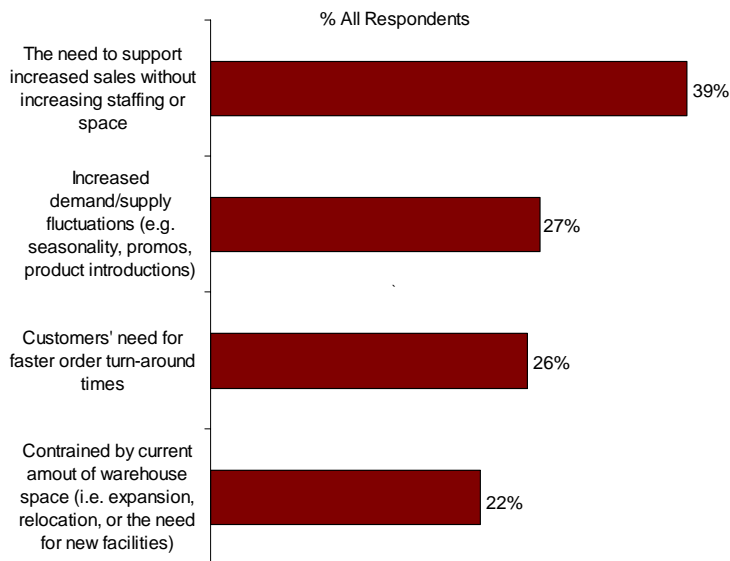
Figure 2: Executive Plans to Invest in Operational Improvements



Source: Aberdeen Group, October 2008

What is driving this focus on operational improvement? Year-in and year-out the discussion continues around improving overall performance in response to mounting pressures from various directions. Often times the top two or three pressures change ranking, but consistently the main pressures that continue to drive improvement projects are outlined in Figure 3.

Figure 3: Pressures Driving the Need for Change



Source: Aberdeen Group, October 2008

Understanding the key pressures facing today's logistics executives, their commitment to improving operations in the next 12 to 24 months, and a sample of the actions they plan to take in that period, the purpose of this report is to provide insight into the process, technology, and organizational changes for companies to consider as they journey down the path of improvement. The goal is to ultimately create a fluid fulfillment system that

can leverage existing and new technology to create more agility and flexibility to withstand the turbulent times ahead.

The Maturity Class Framework

Aberdeen measured the metrics that drive efficiency in order to determine which companies are outperforming the others when it comes to leveraging technology to improve the order fulfillment process. Survey respondents were ranked according to four key performance criteria:

- **Percent of orders picked accurately.** The percent of orders picked accurately the first time according to SKU and quantity.
- **Percent of orders delivered with accurate items and quantities.** The percent of orders delivered accurately the first-time.
- **Warehouse labor cost (trend).** The year-over-year trend in overall cost of warehouse labor.
- **Order turn-around time (trend).** The year-over-year trend in time to turn a customer order around from time of placement through delivery.

Table 1: Top Performers Earn Best-in-Class Status

Definition of Maturity Class	Mean Class Performance
Best-in-Class: Top 20% of aggregate performance scorers	<ul style="list-style-type: none"> ▪ 99.2% orders picked accurately ▪ 99.3% orders delivered with accurate items and quantities ▪ -3.2% warehouse labor cost, trend ▪ -1.1% order turn-around time, trend
Industry Average: Middle 50% of aggregate performance scorers	<ul style="list-style-type: none"> ▪ 97.7% orders picked accurately ▪ 97.6% orders delivered with accurate items and quantities ▪ +2.3% warehouse labor cost, trend ▪ +1.1% order turn-around time, trend
Laggard: Bottom 30% of aggregate performance scorers	<ul style="list-style-type: none"> ▪ 89.8% orders picked accurately ▪ 90.4% orders delivered with accurate items and quantities ▪ +4.9% warehouse labor cost, trend ▪ +2.2% order turn-around time, trend

Source: Aberdeen Group, October 2008

The Best-in-Class PACE Model

Using warehouse automation and technology to achieve improvement goals requires a combination of strategic actions, organizational capabilities, and enabling technologies. In order to better understand how these

performance levels are being achieved, this report examines some of the key capabilities and technology enablers being utilized to take action in response to the top pressures. The Pressures, Actions, Capabilities, and Enablers (PACE) framework is characterized in Table 2.

Table 2: The Best-in-Class PACE Framework

Pressures	Actions	Capabilities	Enablers
<ul style="list-style-type: none"> ▪ Increased demand / supply fluctuations (e.g. seasonality, promos, product introductions) 	<ul style="list-style-type: none"> ▪ Make the warehouse more flexible and agile as business needs change ▪ Improve visibility to warehouse activities and inventory and order status 	<ul style="list-style-type: none"> ▪ Automatically store and retrieve full pallets without the use of lift trucks and operators ▪ Automatically store and retrieve cases and totes without the use of lift trucks and operators ▪ Automatically bring goods to the picker ▪ Automatically transport product from one pick zone to another ▪ Automatically route product to the correct shipping area ▪ Allow pickers to operate in a hands-free environment ▪ Automatically weigh parcels and apply shipping labels ▪ Have a single point of visibility and control for all warehouse automation 	<ul style="list-style-type: none"> ▪ Conveyor based picking systems ▪ Shipping sortation ▪ Speech-based warehousing ▪ RFID technology ▪ Pallet handling ASRS ▪ Robotic picking ▪ Palletizing ▪ AGV's ▪ In-motion manifesting ▪ Mobile technology ▪ Warehouse Control System (WCS)

