Aberdeen Group
A Harte-Hanks Company

Warehouse Operations

Increase Responsiveness through Automation

July 2009

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Executive Summary

In the best of times, warehouse management requires the careful balancing of competing objectives such as space utilization versus organizational flexibility, picking speed versus accuracy, and increasing throughput versus minimizing labor costs. Today's economic environment has only heightened this challenge, with increased scrutiny of capital expenditures, and more demanding requirements for Return on Investment (ROI). For this study, Aberdeen surveyed over 250 executives to understand their performance, current capabilities and use of enabling technologies, as well as their outlook for the future, in terms of potential investments and ROI expectations for improving warehouse operations.

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 used the following three key performance criteria to distinguish Best-in-Class companies:

- Percentage of orders which are picked accurately: 99.5%
- Percentage of orders which ship from the warehouse on-time and complete to customer request: 98.8%
- Percentage of bins in the warehouse that contain correct items and quantities as of the most recent inventory or cycle count: 97.2%

Competitive Maturity Assessment

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

- Seventy percent (70%) more likely than all other companies (all others) to receive goods without using paper documents
- Fifty-five percent (55%) more likely than all others to direct order-picking with mobile devices
- Forty-six percent (46%) more likely than all others to utilize advanced pick methodologies, such as batch, zone and cluster picking.

"The warehouse in today's marketplace is the last frontier to trim additional costs out of the business and it is one of the few remaining places where the business has total control."

~ Operations Manager, Mid-size North American Beverage Distributor

Required Actions

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

- Examine whether currently-implemented warehouse systems provide the level of visibility and ease of integration necessary to support future improvements
- Measure and track warehouse performance metrics, to understand cost drivers and provide a solid basis for evaluating the potential benefits of efficiency-improving technologies

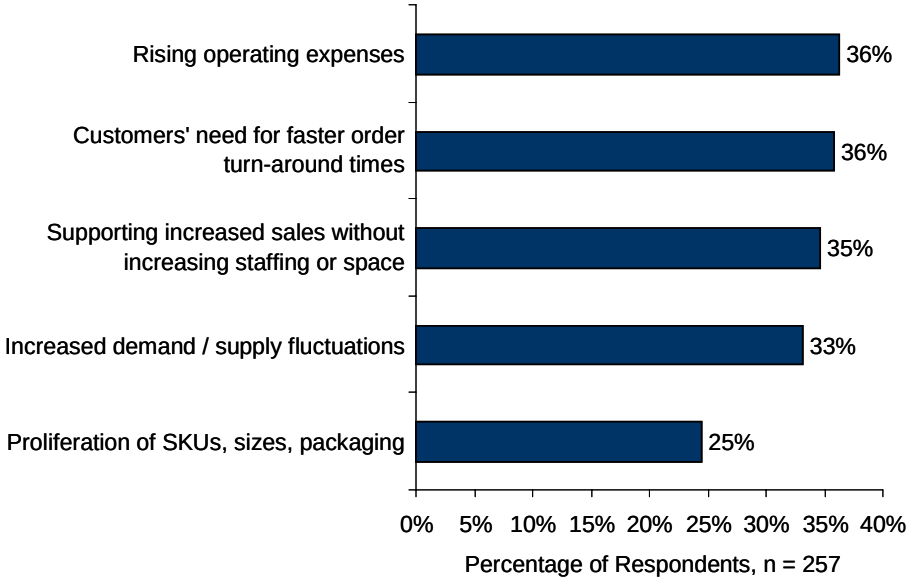
Chapter One: Benchmarking the Best-in-Class

Business Context

In the best of times, warehouse management requires the careful balancing of competing objectives such as space utilization versus organizational flexibility, picking speed versus accuracy, and increasing throughput versus minimizing labor costs. Today's economic environment has only heightened this challenge, with increased scrutiny of capital expenditures, and more demanding requirements for Return on Investment (ROI). For this study, Aberdeen surveyed over 250 executives to understand their performance, current capabilities and use of enabling technologies for warehouse management, as well as their outlook for the future, in terms of potential investments and ROI expectations.

As illustrated in Figure 1, the top pressures driving companies to improve their Distribution Center (DC) operations highlight the need for delicate balancing of competing objectives.

Figure 1: Key Pressures Driving Improvements in DC Operations



Source: Aberdeen Group, July 2009

Faster order turnaround times (36%) may call for transitioning away from manual order processing, ensuring inventory accuracy and availability to avoid stock-outs, or increasing labor efficiency when picking - to name but a few process-related changes. Increasing fluctuations in demand or supply (33%) may lead the planning organization to build up safety stock, pushing space utilization above optimal levels. The proliferation of SKUs, sizes, and packaging (25%) compounds these difficulties, increasing required space, and

Fast Facts

- √ **69%** of respondents have the ability to track warehouse transactions to specific employees
- √ **58%** of respondents know the contents of every bin in the warehouse in real-time

potentially reducing usage efficiency by creating partially-filled storage locations for low-volume configurations.

