

# Taking Advantage of Apps and App Modernization in Warehousing

Mobile applications can deliver on key metrics that are critical to supply chain optimization and warehouse efficiency



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# EXECUTIVE SUMMARY

Global footprint, reduced response times, cost and demand volatility, regulatory pressures, and a constantly changing supplier landscape continue to impact logistics complexity. Along with the increased complexity, there is increasing pressure on financial metrics like distribution costs, asset utilization, working capital, cash flow, and transportation spending as a percent of sales. As complexity increases, manufacturers and distributors are seeking new ways to optimize customer service requirements with rising labor costs. Today's warehouses are more complex than they were 10 years ago. Products and channels have proliferated, late-stage customization requirements have increased, the number of temperature environments has grown (e.g., cold chain, frozen etc.), and warehouse employee turnover remains high. Customer service requirements have increased; as a result, a greater percentage of products are picked by either the "each," the "case," or the "layer" in the modern warehouse. Optimizing warehouse performance is becoming critical for organizations involved in the manufacturing, distribution, or sale of goods as they must find new ways to improve on-time shipment and receipts.

Mobility solutions for warehousing can either be a part of an overall IT strategy or a warehouse-focused engagement. Irrespective of the approach taken, deploying mobile solutions in a warehouse requires special care across numerous aspects due to its process-intensive nature, coupled with the fact that it is a core component of the manufacturing value-delivery mechanism. Thus, it is imperative that the deployment blends in smoothly with day-to-day activities and causes minimal disruption. Deploying mobility in a warehouse requires a disciplined approach to achieve its full potential. VDC data showed that 53% of IT decision makers supporting warehouse operations viewed their mobility deployments as immature—furthermore, VDC's data also showed that 56% of organizations plan on upgrading their existing fleet of mobile devices because these devices are nearing their end of life and/or the old age of their existing devices. In addition, the motivation to upgrade applications to a more visual and modern user interface was cited by one in four respondents as a critical factor influencing their upgrade decision. A critical component of today's digital transformation strategies is migrating legacy mobile applications running on aging equipment to take advantage of more sophisticated and functional modern mobile solutions and their intuitive interfaces. Today's warehousing professionals face big changes in the ways warehouses, distribution centers and the entire supply chain operate. More facilities and larger spaces demand modern mobile communications and application access virtually everywhere on or off the floor.

This white paper addresses the evolution of mobility in warehousing and outlines the evolving requirements shaping the future of mobile applications in these deployment environments. The paper is designed to answer the question, "What are the issues and barriers associated with implementing modern mobile devices and applications to support warehouse operations."

*Exhibit 1: Methodology*

Research Objectives	Research Methodology
<ul style="list-style-type: none"> <li>▶ Research mobile requirements for warehouse applications</li> <li>▶ Evaluate next-generation mobile OS migration plans</li> </ul>	<ul style="list-style-type: none"> <li>▶ Online survey focused on technology decision makers supporting mobile solutions for warehouse operations</li> <li>▶ Survey was fielded in August of 2017</li> </ul>
Respondent Details	Key Research Topics
<ul style="list-style-type: none"> <li>▶ 143 qualified survey respondents</li> <li>▶ Mix of respondents in North American and in Europe</li> <li>▶ Respondents were responsible for the selection, purchase, and/or support of mobile solutions in warehouse deployment environments</li> <li>▶ A mix of industries was represented</li> </ul>	<ul style="list-style-type: none"> <li>▶ Current investment in mobile solutions supporting warehouse operations</li> <li>▶ Operational challenges faced and addressed</li> <li>▶ Migration plans for existing legacy mobile solutions</li> <li>▶ Next-generation mobile OS migration plans</li> </ul>

Source: VDC|Research, 2017

The move towards omnichannel transactions has forced organization to make investments in a variety of technology to improve their inventory control, be more flexibility and faster, and achieve more accurate fulfillment. These factors are contributing to the need to convert warehouses and distribution centers into assets for competitive differentiation; VDC's data shows that mobility with be front and center in this shift. Exhibit 1 details the investment priorities of technology decision makers in warehouse operations.