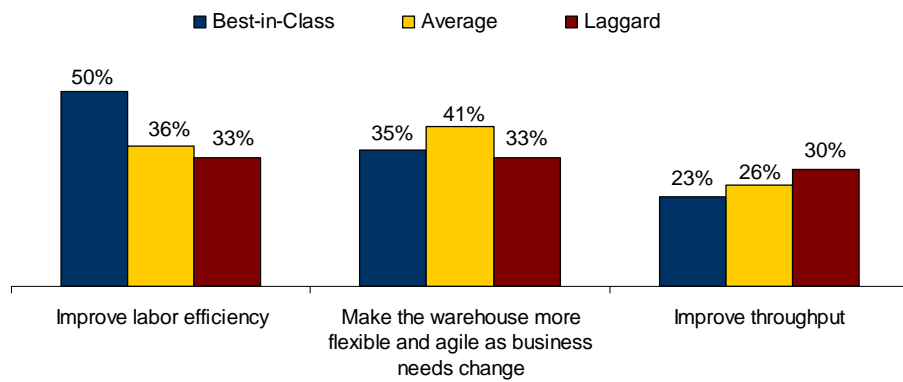
Source: Aberdeen Group, October 2008

Best-in-Class Strategies

When it comes to the actions being planned or taken to improve warehouse operations, there is a maturity continuum along which companies can be placed in regards to order of priority. Many companies initiate change by identifying areas to remove bottlenecks and improve throughput inside the warehouse in order to improve order turnaround time.

Streamlining the order fulfillment process is critical for companies looking to reduce the disruptions caused by supply and demand fluctuations. Aberdeen research shows that Best-in-Class companies are doing a much better job at managing (even reducing) customer order turn-around time, even as complexity is increasing. By utilizing more real-time processing of order management (including adopting distributed order management solutions - 42% of Best-in-Class companies are equipped with distributed OM capabilities, versus 22% and 21% for Industry Average and Laggards, respectively), logistics executives have been able to create better consolidation and distribution of orders in a more strategic fashion and improved warehouse processes accordingly. Relying on cookie-cutter or one-version-for-all methodologies can be replaced with improved product allocation, picking and replenishment methodologies, and automation that are all aligned to fill customer orders in the most optimal and cost-saving way for all parties involved.

Figure 4: Actions Being Considered to Improve Operations

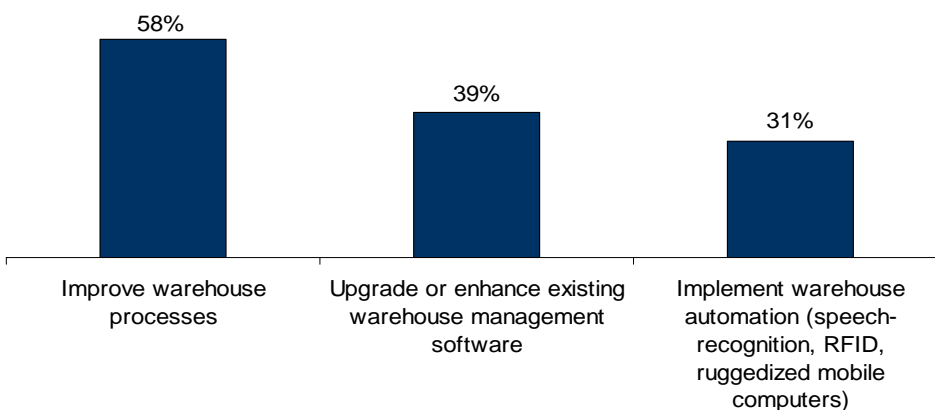


Source: Aberdeen Group, October 2008

Whether it's automating picking lines, adding conveyors to increase the flow of product from the inbound to the outbound side of the warehouse, or utilizing material handling equipment to reduce the labor costs, these companies look to create more flexibility and agility prior to fine tuning operations. Figure 4 shows a contrast in focus between the Best-in-Class and the rest of the respondents.

Figure 4 demonstrates areas where the Best-in-Class have been able to take action and move forward with more incremental improvements like improving overall labor efficiency. While their time and investment in creating better flow through the warehouse is not completely over (almost 58% plan to continue with those projects), many have turned their attention to driving productivity out of their most strategic asset, the workforce.

Figure 5: Improvement Methods Being Used by the Best-in-Class



Source: Aberdeen Group, October 2008

It's clear in Figure 5 that the methods used to support the activities being considered as top priority by the Best-in-Class (improving labor efficiency) all focus around automating processes and areas of the warehouse in order to decrease the non-value added time of today's DC workforce. Throughout Chapter Two the technology being deployed to increase the level of warehouse automation will be examined, along with the overall

impact to the distribution center, and what today's logistics executives are planning to do in the next 12 to 24 months.

Aberdeen Insights — All-Star Performance at Holloway USA

If you are watching and cheering a championship performance, chances are the athletes are wearing Holloway. It is no surprise that same winning attitude is found throughout Holloway (a division of the Augusta Sportswear Group). "We pride ourselves on fanatical customer service. That message resonates from the very top of this organization and is the common thread driving everything we do," says Mark Vondenhuevel, President of Holloway.

In 2007, Holloway initiated significant system upgrades to move away from their manual fulfillment processes and to utilize automation. The objective was to improve internal efficiencies and shorten lead times to better service customers. With approximately 30,000 line items selected each week, from over 7,500 SKUs, the Sidney Ohio distribution center recognized automation was necessary to keep pace with increasing volumes, without increasing costs. Holloway intended to reduce manual handling and movements of product through their warehouse.

In July 2007, their new automated conveyor picking, packing, and shipping system was switched on and they have not looked back. Rather than walking excessively around the warehouse carrying product and handling picking containers, pullers are now staged in one of four zones, where bar code labeled cartons are now routed directly to their stations. The products are smartly located using the criteria of companion or family groupings and popularity, to reduce the travel distance to select items. Once a zone is complete, cartons are systemically routed to the next stations, based on the order. Pickers utilize RF devices to "check" boxes into and out of their zone and for confirming each individual item picked. Once the entire order is finished, the boxes are routed to a packing work station, where it is weighed and checked against the order configuration. It is then labeled and routed directly to the shipping truck for delivery.

"We see our investment in technology as a competitive advantage," says Kurt Jacob, Director of Distribution. "Our internal improvements in efficiency and cost savings are a benefit to the customer, because of our reliable accuracy and order turnaround time." In the past 10 months alone, Holloway reduced their cost per line item in half. At the same time, they achieved 99.96% of orders filled complete, 99.54% on-time delivery rates, and 99% inventory accuracy. "This will be the first year in our history we will not need to perform a physical inventory count, because of the visibility and accuracy our automated system brings to the business." Holloway authorized a plan for an expansion project in 2009, to carry them through 2012. This is another example of their commitment to the customer, to provide winning service.