The Maturity Class Framework

Aberdeen used three key performance criteria to distinguish the Best-in-Class from Industry Average and Laggard organizations for warehouse operations-related processes, as shown in Table 1.

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	▪ 99.5% of orders picked accurately ▪ 98.8% of orders shipped on-time and complete ▪ 97.2% inventory accuracy as of last physical inventory or cycle count
Industry Average: Middle 50% of aggregate performance scorers	▪ 97.7% of orders picked accurately ▪ 95.6% of orders shipped on-time and complete ▪ 95.9% inventory accuracy as of last physical inventory or cycle count
Laggard: Bottom 30% of aggregate performance scorers	▪ 88.4% of orders picked accurately ▪ 88.2% of orders shipped on-time and complete ▪ 89.1% inventory accuracy as of last physical inventory or cycle count

Source: Aberdeen Group, July 2009

These measures serve to address key performance areas within the four walls of the distribution center. This internal focus captures true warehouse performance, without penalizing respondents for external factors like transportation delays that impact end-to-end metrics such as perfect order percentage.

Order pick accuracy is fundamental to an efficient and cost-effective order fulfillment operation. Lower accuracy leads to increased error costs, either through detection and re-picking prior to shipment, or returns processing, customer service, and re-picking after an inaccurate order reaches its destination. This reprocessing step also threatens to introduce inaccuracies into the inventory management system, which may not be corrected until the next physical inventory or cycle count iteration.

Orders shipped on-time and complete to customer request represent the best contribution that the DC can make to overall on-time performance and customer satisfaction. This metric captures performance across put-away, picking and replenishment, while also integrating the operation's ability to identify and rectify process errors within the initial timeframe. On-time shipment also eliminates externalities such as costs for expedited shipping, which are caused by DC inefficiency, but are borne by the company's transportation organization.

Inventory accuracy as of last physical inventory or cycle count sets the stage for both high-performing order fulfillment and intelligent inventory management. Both numeric and spatial inaccuracies can lead to incomplete orders, misaligned replenishment, and inaccurate reorder times and / or quantities.

The Best-in-Class PACE Model

Improving warehouse operations to achieve corporate goals requires a combination of strategic actions, organizational capabilities, and enabling technologies that can be summarized as shown in Table 2.

Table 2: The Best-in-Class PACE Framework

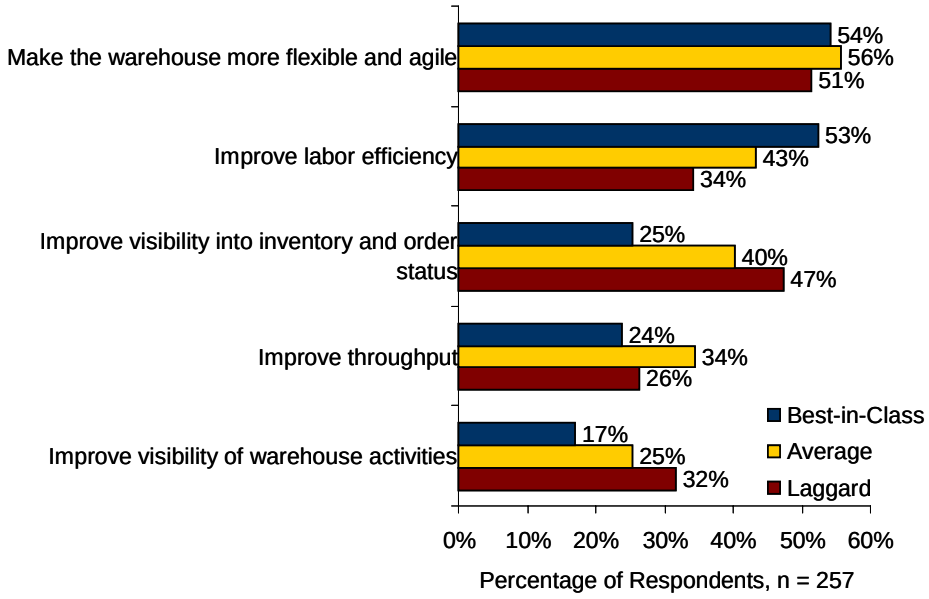
Pressures	Actions	Capabilities	Enablers
▪ Rising operating expenses	▪ Make the warehouse more flexible and agile as business needs change ▪ Improve labor efficiency	▪ Advanced picking methodologies ▪ Advanced replenishment methodologies ▪ Tracking warehouse transactions to specific employees ▪ Ability to measure and post performance metrics for the warehouse staff ▪ Centralized direction of warehouse processes ▪ Real-time knowledge of contents for every bin in the warehouse	▪ Warehouse Management Systems (WMS) ▪ Ruggedized mobile computers ▪ Distributed order management software ▪ Automated shipping sortation ▪ In-motion manifesting systems ▪ Pick-to-light ▪ Speech-based warehousing ▪ Automated palletizing systems ▪ Transportation Management Systems (TMS)

Source: Aberdeen Group, July 2009

Best-in-Class Strategies

For both Best-in-Class (36%) and Industry Average (42%) organizations, rising operating expenses represent the top pressure driving interest in improving warehouse operations. How do these organizations, currently achieving superior results across warehouse metrics, combat this pressure without compromising performance?