*Exhibit 2: Investment priorities for materials handling equipment technologies and solutions*



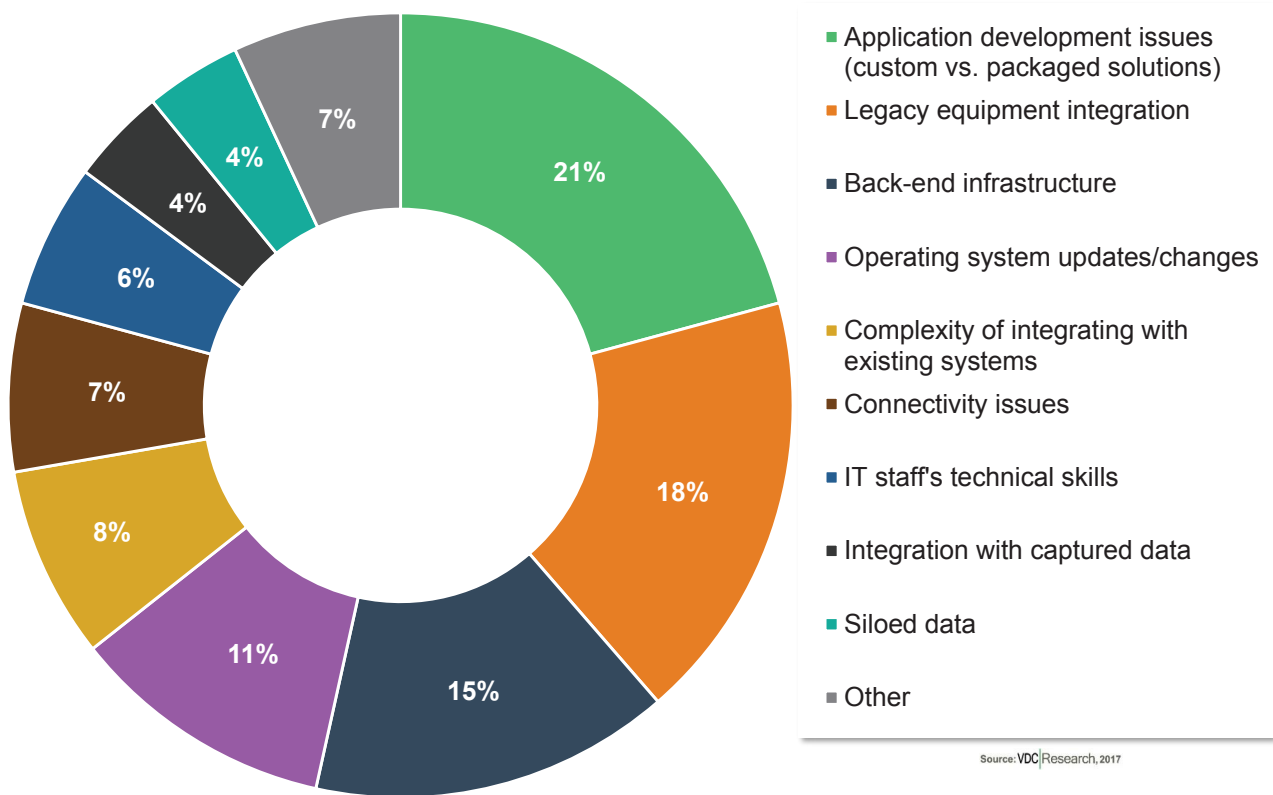
Our discussions with warehousing professionals revealed that they remain laser focused on cost reduction; however, what is changing is the reliance on modern mobile platforms and data collection technologies. Technology must play an important role in helping to improve efficiency and accuracy in supply and distribution chains.

## **Simplifying and Benefiting from App Migration**

More than half (56%) of the warehousing professionals we surveyed plan to upgrade their existing fleet of mobile devices because these devices are nearing their end of life and/or the old age of their existing devices. In addition, the motivation to upgrade applications to a more visual and modern user interface was cited by one in four respondents as a critical factor influencing their upgrade decision. This is notable, as many ruggedized mobile deployments used in warehouse deployments are text-oriented and keyboard-centric solutions.