In the next chapter, we will see what the top performers are doing to achieve these gains.

Chapter Two: Benchmarking Requirements for Success

Today's distribution centers are dealing with rising complexity in customer demand and the pressure to maintain service levels while managing supply-side disruptions and labor costs. Today's distribution center managers are taking a closer look at the entire order fulfillment process to try to find new ways to integrate automation and human capital into a more agile and flexible unit in order to drive efficiency and savings even in tumultuous times. The case study to follow is an example of the benefits that can come from improving the order fulfillment process by leveraging today's technology.

Case Study — Performance Food Group Lives Up to the Name

When it comes to investing in technology many companies are skeptical, even cautious; especially when the technology can ultimately transform the labor force. That's exactly what the team at Performance Food Group was thinking when they began looking at voice technology. With 650 order pickers at 18 locations, the team was looking for a way to improve their pick accuracy and reduce truck shorts. Voice seemed to be the one technology that could help drive the performance they need to improve their customer service levels. "We saw an opportunity where voice could really play a role in our business and improve our overall service levels," said Jeff Williamson, Senior VP Operations.

There's a gap between thinking something can make a difference and actually proving it can make a difference. With data in hand, the PFG team took on the task of developing an ROI plan that would help them get complete buy-in across the organization for the investment. "We won't make any investment without a clearly defined ROI. It's a critical step for us to ensure we have fully researched the impact of the technology, and it is our tool for executive buy-in," Williamson added. By breaking down the entire process where voice was going to be implemented, the team was able to clearly establish the positive impact areas and to level set everyone's expectations of the technology. It also provided focus for the project rollout and budgeting purposes. The other component to any PFG investment is the pilot stage, the proving ground for the ROI and the opportunity to completely calculate process impact of the technology.

continued

Lagging Behind

- √ **27%** of Laggards have visibility to daily or weekly performance data
- √ **30%** of Laggards utilize mobile devices
- √ **12%** of Laggards have conveyor-based picking systems

Case Study — Performance Food Group Lives Up to the Name

After starting the voice rollout in January 2008, PFG has completed about 50% of the project plan and has already achieved their payback on the investment in some of the initial implementations. Their service levels have improved beyond expectations and they've reduced their mis-picks from 1 per 1,000 to less than .5 per 1,000 and reduced their truck shorts from 1.3 per 1,000 to .65 per 1,000. PFG's Williamson adds, "We'll continue to investigate ways to expand our utilization of our existing investment in the technology and improve other areas of our operations. As we complete the implementation of voice for our selection activities, we will evaluate the use of voice for truck loading and our cycle counting activities. If we can improve our service levels and accuracy in our operations with an acceptable ROI we will plan to move forward."

Competitive Assessment

Aberdeen Group analyzed the aggregated metrics of surveyed companies to determine whether their performance ranked as Best-in-Class, Industry Average, or Laggard. In addition to having common performance levels, each class also shared characteristics in five key categories: (1) **process** (the approaches they take to execute their daily operations); (2) **organization** (corporate focus and collaboration among stakeholders); (3) **knowledge management** (contextualizing data and exposing it to key stakeholders); (4) **technology** (the selection of appropriate tools and effective deployment of those tools); and (5) **performance management** (the ability of the organization to measure their results to improve their business). These characteristics (identified in Table 3) serve as a guideline for best practices, and correlate directly with Best-in-Class performance across the key metrics.

Table 3: The Competitive Framework

	Best-in-Class	Industry Average	Laggards
Process	Confirm transactions with automatic data capture (bar-coding, speech, RFID)		
	65%	55%	53%
	Direct order-picking with mobile-devices		
	60%	50%	31%
	Ability to send electronic Advance Ship Notices (ASNs)		
	70%	45%	44%
Advanced pick methodologies like batch, zone, or cluster picking			
65%	52%	28%	

	Best-in-Class	Industry Average	Laggards
Organization	Only employees who have our application loaded onto their PC can login and view driver and vehicle status data in real time		
	35%	23%	25%
Technology	Technology enablers to support fleet management:		
	<ul style="list-style-type: none"> ▪ 70% Ruggedized Mobile Computers (Forklift or Handheld) ▪ 50% Automated Shipping Sortation ▪ 40% Conveyor Based Picking Systems ▪ 25% Automatic Palletizing Systems 	<ul style="list-style-type: none"> ▪ 48% Ruggedized Mobile Computers (Forklift or Handheld) ▪ 21% Automated Shipping Sortation ▪ 27% Conveyor Based Picking Systems ▪ 9% Automatic Palletizing Systems 	<ul style="list-style-type: none"> ▪ 31% Ruggedized Mobile Computers (Forklift or Handheld) ▪ 12% Automated Shipping Sortation ▪ 12% Conveyor Based Picking Systems ▪ 6% Automatic Palletizing Systems
Performance	Measure and update fleet performance daily or in real-time		
	55%	37%	22%

Source: Aberdeen Group, Month 2008

Capabilities and Enablers

Warehouse automation such as conveyor-based pick systems, shipping sortation, automated storage and retrieval systems, pick-to-light systems, speech-based warehousing, and RFID has a well-earned reputation for drastically improving warehouse throughput with minimal labor requirements and storage footprint. However, much of this technology was pioneered in days when distribution requirements were far more stable than they are today.

With the changing economy and the pressure on logistics executives to create more efficiency in the warehouse to ensure it will support long-term business dynamics, warehouse automation technology has been put to the test in recent years. As a result, it has evolved to provide greater flexibility at more reasonable investment levels making it more accessible to companies of all sizes. However, technology alone is not sufficient to improve the overall performance of any warehouse, and requires complete alignment with process and organizational / behavioral improvements in order for any investment to deliver on expectations.