Figure 2: Strategic Actions across Maturity Classes



Source: Aberdeen Group, July 2009

As illustrated by Figure 2, the Best-in-Class are focused on two main areas: warehouse flexibility / agility and labor efficiency. In an uncertain and increasingly volatile economic environment, it is not surprising that the ability to respond to change is central for business across the maturity framework. When moving beyond that common ground, the differences between the Best-in-Class and their peers become clear. Laggard organizations, for example, are less likely to focus on labor efficiency, instead showing a strong desire to improve their visibility of inventory; orders, and warehouse activities. The discussion in Chapter Two will outline the underlying capability gaps between these maturity classes, shedding light on the reasons for their differing strategies.

"Quick turnaround for customers is key. Precision in picking, kitting, and shipping is paramount so that every opportunity is a great experience for our customers."

~ Logistics / Supply Chain Consultant, Metals and Metal Products Manufacturer

Is Ceasing Capital Investment the Right Way to Go?

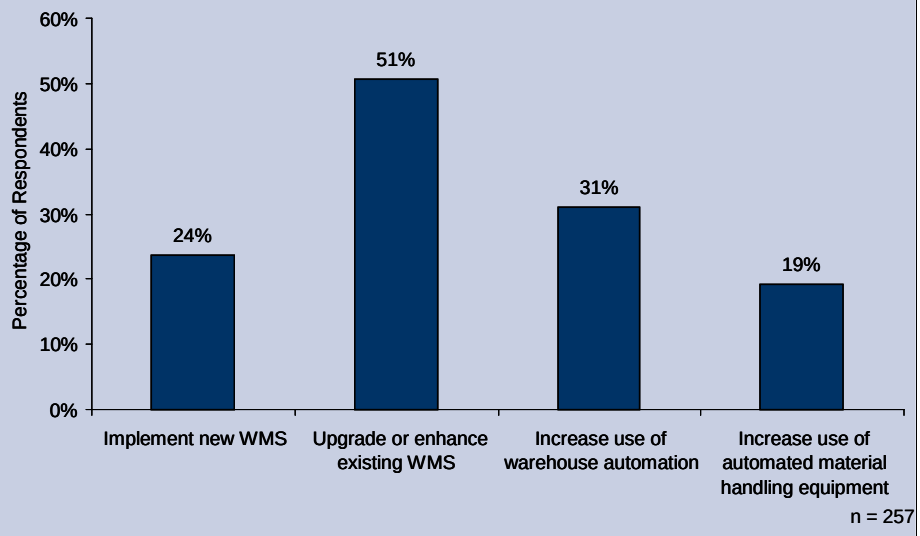
In response to the economic downturn, some companies have adopted blanket policies, scuttling planned improvements or delaying the evaluation of prospective projects. This is an understandable, yet misguided, approach. The fundamental question to ask is quite simple: what exactly has changed? For both planned and prospective investments, redefinition of parameters and revaluation of expected returns must be at the forefront of go / no-go decision-making. The end result may be the same as that dictated by a spendthrift investment policy, but the additional step of revaluation offers the potential to identify opportunities with value that has endured the downturn, and can contribute to both short-term recovery and long-term profitability.

continued

Is Ceasing Capital Investment the Right Way to Go?

As illustrated in Figure 3, many companies remain dedicated to investing in performance improvement, despite the economic environment. Those plans, however, evince a preference for smaller-scale investments, concentrating on upgrades and enhancements rather than new implementations for WMS and for supporting technologies (pick-to-light, pick-to-voice, mobile computers, RFID) rather than big-ticket or infrastructural additions (AGVs, AS / RS, conveyors, carousels, robotics, etc.). When it comes to potential improvements, the question is not whether to invest, but which technology offers a palatable balance between up-front cost, flexibility, performance improvement, and payback potential.

Figure 3: Future Hardware- and Software-related Plans



Source: Aberdeen Group, July 2009

Interestingly, expectations for payback horizons have not strayed far from the common two-year convention. Across all respondents planning investments, the average expected payback period is just under 26 months (25.57 months), with little variation between the maturity classes. What is most surprising is the number of respondents that are exploring technology investments but cannot specify a timeframe within which they expect to reach break-even (30% overall). This is a key piece of information in the decision-making process, which will help to differentiate competing solutions which offer similar performance improvements.

continued

Is Ceasing Capital Investment the Right Way to Go?

Table 3 presents an example of how economic conditions can affect how the dominant pressure is defined for a business' warehouse operations. The key point is that the specific technology chosen is, in fact, less important than the re-prioritization process itself. Even though the end result may not change, without thoughtful re-examination, the potential misalignment between the dominant pressure and strategic action could have a severe impact on the organization's ability to survive in the new economy.