Modern mobile platforms such as Android are beginning to make more sense in warehouse deployment environments due to tenured hardware vendors such as Bluebird, CIPHERLAB, Honeywell, Panasonic and Zebra Technologies working closely with Google's Android operating system and delivering ruggedized solutions to the market. While terminal emulation and web applications have a long and proven history in these deployment environments, solutions to seamlessly port these application to platforms such as Android are not only commercially viable, but are enabling organizations to automate workflows and keep their workers productive. Exhibit 2 details the technical obstacles warehousing professionals are contending with as they attempt to implement new technologies into their deployment environments.

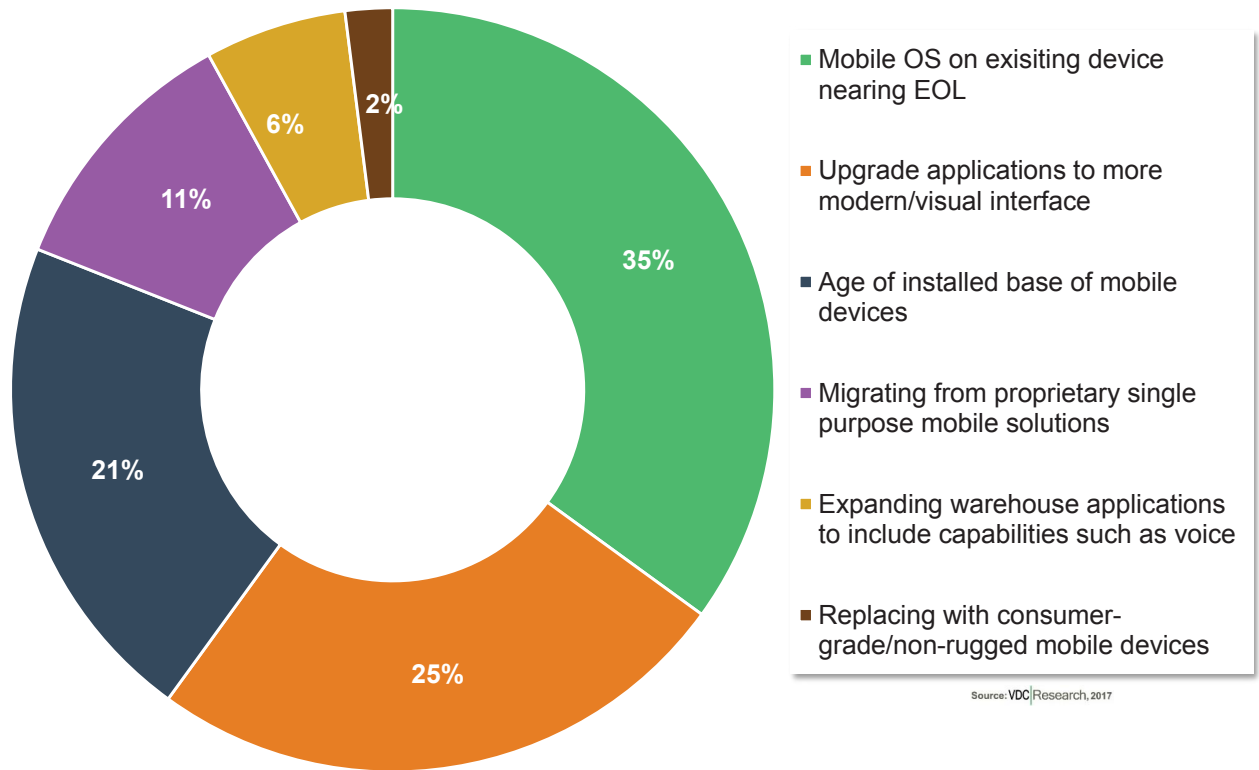
Exhibit 3: Technical obstacles to implementing new technologies in warehouse environments  
(Percent of Respondents)



VDC data showed that 53% of IT decision makers supporting warehouse operations viewed their mobility deployments as immature and/or outdated—furthermore, VDC’s data also showed that 56% of organizations plan on upgrading their existing fleet of mobile devices because these devices are nearing their end of life and/or the old age of their existing devices. Organizations have made sizeable mobile technology investments to support their warehouse operations; however, Microsoft’s WinCE or Windows Mobile not only remain in place, but are nearing their end of life.