Process

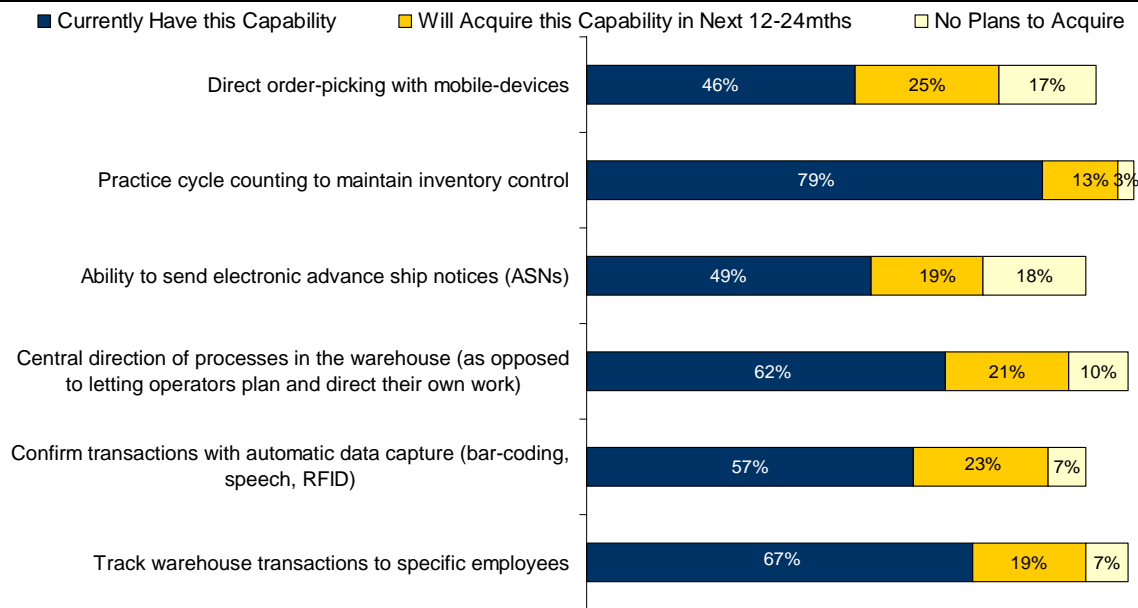
Almost 90% of all survey respondents indicated a plan to improve distribution center operations in the next 12 to 24 months (81% of Best-in-Class). The majority of those improvements (61%) will involve some level of process improvement. Increasingly, the most important stage of any process improvement change is ensuring proper workflow in the warehouse to

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~ Kurt Jacobs, Director of Distribution, Holloway USA

effectively measure the impact of automation and the expected return on that investment. There are significant advantages in making these process improvements, including the ability to fund additional investment from the resulting bottom-line savings.

Figure 6: Process Capabilities for Today's Warehouse



Source: Aberdeen Group, October 2008

Figure 6 outlines the process capabilities currently being utilized or planned by today's logistics executives in the next 12 to 24 months. The most prevalent process capabilities in today's warehouse are the ability to maintain inventory visibility, track transactions to specific employees, and maintain a central direction of processes. The combination of those capabilities make it clear that today's warehouses are looking to maintain a consistent and reliable level of visibility across real-time activities in order to be more flexible and agile.

The Best-in-Class continue to set the bar very high and have implemented many of these capabilities with greater levels of adoption:

- Practice cycle counting to maintain inventory control (92%)
- Track warehouse activities to specific employees (81%)
- Confirm transactions with automatic data capture (73%)
- Central direction of processes in the warehouse (69%)
- Ability to send advanced ship notices (69%)
- Direct order-picking with mobile devices (65%)

The focus going forward, once visibility and process flow are more aligned, is to make those processes more automated and aligned with the business flow in the warehouse. This will ensure the activities being performed are in

Best-in-Class Advancing

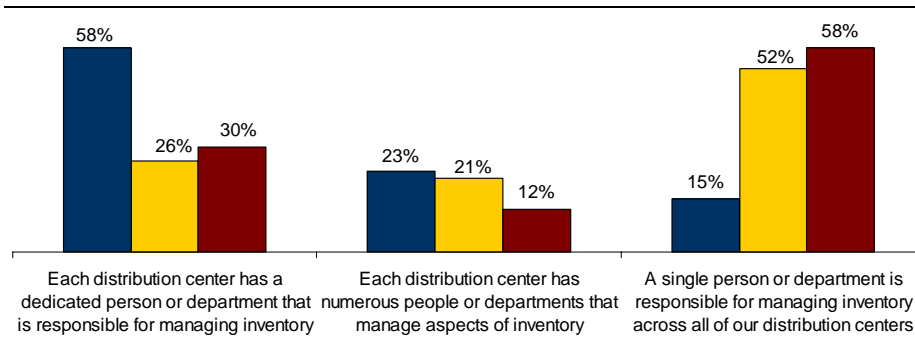
- ✓ **81%** Utilize advanced replenishment methods
- ✓ **69%** Utilize advanced picking methods
- ✓ **50%** Have implemented reverse logistics

support of the needs of the business at that point in time, not at some point in the past. Almost 25% of all respondents indicated plans to continue to adopt mobile devices for order-picking and transaction confirmation, increasing the ability to drive more real-time operations and improve the order-fulfillment process by removing non-value add activities and wasted trips in the process.

Organization

Another key component of creating a more effective order fulfillment process is ensuring an environment that supports more agile and flexible operation; making sure changes can be made quickly in order to respond to changing conditions and prevent or mitigate the impact of damaging economic factors. While almost 50% of respondents try to manage all of their distribution centers with a single person or department, the Best-in-Class (Figure 7) have kept a focus on maintaining the individuality of each distribution center and created more of a central direction for each location, as a part of the overall network of the supply chain. However, this does not imply siloed operation of all distribution centers (50% of all respondents operate at least two distribution centers).