Table 3: Re-Prioritization of Pressures, Actions, and Investment Choices

	Before	After
Economic Environment	High-demand, growth-oriented	Moderate-demand, retention-oriented
Dominant Pressure	Capacity constraints - picking cannot keep pace with demand	Customer service levels - inaccurate orders pushing customers to seek alternative suppliers
Strategic Action	Increase efficiency in the picking process	Increase accuracy in the picking process
ROI Justification	Additional revenues from increasing orders, and savings from avoiding expedited shipping, will outweigh solution cost. Breakeven horizon: 1.5 years	Solution cost is less than potential lost revenue, and will return greater value when demand rises. Breakeven horizon: 2 years
Investment Decision	Pick-to-light system integrated with mobile devices	Same

Source: Aberdeen Group, July 2009

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

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Chapter Two: Benchmarking Requirements for Success

To effectively combat the pressures, and implement the strategies, profiled in Chapter One, companies have at their disposal a cornucopia of alternative order fulfillment process and enabling technologies. This chapter will examine which capabilities the Best-in-Class have invested in to increase warehouse flexibility, improve labor efficiency, and achieve superior performance.

Case Study — Belkin International

At Belkin International's Midwest distribution center, the scope of operations is impressive. The consumer electronics distributor runs an 800,000 square foot facility, primarily serving retail outlets throughout the US, Canada, and Latin America. Running two shifts for outbound orders and a third for replenishment, the facility processes upwards of 40,000 outbound cartons per day. The DC utilizes a WMS linked to a shoe sortation system for outbound order consolidation, and makes heavy use of RF and inventory activity tracking. In addition to standard inbound and outbound operations, Belkin's facility also handles returns, light assembly and packaging processes.

Like many of its peers, Belkin is facing pressure to reduce customer order turn-around times. This effort must be balanced, however, against a need to support sales without increasing staffing or space. To further compound these challenges, Belkin also faces proliferation of SKUs – calling for an approach that can process an expanding item base more quickly, utilizing only the existing space and labor pool.

Recent changes have addressed both the software and hardware sides of the warehouse, according to Layth Hussain, General Manager at Belkin. "In terms of hardware, most changes revolve around the upgrade of the RF devices used on the floor. As most of this ties to [product] end-of-life validation, the results were pretty straightforward: reduced repair costs."

On the software side, the focus has been on maximizing previously-overlooked capabilities of the WMS system to allow for the removal of human steps. Hussain says, "A prime example is the removal of a scan step to associate carton UCC128 labels to a pallet ID label, instead allowing for the system's double cubing technology to front-end load the pallet build. Minor tweaks to label indicators and a re-train to the floor completed the process."

continued

Fast Facts

- √ **90%** of Best-in-Class warehouses practice cycle counting to maintain inventory control, versus 79% of all others
- √ **71%** of the Best-in-Class employ advanced picking methodologies, versus 48% of all others

Case Study — Belkin International

As a result of these efforts, Belkin has achieved a 10% headcount reduction to date, while maintaining pallet accuracy and allowing for easier customization of pallet builds to meet customer specifications. As volume spikes, Hussain expects these results to continue, eventually obtaining their overall reduction goal of 24%.

Moving forward, Belkin is looking for further avenues to improve warehouse operations. They have already begun replacing older hand-held devices with newer, higher-frequency models that will allow them to implement wireless label printers for certain parts of their operations. For new projects, one potential option is pick-to-light (or other broken case picking) processes, though this accounts for only a small portion over the overall volume. Another area of interest concerns "deeper activity tracking in certain departments. Some functionality exists, but fear of slowing flow has been a roadblock to further investigation," says Hussain.

Other areas of interest include further investigation of slotting, more dynamic use of locations, and potential implementation of basic data gathering technologies. "Lower operational costs are always the initial drivers, [and] they have to be quality neutral or offer an improvement." The current economic climate is weighing on these efforts, however. "In all cases, no ROI, no go. I am saving my battles for capital on replacing or overhauling current infrastructure – at least until things change on the business front," concluded Hussain.

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 its results to improve its business). These characteristics (identified in Table 4) serve as a guideline for best practices, and correlate directly with Best-in-Class performance across the key metrics.