Ruggedized handheld computers have been the de facto hardware platform used for data collection and processing across a variety of workflows in virtually every industry. These devices are widely deployed in warehouses and distribution centers for inventory and material management applications, courier delivery drivers supporting parcel delivery verification, and beverage distributors supporting digital exchange. Organizations rely on these devices to conduct business critical applications and operations in real time. However, the dominant OS supporting this ecosystem of devices is quickly approaching its end of life, leaving current customers with no clear migration path forward. Put another way, no matter which OS platform an enterprise looks to deploy next to support its business-critical applications, each application will require recoding and rework, as it will not be compatible with modern mobile platforms. Moreover, these legacy devices fall well short of today’s mobile standards across all performance, functionality and usability criteria, ultimately limiting their potential impact on business operations. VDC has tracked these deployments, and estimates that there are 15 to 20 million legacy rugged handheld devices currently deployed supporting various line-of-business (LOB) applications. Exhibit 3 shows the primary factors that drive the decision to upgrade mobile deployments in warehouse environments.

Exhibit 4: Primary Factors Driving Decision Making Relating to Mobile Platform Upgrades  
(Percent of Respondents)



Microsoft's Windows CE and Windows Embedded Handheld 6.5 have long a tenure as the OS platforms of choice for the majority of these deployment scenarios. The portfolio of devices and form factors is broad, development tools are mature, and the developer community is sizeable. In addition, with support from Microsoft for the past decade, businesses have been able to effectively manage and maintain their deployments (often longer than expected). But change has been forced on this ecosystem, with Microsoft's end of life of its prolific Windows platforms looming, and the emergence of a new generation of modern Android-powered purpose-built ruggedized handheld devices not to mention the flood of smartphones being used in various corporate settings.

Below are several important dates that should be marked on your calendar:

- > June 10, 2018 — Windows Embedded CE 6.0 will be End of Life
- > June 9, 2019 — Windows Embedded 8.1 Handheld will be End of Life
- > January 14, 2020 — Windows Embedded Handheld (WEH) 6.5 will be End of Life

Preparing for Microsoft's most prolific Windows Embedded Operating Systems End of Life is essential for any organization maintaining these deployments; the devices impacted are often required for day-to-day job-related activities/functions of their users.

## Migration to Modern Mobile Platforms

Each and every warehouse application that you migrate brings an opportunity to improve upon or transform its user experience; regardless of which OS (or OSes) you decide to support and subsequently migrate your applications to. While mobile initiatives are a key priority, it is important to recognize that developers on staff typically do not have the luxury of devoting all of their time to developing just mobile applications. Additionally, mobilizing and integrating manual business processes and workflows using modern mobile development platforms and tools is not only complex but can also be costly, as many legacy applications used in warehouse deployments are not being abandoned and new mobile applications require a high degree of specialized skills.