Figure 7: Organizational Layout for Today's Distribution Center



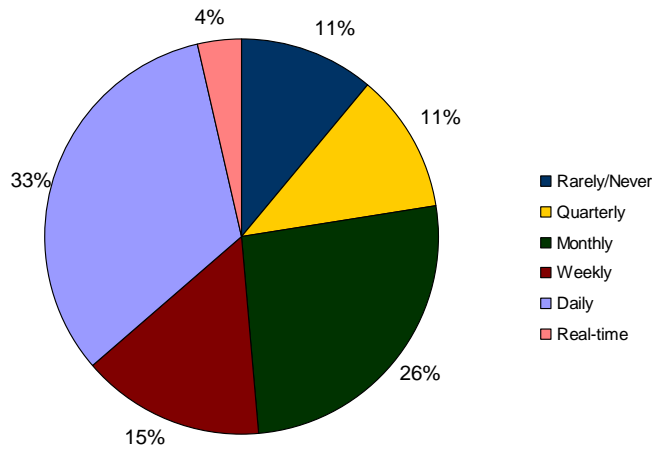
Source: Aberdeen Group, October 2008

The combination of this organizational structure and the level of visibility (Figure 8) signify a more agile structure that allows optimal performance at the distribution center level to ensure the ability to adjust to changing local conditions (inside and outside the distribution center) more easily.

Knowledge and Performance Management

In order to implement improvements that focus on increasing labor efficiency and throughput (as indicated earlier) access to operational data and performance metrics is critical. Too often, changes are implemented and technology adopted based on out-of-date information that doesn't accurately reflect the current conditions and trends inside the distribution center. Real-time may have a different meaning and level of relevance depending on the distribution center, especially in the ability of operations processes and staff to effectively use real-time information. But defining the level of performance visibility necessary to ensure more fluidity and adaptability is critical to any improvement.

Figure 8: Level of Performance Visibility in the Warehouse



Source: Aberdeen Group, October 2008

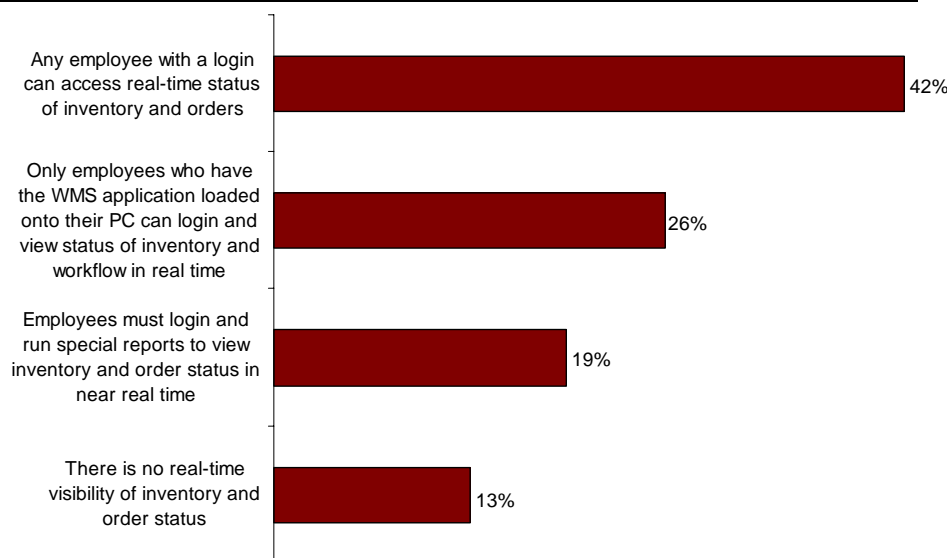
"We pride ourselves on fanatical customer service. That message resonates from the very top of this organization and is the common thread driving everything we do."

~ Mark Vondenhuevel,
President of Holloway.

Almost 50% of all logistics executives surveyed rely on performance data older than a month to manage their operations. At the same time, less than 23% of Best-in-Class companies utilize any information older than a week in order to manage their operations. With the constant fluctuation in supply and demand as well as economic pressures, today's distribution centers need the most up-to-date information possible in order to ensure alignment between the business-level expectations (customer needs and demands) and the activities taking place.

In many organizations, daily and weekly performance metrics can be utilized to align the workforce to new process changes to measure compliance and to incentiveize. If information is going to be collected and measured for performance tracking, employees need access to that information.

Figure 9: Employee Access to Operational Information



Source: Aberdeen Group, October 2008

Best-in-Class Plans for 12 to 24 months

- ✓ **20%** Acquire RFID technology
- ✓ **20%** Acquire in-motion manifesting system
- ✓ **20%** Acquire speech-based warehousing technology

As indicated earlier in this report, today's distribution centers have more visibility to transactions down to the employee level. In Figure 9, it's also clear that at least 87% of today's employees have some level of access to operational information themselves. It's important to provide various levels of access depending on role within the organization, including secure access for viewing and printing key operational information, while also increasing the level of "free visibility" to real-time status information.

Technology

Today's technology providers have invested heavily in providing solutions that are more easily integrated and adaptable to the changing landscape of the distribution center. While a majority of the focus revolves around process-centered improvements as the initial step to improve operations, an increasing number of projects are underway to investigate, evaluate, and implement technology that helps automate good processes and remove waste. As indicated in the competitive framework in Table 3, more of today's Best-in-Class companies are leveraging technology to support, and often times enhance, the order fulfillment process.