Table 4: The Competitive Framework

	Best-in-Class	Average	Laggards
Process	Min/max replenishment		
	85%	72%	61%
	Ability to send electronic advance ship notices (ASNs)		
	76%	57%	34%
	Ability to print customer-compliant labels for outbound product		
	63%	48%	40%
	Direct order-picking with mobile devices		
	56%	48%	40%
Organization	Central direction of processes in the warehouse (as opposed to letting operators plan and direct their own work)		
	73%	58%	50%
Knowledge	Know the contents of every bin in the warehouse in real-time		
	81%	61%	36%
	Track warehouse transactions to specific employees		
	78%	70%	59%
Technology	Commercially developed Warehouse Management Software (WMS)		
	64%	58%	49%
	Currently using the following technologies:		
	▪ Ruggedized mobile computers - 51% ▪ Conveyor-based picking systems - 39% ▪ Automated shipping sortation - 29% ▪ In-motion manifesting systems - 25% ▪ Pick-to-light - 20% ▪ Speech-based warehousing - 17%	▪ Ruggedized mobile computers - 39% ▪ Conveyor-based picking systems - 33% ▪ Automated shipping sortation - 25% ▪ In-motion manifesting systems - 13% ▪ Pick-to-light - 17% ▪ Speech-based warehousing - 12%	▪ Ruggedized mobile computers - 29% ▪ Conveyor-based picking systems - 13% ▪ Automated shipping sortation - 8% ▪ In-motion manifesting systems - 4% ▪ Pick-to-light - 11% ▪ Speech-based warehousing - 5%
Performance	Measure and post performance metrics to the warehouse staff on a monthly or more frequent basis		
	81%	74%	43%

Source: Aberdeen Group, July 2009

Capabilities and Enablers

Based on the findings of the Competitive Framework and interviews with end users, Aberdeen's analysis of the Best-in-Class demonstrates that they exhibit greater capabilities across five areas: process, organization, knowledge management, performance measurement, and technology.

Process

Higher utilization of advanced methodologies for both replenishment and picking differentiates the Best-in-Class from their peers. Although examples such as min / max replenishment (above) illustrate the differing adoption rates across maturity classes for specific approaches, the salient point here is higher-level. The percentage of respondents employing advanced methodologies is valuable by proxy, as an indirect measure of operational maturity that would be problematic to query directly. These companies have in place systems that are capable of directing these processes, which, in turn, requires the collection, storage, and manipulation of inventory and order-specific information. The end results of this effort are improved labor efficiency, increased pick accuracy, and lower operational costs.

The ability to print both Advance Ship Notices (ASNs) and customer-compliant labels illustrate a level of communication with parties outside of the warehouse's four walls that are directly impacted by internal performance. Communication of ASNs provides visibility to order recipients, allowing them to make informed planning decisions for receiving and processing incoming shipments. Printing customer-compliant labels for outbound product provides added value for the recipient by removing steps from their processing operations. In both instances, communication is key to providing value to the warehouse's customers, whether it is an end-customer, or a company's own retail outlet.

"My company deals with mission critical equipment support, so we believe improvement in the automation of the tracking process using methodology like RFID allows us to better coordinate supply chain with the servicing event for our clients. This serves to improve process efficiency and reduce labor costs on both the supply chain and service delivery components of the repair event. This is especially critical in our current environment where we are trying to do more with less while not degrading customer service."

~ Business Process Management Consultant, Large North American Manufacturer

Organization

Central direction of processes in the warehouse (utilized by 73% of the Best-in-Class, versus 58% and 50% for the Industry Average and Laggards, respectively) is a foundational element for truly organized warehouse operations. This structure allows for labor efficiency through the design of picking tours, inventory accuracy through intelligent cycle counting, and when combined with mobile technology, allows for dynamic workflow changes based on incoming orders, to provide just a few examples. It is a sign of operational maturity, which once in place, allows an organization to make intelligent changes to warehouse processes (i.e., directing one worker to pick a single, expedited order while remaining staff continue regular zone assignments).

Knowledge Management

For employee-specific transaction tracking, and real-time knowledge of inventory on the bin level, visibility is key. Real-time inventory visibility (81% for the Best-in-Class, as compared to 61% for Industry Average and 36% for

Laggards) provides managers, or automated systems, with the information necessary for accurate reordering and timely replenishment, while also serving as a foundation for performance analysis. The ability to relate order processing transactions to specific workers (78% for the Best-in-Class, versus 70% and 59% for the Industry Average and Laggards, respectively) also provides valuable data for performance analysis. Capturing data at this level of granularity, when coupled with individual worker profiles, can also enable underlying systems to intelligently assign tasks based on each worker's strengths or physical limitations.

Performance Management

Best-in-Class organizations are more likely than both Industry Average and Laggards to measure and post warehouse performance metrics for the warehouse staff on a monthly, or more frequent, basis (81% versus 74% versus 43%, respectively). Managers cannot expect to improve performance without a solid understanding of the current state of operations. By the same token, warehouse staff cannot be expected to improve performance without knowledge of their current pick and error rates, and guidance as to how those measures compare to pre-defined targets. As mentioned previously, in order to judge worker performance, warehouse managers must have the ability to track transactions to specific employees. With that foundation, they can integrate monitoring and reporting functionality that will calculate and track performance metrics for each individual. This capability is a sign of a more mature operation, as illustrated in the high adoption among Best-in-Class and Industry Average organizations.

Technology

Best-in-Class companies show increased adoption of warehouse technologies across the board, from underlying commercial WMS (64% for the Best-in-Class, as compared to 58% for Industry Average, and 49% for Laggards) to supporting technologies that enable more efficient order processing. Although this report is focused on the hardware side of warehouse operations, a siloed analysis would ignore an important reality: WMS software provides a solid data foundation for visibility, analysis, and direction, and its benefit to performance is only enhanced by integration with material handling and order fulfillment solutions.