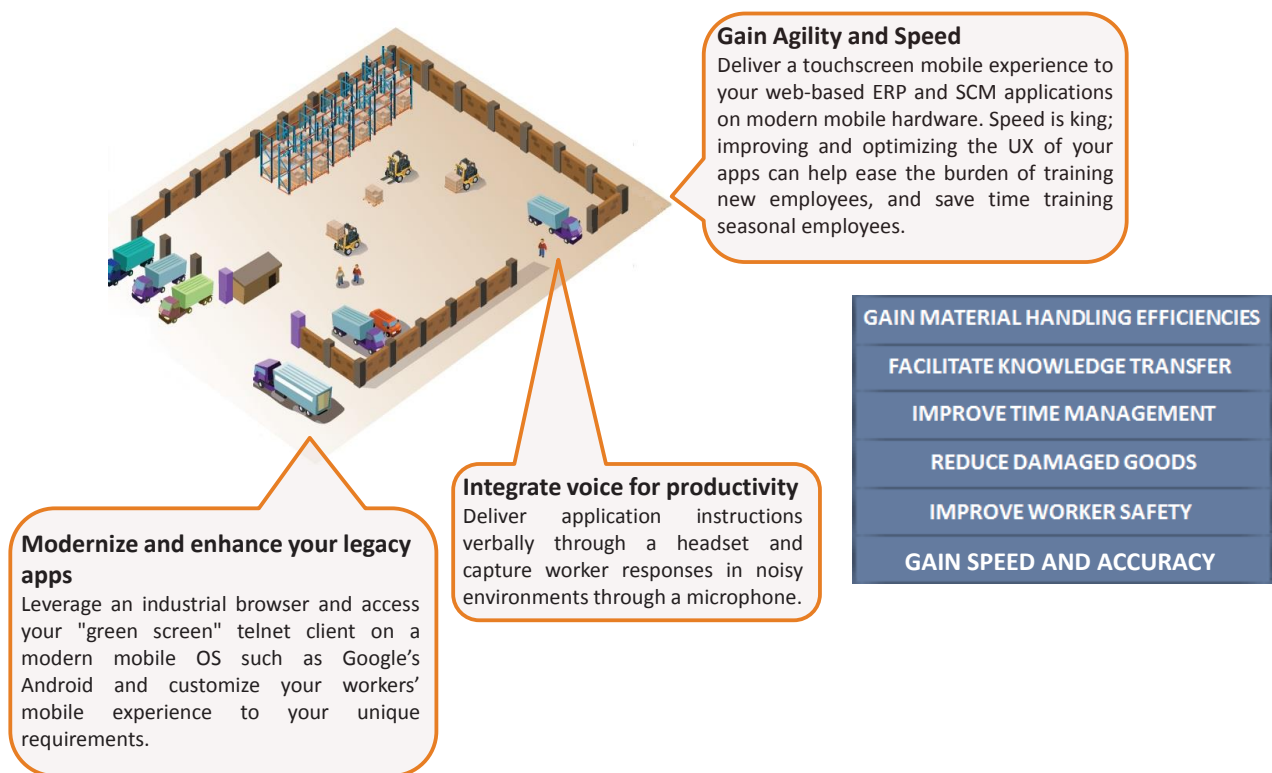
Migrating your legacy application will require a significant amount of work and resources; your organization will quickly discover that designing, developing, integrating, managing, and maintaining said applications remains a significant task (depending on your talent/staffing, and your device landscape). Unfortunately, creating new mobile applications that are properly integrated with your legacy systems requires both a high degree of specialized skills and additional software. One of the most complex elements of modernizing and migrating aging/legacy mobile applications typically surround the manual nature of the integration work, which frequently involves time-intensive and costly manual coding. Many large enterprises have traditionally supported this through internal teams and are now sitting on often millions of lines of custom code with no clear documentation that ultimately needs recoding to leverage next generation platforms.

## Industrial Browsers Can Ease the Transition to Modern Mobile Platforms

While planning for the end of life of the aforementioned legacy Microsoft platforms is likely underway, there are commercially viable solutions that can help ease the transition to modern mobile platforms. Industrial browsers have been architected to incorporate critical data-capture technologies that are critical to the infrastructure and workflows in warehouse environments. When considering that many of the aforementioned legacy Windows applications are terminal screens, using an industrial browser is a logical means of porting legacy applications to modern mobile platforms; not only do these solutions support for custom keyboards and the hardware interfaces that are a necessity in warehouse operations (e.g., barcode scanning, signature capture, and RFID) they offer an opportunity to alleviate the pain of re-writing legacy applications, and will dramatically simplify the transition to new mobile platforms.

Bringing existing terminal emulation, telnet, and web applications to modern mobile platforms is inevitable. Industrial browser solutions can make modernizing host applications seamless, as they are able to automatically convert a host application's text interface and deliver the modern touchscreen experience that a growing segment of your workforces is beginning to expect. Furthermore, these solutions have been designed to be customized so that onscreen keypads are intuitive; they also provide future-proof functionality, by enabling administrators the ability to deliver new enhancements that can speed business-critical workflows. Exhibit 4 details the mobile modernization opportunities available that are available in warehouse deployment environments.