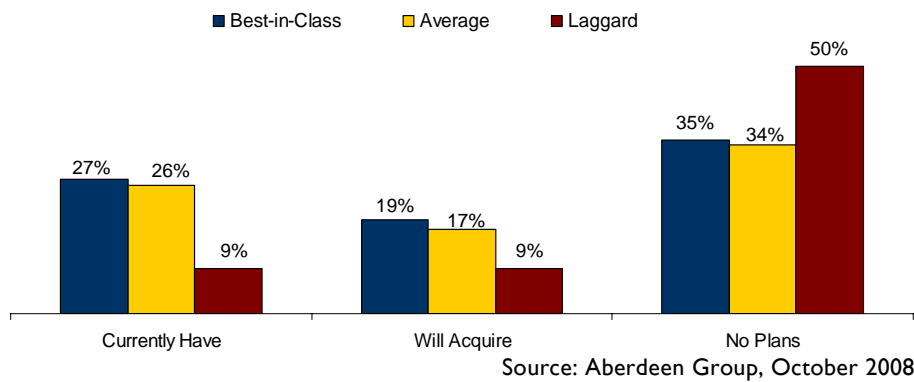
Mobile Computers and Speech-based Warehousing

Roughly 65% of Best-in-Class distribution centers utilize ruggedized mobile computers, and use those devices to direct the order-picking process. The expansion in recent years of mobile computers in the warehouse has provided the ability for logistics executives around the world to equip their workforce to be adaptive and cross-functional therefore making them even more productive. It's also provided the Best-in-Class with a way to shorten the number of discrete steps in the order fulfillment process and create more streamlined activities including:

- Confirming transactions to the employee level in real-time (73%)
- Receiving goods without paper (50%)
- Automatically labeling inbound goods at point of receipt (50%)
- Print customer-compliant labels for outbound (62%)

These are the type of service-related activities that can greatly reduce the turn-around time for customer orders, and at the same time, provide added levels of service for competitive differentiation. It's the addition of new technology releases, as well as upgrade components for existing device pools, that is taking automation to the next level, turning the warehouse worker into a tactical weapon for attacking inefficiencies in warehouse processes.

Figure 10: Speech-based Warehousing

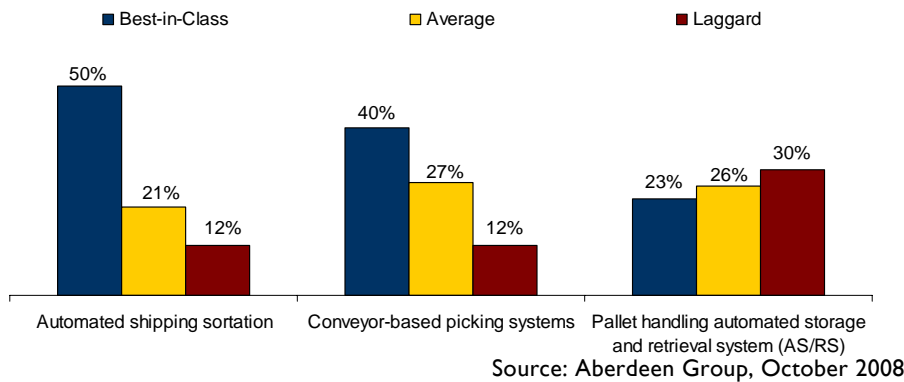


While mobile computers continue to expand the use of their screen and keyboard functionality, many providers are expanding the flexibility of the devices beyond scanners and printers, and adding peripheral support for RFID and speech-based warehousing. In Figure 10 it's clear that the level of adoption of speech-based technology for warehousing has been accepted more by the Best-in-Class and Industry Average respondents than by Laggards. In particular, it continues to find adoption in grocery / retail vertical segments. While many companies indicate no plans for adoption in the coming 12 to 24 months, market pressures combined with ongoing education and visibility of the options available will move logistics executives to adopt speech technology at levels similar to RF and scanning technology in the coming years.

Material Handling and Automation

For more than 10 years, logistics executives have been reducing the amount of human effort required for material handling by turning to metal and ball bearings to move product through the fulfillment cycle from one end of the distribution center to the other. As more focus is placed on turning the workforce into a value-added part of the fulfillment chain, automated equipment has taken on the roll of product movement, reducing the human-handling of boxes along the way. From conveyors to move totes and boxes through the picking process, to routing completed orders to palletizing and shipping stations, and moving raw product from staging areas to pick-faces, automated material handling provides a key opportunity to leverage the workforce.

Figure 11: Use of Integrated Material Handling



Especially in high-volume order distribution centers, material handling equipment has increased the productivity and efficiency of the workforce while maintaining or increasing the velocity of the fulfillment process. Focusing the workforce on value-added steps in the process (picking, replenishment, and inventory control) and automating as much of the product movement as possible, has led to achieving the superior levels of accuracy and velocity in today's Best-in-Class distribution center. By streamlining the receipt of inbound product (through mobile technology) to the outbound order fulfillment side of the warehouse (with material handling equipment), logistics executives have been able to put the pieces in place to take action and improve labor efficiency.

“We’ll continue to investigate ways to expand our utilization of our existing investment in the technology and improve other areas of our operations. If the ROI is there then we’ll move forward, that’s our measuring stick.”

~ Jeff Williamson, Sr. VP
Operations, PFG

Over the next 12 to 24 months, many Best-in-Class logistics executives will continue to look for ways to incorporate material handling and sortation equipment into their distribution center strategies, including:

- In-motion manifesting system (20%)
- Case handling automated storage and retrieval (AS/RS) systems (12%)
- Automated shipping sortation (12%)
- Vertical carousels and / or lift modules (10%)

Aberdeen Insights — Robotics Technology

The next generation in automated material handling equipment has moved from the conveyor, and even the AGV-level, into the world of robotics, and has begun to create visions of the fully automated warehouse. The "green" distribution center of tomorrow may depend primarily on robotics and remove the need for costly lighting and human-related temperature control. With improvements in the core technology behind the manufacturing of robotics (including battery technology, sensor technology, and multi-dimensional movement) the cost and integration of this technology is beginning to show signs of a solid return on investment.

continued

Aberdeen Insights — Robotics Technology

Currently, less than 10% of respondents indicated use of robotics in their distribution center. Almost the same number of companies indicated plans to acquire this technology in the next 12 to 24 months which indicates that for most logistics executives, this technology is still early in the adoption phase. There have been significant wins over the past year in the retail and grocery space that indicate not only a demonstrable ROI on the technology, but proof that the technology is capable of performing at least as good as historically popular technologies like RF and mobile devices.

As more options become available and adoption continues to lead to exposure of success stories and demonstrable ROI, robotics will begin to see more attention as part of the process improvement cycle.