Ruggedized mobile computers enable two-way communication between the warehouse management system and the workers throughout the building. They allow tasks to be assigned, and dynamically updated, in real-time, without requiring the worker to return to the staging area. They provide an intelligent interface between the worker and the underlying data, increasing both pick accuracy and labor efficiency.

Building on this ability, both pick-to-light and speech-based (pick-to-voice) systems simplify the fulfillment process for warehouse staff, guiding them to correct locations, relaying item and quantity information, and providing confirmation through means such as bar-code scanners or check digits (location-specific IDs) to ensure first-time pick accuracy. This increased

accuracy reduces errors, and with them, the associated costs of processing returns, and repeating the picking process.

Automated shipping sortation and in-motion manifesting systems both reduce the manual labor required to move completed orders from the warehouse to the customer. Sortation systems identify bar-coded packages, and direct them to a predefined location. In-motion manifesting systems, also using barcode identification, match each package with the intended recipient of the order, weigh them, and apply appropriate shipping labels and postage. These systems integrate with an underlying WMS, and can apply existing rules to identify a preferred method and carrier for shipment to secure the most beneficial rate.

Picking Technology Overview - Finding the Right Fit

There is no silver bullet for achieving superior performance in the warehouse. When evaluating potential investments, the focus should be on which capabilities are needed in order to achieve the desired result, and not on which types of solutions promise to deliver those results. Managers must thoroughly evaluate their operations to ensure that the chosen solution addresses their specific needs: pallet, case, or piece-picking; required storage density and architectural constraints; applicability to fast- versus slow-moving inventory; etc. The summary to follow provides a brief overview of available technologies, ranked based on the percentage of survey respondents currently utilizing each option:

Ruggedized mobile computers (39% current adoption) offer a wide range of functionality, from directed picking and barcode scanning, through integration with other technologies such as RFID. This category includes both handheld and forklift-mounted devices. Running on mobile operating systems, these devices offer adaptability and expandability through continued application development and integration with existing systems.

Conveyor-based picking (28% overall adoption) can improve productivity in zone-based batch picking operations. For high-volume items destined for multiple orders, implementation of a conveyor-based system can offer significant improvements over a baseline of discrete picking.

Pick-to-light solutions (16% overall adoption) help mobile workers to accurately identify correct items, pick / put-away appropriate quantities, and communicate confirmation with a centralized management system. Absent integration with other technologies, they provide little overall direction, as workers must be within a short distance of the display for visual recognition. Common installations, however, will utilize mobile devices to guide the process end-to-end.

Continued

Picking Technology Overview - Finding the Right Fit

Carousels (14% adoption for vertical, 10% for horizontal) offer piece-to-picker automation, increasing labor efficiency by removing (or minimizing) travel time in the picking process. Their efficiency gains should be evaluated against both their implementation cost and their impact on future operations. Carousel-based systems offer significant improvements, but are also significant infrastructural investments.

Automated Storage and Retrieval Systems (AS / RS) (12% adoption for pallet-based, 11% for case-based) offer significant benefits for warehouses large enough to accommodate their size. In combination with conveyors and sortation systems, these solutions can automate the vast majority of case- and pallet-level order fulfillment. Mini-load AS / RS provide similar functionality at the tote-level, interfacing with other equipment to enable an efficient human-based piece-picking operation.

Speech-based (pick-to-voice) solutions (11% overall adoption), which feed information to mobile workers via a wearable headset, afford the same capabilities as pick-to-light - namely, wireless communication with and direction of warehouse tasks. Because the information is communicated through a wearable device, if combined with RF location, these solutions can also direct a worker's path to the appropriate items prior to picking. Hand-scanning via supplemental mobile devices or spoken confirmation ensures that the intended items and quantities are accurately picked, and that information is relayed back to the controlling application.

Robotics (4% overall adoption for picking-specific applications) is only a broad categorization, as automated solutions exist that are geared towards very different operations. Aggregating all of these offerings under one umbrella term does justice to none of them. Their promise, and feasibility, should be evaluated individually, based on their specific benefits. Some solutions focus on the movement and staging of pallet-based loads (similar in functionality to AGVs) supporting either full-pallet orders, or subsequent break-down and put-away. Others serve to enable more efficient picking processes by bringing items to, and taking completed orders from, picking stations - which may also integrate with other picking technologies such as pick-to-light. Still others aim to completely automate the piece-picking process, rather than simply enabling more efficient human productivity.