*Exhibit 5: Capitalizing With Mobile Technologies in Warehouse Deployments*

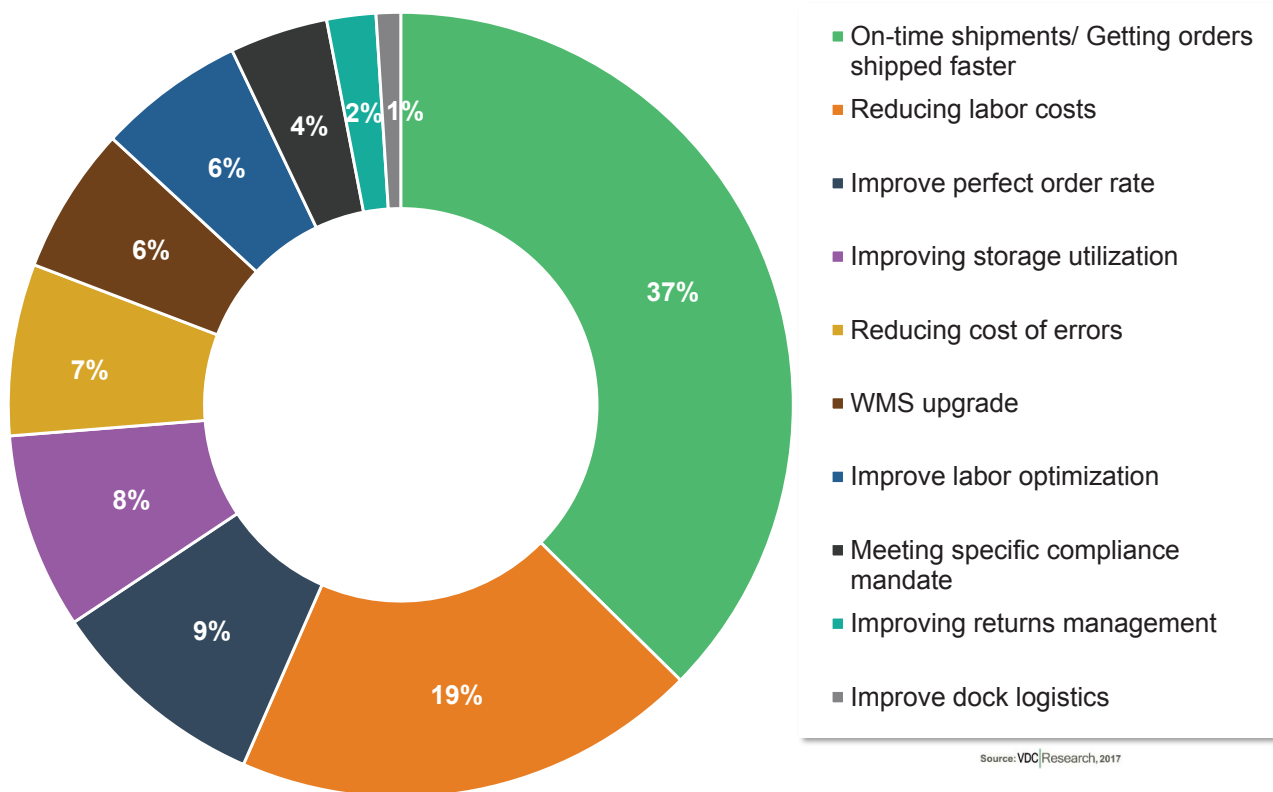


Modern mobile solutions offer opportunities to gain agility and speed, and can help in evolving warehouse professionals move away from processes that are governed by manual labor and paper-based tracking to one in which technology plays a vital role in better utilization of available resources and growing space restrictions. For large consumer goods retailers such as Target, Stop & Shop, Sobey's, TJX, and Walmart, today's business challenges leave them with no choice but to invest heavily in automation for their warehouse and supply chain operations. Efficiency in inbound/outbound handling, storage, inventory control as well as "pick and fill" is critical to these organizations; slow and inaccurate receiving, sortation and put-away is not an option.

Deployments of handhelds, wearables, scanners and other multi-modal devices have without question delivered productivity gains; but our research shows that the application environment in warehouse operations has been static for many years, with companies continuing to rely heavily on computer terminals with batch connectivity and legacy software to manage their operations, —even the basics of pen and paper. As depicted in Exhibit 4, innovative mobile solutions offer the opportunity to leverage your present IT infrastructure and gain access to your legacy systems, such as "green screen" telnet clients, on a modern mobile platform. New mobile platforms will be required as our workforce ages, and new entrants to the workforce will begin to expect modern mobile solutions.

Organizations in the warehouse and logistics industry face significant pressures to improve their warehouse performance; Exhibit 5 shows the areas which represent the primary initiatives heading into 2018.