Figure 12: Application of Robotic and AGV Technology



Source: Aberdeen Group, October 2008

There continues to be applicable space for robotics to facilitate the receiving and put-away process, as well as the loading / shipping side of distribution, but more technology is available to replace picking labor, as well as at least support it. Today's logistics executives should weigh all costs when evaluating the overall impact of order fulfillment to fully understand the potential value-add of robotics.

Advanced Technology and Process Capabilities

Moving beyond the use of basic process and technology improvements, the Best-in-Class continue to chip away at performance inefficiencies and find ways to optimize the flow of orders through the distribution center.

Figure 13: Best-in-Class Adoption: Beyond the Basics



Source: Aberdeen Group, October 2008

The earlier investment in process change and the adoption of technology (like mobile computers, integrated automation into the workflow, and centralized control) have provided opportunities for the Best-in-Class to focus more on integrating the workforce with automation to expedite orders and add value to customer demands. The ability to treat the technology and the worker as one-unit has increased flexibility and agility in the warehouse and driven performance metrics higher year-over-year, while at the same time, controlling labor costs.

Chapter Three: Required Actions

Whether a company is trying to move performance from Laggard to Industry Average, or Industry Average to Best-in-Class, the following actions will help guide the necessary performance improvements. Success is not guaranteed by choosing to change one process or implement one solution; it must be looked upon as building momentum through a number of changes, some which are outlined to follow.

Laggard Steps to Success

- **Identify short-term opportunities to improve performance without increasing costs.** With the adoption of a central direction of process (69%) in the warehouse, cycle counting (92%), and even the ability to receive goods into the warehouse without the need for paper (50%), many Best-in-Class companies have set the stage for early success by creating more alignment and visibility. Laggard's can find opportunities in the short-term that require less upfront investment in order to produce savings that can ultimately fund future investment and improvement.
- **Focus on visibility.** It's difficult to create a business case to invest in operational improvements, especially in the state of the economy over the next 9 to 12 months, without accurate and relevant information. Only 27% of Laggard organizations have the ability to measure and post performance metrics to the warehouse. The best way to ensure process compliance and correct errors is to create a method for providing immediate feedback to all warehouse employees. This will ensure the proper information is used for activities from analysis through activity tracking.
- **The workforce as a strategic weapon.** Look for opportunities to marry the workforce with technology in order to drive efficiencies and greater return on investment. Equipping the workforce with mobile devices to drive and enhance daily activities can increase productivity and improve visibility throughout the distribution center. Over 65% of Best-in-Class organizations have utilized technology to drive picking operations, track activity and performance, and provide value-added services to enhance the order fulfillment process. Better alignment leads to improved flexibility and better performance.

Industry Average Steps to Success

- **Continue to integrate automation into distribution center strategies.** There will continue to be opportunities to streamline distribution processes and to focus on maximizing workforce utilization while reducing wasted effort. Over 40% of Industry Average respondents indicated they would be investing in

Hurdles to Adopting Automation Technology

- √ 49% upfront cost of technology is too high
- √ 24% integration is too expensive / difficult
- √ 22% lack of knowledge of available solutions

warehouse automation in the next 12 to 24 months. Over 15% plan on enhancing order-picking with the addition of mobile and automated picking technology.

- **Take mobile devices to the next stage.** Over 50% of Industry Average respondents currently utilize mobile technology to direct order-picking (21% plan to acquire this capability in the next 12 to 24 months). With the upfront implementation out of the way and ROI being demonstrated through the picking process, logistics executives should continue to incorporate mobile technology into process improvements, especially extending mobile direction of put-away and replenishment activities to ensure the picking process moves forward without disruption.
- **Increase the level of performance visibility.** Almost 50% of Industry Average distribution centers continue to rely on performance information that is more than a week old. While some businesses may operate within successful ranges with monthly data, analyzing and posting performance metrics daily or weekly can increase labor productivity and efficiency.

Best-in-Class Steps to Success

- **Expand the use of existing technology for incremental ROI savings.** With accuracy levels hovering around 99% and an almost 2% year-over-year decline in labor costs, the Best-in-Class are outpacing other distribution centers in performance. However, continuing to utilize investment in automation technology can help to push performance even higher, and drive results directly to the bottom-line. There are opportunities to expand existing automated material handling to integrate value-added services like shipping sortation and in-motion manifesting to help expedite the shipping process and extend efficiency from inbound to outbound.
- **Turn process improvement into a continuous lifecycle.** The key to any process improvement is the ability to re-visit changes by monitoring and tracking performance. By focusing on analysis, logistics executives can fine-tune process and technology changes in order to drive greater efficiency. With almost 45% of organizations relying on daily performance visibility, the ability to make adjustments and respond to disruptions can be identified and implemented in time to avoid a performance impact.
- **Find opportunities to partner with vendors and pilot new technology.** Many Best-in-Class organizations have adopted technology earlier in the lifecycle because of their ability to identify and successfully implement changes. Monitoring and tweaking performance based on performance can go a long way to getting more out of an investment. Look for opportunities to work with technology providers to provide feedback and recommendations to ensure even greater utilization of existing investments. Next

“We won’t make any investment without a clearly defined ROI. It’s a critical step for us to ensure we have fully researched the impact of the technology, and it is our tool for Executive buy-in”

~ Jeff Williamson, Sr. VP
Operations, PFG

generation upgrades and even minor enhancements can be the difference in streamlining any fulfillment process.

Many organizations still have a long way to go in evaluating technology, especially around automation. Consistently, the top three reasons many companies fail to implement new technology are:

- Upfront costs for technology are too high (56%)
- Integration is too expensive / difficult (33%)
- Lack of knowledge of available solutions (20%)

Lack of due diligence and visibility typically lead to a large population indicating a lack of knowledge of what's available. Less than 10% of the Best-in-Class indicate a lack of knowledge of available solutions, implying their ability to be more up-to-date on the latest technology as well as being active in looking for opportunities to invest in new technology. Whatever the barriers to adoption, today's logistics executives must find it in their agenda's to take the time to invest in research in order to fight off the impact of every-day disruptions in the supply chain. Failure to move in this direction can leave organizations behind and result in year-over-year business results that fall below levels of expectation.