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Chapter Three: Required Actions

Whether a company is trying to move its performance in warehouse operations from Laggard to Industry Average, or Industry Average to Best-in-Class, the following actions will help spur the necessary performance improvements:

Laggard Steps to Success

- **Implement a WMS** to build a strong information foundation. Nearly half of all Laggards (47%) report using either spreadsheets or a manual system to manage the warehouse. Future improvements will be dependent upon the ability to integrate additional functionality with underlying systems, whether through integration with other applications or support for data exchange with mobile devices. In addition to realizing immediate performance improvements, investment in a WMS will provide flexibility for future expansion.
- **Leverage advanced picking and replenishment methodologies.** Best-in-Class companies are 64% more likely to employ advanced replenishment methods (demand-based, min / max, interleaved, etc.), and are 135% more likely to use advanced picking methods (batch, zone, cluster), as compared to Laggards. Labor efficiency is not simply a function of speed. Rather, it is a measure of the intelligent organization and deployment of limited resources to accomplish a level of work. Alternative methodologies allow warehouse staff to work smarter, achieving success through proper task design.
- **Implement automated data capture**. Laggard organizations are 36% less likely than the Best-in-Class to utilize barcode scanners, speech, RFID, or similar technologies to confirm transactions in real-time. Manual data entry leads to higher levels of inaccuracy which, in turn, compounds problems down the line. Avoid this garbage in, garbage out scenario, while providing accurate and reliable data to your warehouse systems.

Industry Average Steps to Success

- **Increase external communication and collaboration.** Best-in-Class organizations are 35% more likely than the Industry Average to able to receive goods without using paper documents. This method of improving supplier communication streamlines in-bound processing and increases inventory visibility and accuracy from the moment goods enter the warehouse. Similarly, the Best-in-Class are 53% more likely than the Industry Average to be able to send electronic ASNs. Improving communication with customers (whether internal or external) through electronic ASNs will not

Fast Facts

√ **73%** of the Best-in-Class direct warehouse processes centrally, rather than allowing individual operators to direct and plan their own work

√ **71%** of Best-in-Class companies can track inventory attributes (such as lot number, serial number, size, color, etc.) in real-time

only improve outbound processing, but also improve customer satisfaction by allowing recipients to plan for their own receiving and processing operations.

- **Remove manual data entry.** Industry Average companies are 37% less likely to have the ability to confirm transactions with automated data capture, relative to the Best-in-Class. Utilizing barcode-, speech-, or RFID-based solutions to confirm picking, put-away, and other warehouse tasks improves accuracy and reduces error costs by minimizing the influence of human error in the confirmation process. Improved accuracy at the point of confirmation improves overall inventory accuracy by limiting the possibility of introducing error into the system.
- **Implement event management functionality.** As compared to the Best-in-Class, Industry Average companies are 68% less likely to have processes in place to notify appropriate personnel when certain warehouse events take place (event management). Effective event management improves responsiveness and reduces the potential service impact of exceptions within the warehouse. This capability removes the manual steps of incident discovery and response routing, and allows for automated resolution. While specific implementations may vary in how they provide this functionality, common components will include automated data entry, rule-based exception identification, and integration with warehouse communications to appropriately direct staff in resolving the issue.
- **Look beyond simple fulfillment, and automate value-added processes.** Best-in-Class enterprises are 52% more likely than the Industry Average to automate value-added services within the warehouse. Whether through centrally-directed kitting via mobile devices, or printing customer-compliance labels for out-bound packages, warehouse technologies offer the ability to automate processes that may be manual for receiving customers, increasing revenue while simultaneously their decreasing costs, and building stronger customer relationships in the process.

"Part of my wish list is to improve the information and reporting available for our warehouse and delivery operations, because improving upon the information available will not only help us make better warehouse and delivery decisions, but also better business decisions. [By] expanding our RF capabilities within the warehouse, I also expect to have a better view of our internal operations with the potential to identify non-value added tasks, as well as improve data available to make good decisions: having those time stamps for certain transactions will allow us to better measure productivity and accuracy at the SKU and operator level."

~ Manager, Logistics / Supply Chain, Large North American Chemicals Manufacturer

Best-in-Class Steps to Success

- **Improve mobile warehouse communications.** While 56% of Best-in-Class organizations have direct picking operations via mobile devices, only 42% have the ability to communicate with workers wirelessly, in real-time. Delayed communications hamper responsiveness. In high-volume operations, this can lead to increased re-processing costs, as unneeded items are picked or needed items are passed over initially. Further, interleaved processes require the ability to locate and direct workers in real-time in order to maximize efficiency in warehouse processes.

- **Implement labor and task management functionality.** Best-in-Class organizations are, by definition, high-performing operations - but there is always room for improvement. Only 37% of the Best-in-Class currently employ solutions that allow them to track task times for benchmarking against system-calculated times. This systematized approach provides true labor performance analytics, and provides data not only for current-versus-ideal comparisons, but also to serve as a historical baseline for analysis of incremental improvements in future periods.
- **Increase utilization of cross-docking**, where appropriate, to reduce unnecessary duplication of effort and preserve storage area flexibility. For the 74% of Best-in-Class companies not currently utilizing cross-docking, there is reason for self-evaluation. Though not suited for all operations, cross-docking may prove quite beneficial for those enterprises with a significant percentage of outbound orders comprised of multi-case (consolidated) and full-pallet loads. Even if certain inbound products cannot be matched with an existing outbound order (for 'textbook' cross-docking), the same benefit can be realized with the creation of a dedicated area of pallet storage within close proximity to the loading area, which can accommodate bulk product with steady, predictable demand.

The Five Pieces of Information Warehouse Managers Must Know

For every discrete transaction in the order fulfillment process, there are five fundamental pieces of information, without which a warehouse cannot achieve superior performance:

- **Who** is responsible? Without attributing product movements to an identifiable warehouse employee, meaningful performance analysis is impossible.
- **What** is moving? This is a fundamental element that is present in every organized system to some degree. Mature organizations can capture this in the early stages, beginning with ASNs from their own suppliers or through connectivity with the manufacturing organization within their own company.
- **Where** is it going? Nothing should move without a predetermined destination, whether totes of picked pieces moving to a staging area, cases moving towards palletization, or incoming pallets being held for cross-docking.

continued

The Five Pieces of Information Warehouse Managers Must Know

- **When** was it picked up, and when did it arrive? This forms the basis for accurate performance measurement. Also, proper planning will allow for deciding when it *should* be picked up, and when it *should* arrive. This information allows for intelligent task assignment and process prioritization.
- **How** (many)? Integrating item counting into regular processes will help managers not only be more responsive to exceptions, but will also help them to better plan their operations to avoid problems like stock-outs from occurring.

For those questioning the omission of 'why' from this familiar analytical construct, the answer is simple: the why for every transaction is the same as the why for all warehouse processes - to improve warehouse operations and better serve the organization's customers.

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Appendix A: Research Methodology

In June 2009, Aberdeen examined the use, the experiences, and the intentions of more than 250 enterprises using warehouse automation in a diverse set of enterprises.

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

Responding enterprises included the following:

- *Job title:* The research sample included respondents with the following job titles: C-level Executive (6%); EVP / SVP / VP (9%); General Manager (7%); Director (20%); Manager (37%); Consultant (5%); and other (16%).
- *Department / function:* The research sample included respondents from the following departments or functions: logistics / supply chain (42%); operations (25%); business process management (6%); procurement (4%); manufacturing (4%); and other (19%).
- *Industry:* The research sample included respondents from the following industries: distribution (13%); consumer goods (12%); food and beverage (11%); transportation / logistics (8%); retail (8%); general manufacturing (5%); wholesale (5%); automotive (4%); industrial equipment manufacturing (4%); and other (30%).
- *Geography:* The majority of respondents (75%) were from North America. Remaining respondents were from the Asia-Pacific region (11%), EMEA (13%), and South / Central America and the Caribbean (1%).
- *Company size:* Thirty-two percent (32%) of respondents were from large enterprises (annual revenues above US $1 billion); 40% were from midsize enterprises (annual revenues between $50 million and $1 billion); and 23% of respondents were from small businesses (annual revenues of $50 million or less).
- *Headcount:* Forty percent (40%) of respondents were from large enterprises (headcount greater than 1,000 employees); 38% were from midsize enterprises (headcount between 101 and 1,000 employees); and 21% of respondents were from small businesses (headcount between 1 and 100 employees).

Study Focus

Responding supply chain and operations executives completed an online survey that included questions designed to determine the following:

√ The degree to which automation is employed in their warehouse operations and the financial implications of the technology

√ The structure and effectiveness of existing automation implementations

√ Current and planned use of warehouse 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 in warehouse operations, and to provide a framework by which readers could assess their own management capabilities.

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Table 5: The PACE Framework Key

Overview
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: **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) **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) **Capabilities —** the business process competencies required to execute corporate strategy (e.g., skilled people, brand, market positioning, viable products / services, ecosystem partners, financing) **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)

Source: Aberdeen Group, July 2009

Table 6: The Competitive Framework Key

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

Source: Aberdeen Group, July 2009

Table 7: The Relationship Between PACE and the Competitive Framework

PACE and the Competitive Framework – How They Interact
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.

Source: Aberdeen Group, July 2009

Appendix B:
Related Aberdeen Research

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

- *Five Key Steps to Optimizing Warehouse Management*; February 2009
- *Distribution Center Strategies for Today's Economy: Managing Growth Without Adding Labor or Space*; November 2008
- *Warehouse Automation: How to Implement Tomorrow's Order Fulfillment System Today*; October 2008
- *Agile Logistics: Transforming the Distribution Center*; May 2008
- *Warehouse Management Software: Five Key Capabilities for Every Distribution Center*; December 2007
- *High Octane Warehouses–How Top Companies Use Capabilities Like Labor Management, Slotting, and, Speech-Based Warehousing*; August 2007
- *Technology Strategies for Multi-Site Warehouse and Order Management*; April 2007
- *Warehouse Automation–What's Really Working For Pallet, Case, and Piece Pick Operations*; January 2007

Information on these and any other Aberdeen publications can be found at www.aberdeen.com.

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