Aberdeen Insights — Summary

In the unpredictable ebb and flow of today's global economy, supply chain performance is coming under increased visibility and pressure from areas that never considered the impact of supply chain performance. Today, everyone is aware of how well the company is performing across all divisions and cost centers. Customers are becoming more aware of the vendors and suppliers they work with on a daily basis and are becoming increasingly hesitant to dig into their pockets when there seems to be no added value. Today's logistics executives are taking a closer look at their operations and uncovering areas for improvement that can help provide greater customer service and cut costs at the same time. The Best-in-Class executives are continuing their attack on inefficiencies and continuing their due diligence in evaluating the technology enablers available that can help them remove waste and inefficiency from their operations and drive better performance and cost savings. They're not doing it ad hoc or without justification. They continue to dedicate time and resources to staying up-to-date on technology and process trends, calculating potential savings, and measuring a strong ROI to help drive investment budgets. Budgets and spending on technology and services will be more restricted in the coming 12 to 18 months and focused more on immediate value. The logistics executives that evaluate and demonstrate investment value will continue to chop away at the inefficiencies and separate themselves even more from the competition, and position themselves as the leaders of tomorrow.

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Appendix A: Research Methodology

Between September and October 2008, Aberdeen examined the use, the experiences, and the intentions of more than 150 enterprises using warehouse automation in a diverse and integrated fashion.

Aberdeen supplemented this online survey effort with telephone interviews with select survey respondents, gathering additional information on warehouse automation and order fulfillment strategies, experiences, and results.

Responding enterprises included the following:

- *Job title / function:* The research sample included respondents with the following job titles: Executive or C-Level (25%), Director (17%), Manager (42%). Primary focus area for the respondents included: Logistics/Supply Chain (45%), Operations (23%).
- *Industry:* The research sample included a sampling of respondents from: retail industries (17%), distribution (14%), food / beverage (11%), healthcare / medical devices (10%).
- *Geography:* The majority of respondents (69%) were from North America. Remaining respondents were from EMEA (17%), the Asia-Pacific region (11%) and South / Central America (3%).
- *Company size:* Thirty-two percent (32%) of respondents were from large enterprises (annual revenues above US \$1 billion); 36% were from midsize enterprises (annual revenues between \$50 million and \$1 billion); and 32% of respondents were from small businesses (annual revenues of \$50 million or less).
- *Headcount:* Forty-three percent (43%) of respondents were from large enterprises (headcount more than 1,000 employees); 37% were from midsize enterprises (headcount between 100 and 999 employees); and 20% of respondents were from small businesses (headcount less than 100 employees).

Solution providers recognized as sponsors were solicited after the fact and had no substantive influence on the direction of this report. Their sponsorship has made it possible for Aberdeen Group to make these findings available to readers at no charge.

Study Focus

Responding logistics executives completed an online survey that included questions designed to determine the following:

- √ The degree to which warehouse automation is deployed in their operations and the financial implications of the technology
- √ The structure and effectiveness of existing automation implementations
- √ Current and planned use of automation to aid operational and promotional activities
- √ The benefits, if any, that have been derived from automation initiatives

The study aimed to identify emerging best practices for automation usage, and to provide a framework by which readers could assess their own management capabilities.

Table 4: The PACE Framework Key

Overview
<p>Aberdeen applies a methodology to benchmark research that evaluates the business pressures, actions, capabilities, and enablers (PACE) that indicate corporate behavior in specific business processes. These terms are defined as follows:</p> <p>Pressures — external forces that impact an organization’s market position, competitiveness, or business operations (e.g., economic, political and regulatory, technology, changing customer preferences, competitive)</p> <p>Actions — the strategic approaches that an organization takes in response to industry pressures (e.g., align the corporate business model to leverage industry opportunities, such as product / service strategy, target markets, financial strategy, go-to-market, and sales strategy)</p> <p>Capabilities — the business process competencies required to execute corporate strategy (e.g., skilled people, brand, market positioning, viable products / services, ecosystem partners, financing)</p> <p>Enablers — the key functionality of technology solutions required to support the organization’s enabling business practices (e.g., development platform, applications, network connectivity, user interface, training and support, partner interfaces, data cleansing, and management)</p>

Source: Aberdeen Group, October 2008

Table 5: The Competitive Framework Key

Overview	
<p>The Aberdeen Competitive Framework defines enterprises as falling into one of the following three levels of practices and performance:</p> <p>Best-in-Class (20%) — Practices that are the best currently being employed and are significantly superior to the Industry Average, and result in the top industry performance.</p> <p>Industry Average (50%) — Practices that represent the average or norm, and result in average industry performance.</p> <p>Laggards (30%) — Practices that are significantly behind the average of the industry, and result in below average performance.</p>	<p>In the following categories:</p> <p>Process — What is the scope of process standardization? What is the efficiency and effectiveness of this process?</p> <p>Organization — How is your company currently organized to manage and optimize this particular process?</p> <p>Knowledge — What visibility do you have into key data and intelligence required to manage this process?</p> <p>Technology — What level of automation have you used to support this process? How is this automation integrated and aligned?</p> <p>Performance — What do you measure? How frequently? What’s your actual performance?</p>

Source: Aberdeen Group, October 2008

Table 6: The Relationship Between PACE and the Competitive Framework

PACE and the Competitive Framework – How They Interact
<p>Aberdeen research indicates that companies that identify the most influential pressures and take the most transformational and effective actions are most likely to achieve superior performance. The level of competitive performance that a company achieves is strongly determined by the PACE choices that they make and how well they execute those decisions.</p>

Source: Aberdeen Group, October 2008

Appendix B: Related Aberdeen Research

Related Aberdeen research that forms a companion or reference to this report include:

- [Agile Logistics: Transforming the Distribution Center](#); May 2008
- [Technology Strategies for Closed Loop Inventory Management](#); April 2008
- [The Supply Chain Executive's Strategic Agenda 2008: Managing Global Supply Chain Transformation](#); January 2008
- [Integrated Transportation Management – How Best-in-Class Companies View the World differently](#); June 2007

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