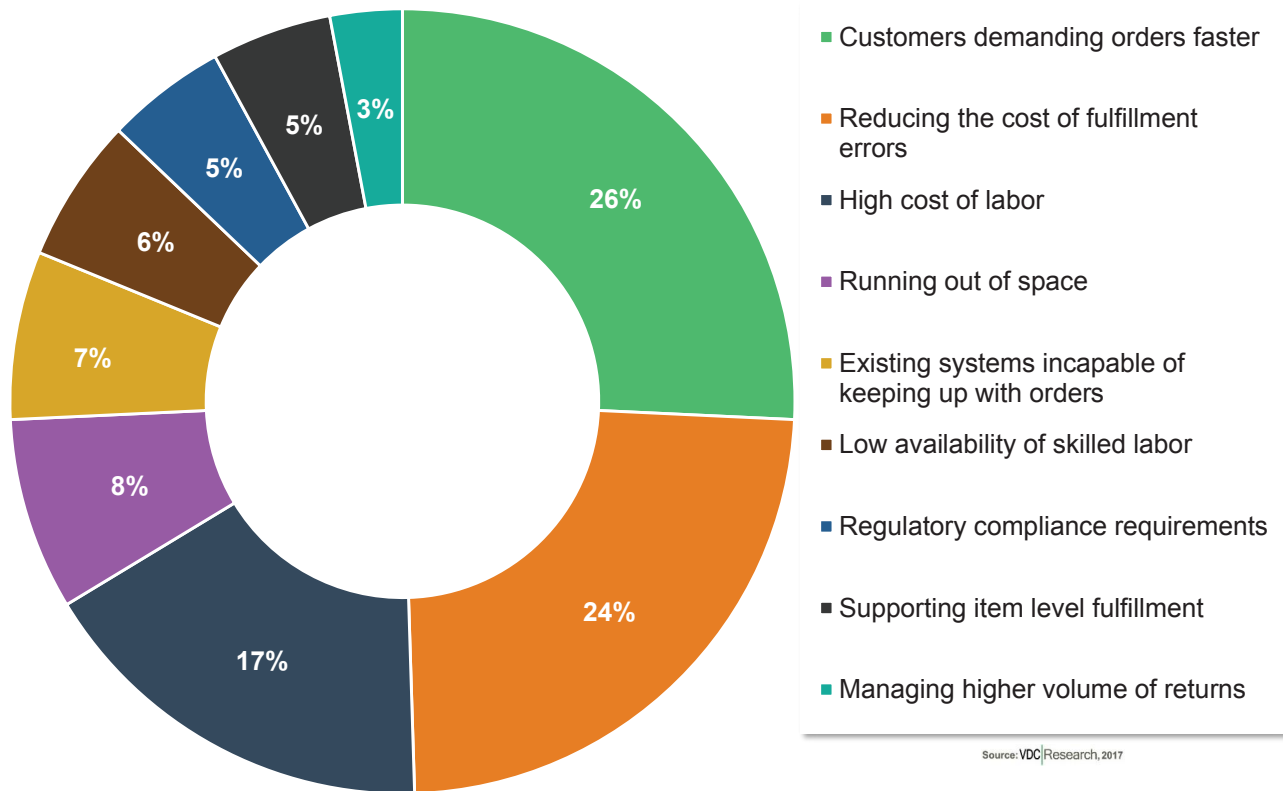
*Exhibit 6: Primary Warehouse Improvement Initiatives for 2018  
(Percent of Respondents)*



VDC's data shows that the need for speed is unmistakable, and has warehouse professionals pursuing technologies that can help speed fulfillment and reverse logistics functions. The right technologies offer opportunities for efficiency gains across the spectrum of daily warehousing workflows including: inbound handling, storage and inventory control, pick and fill and outbound handling. These tasks have traditionally been performed in isolation, using separate teams for each function. Our research shows that warehouse professionals have begun to put processes in place to consolidate

many of these processes through task interleaving whereby activities are integrated across several processes; this has opened up an opportunity for increased efficiency and improved productivity. Exhibit 6 details the leading pressures that are driving investments in mobile warehousing solutions.

*Exhibit 7: Leading Pressures Driving Investments in Mobile Warehousing Solutions  
(Percent of Respondents)*



## Essential Guidance for Supply Chain Executives

Based on our conversations with key warehouse operations personnel, we uncovered a recurring theme – there is often a disconnect between individuals looking to deploy modern mobile solutions and the supply chain executives who sign off on these technology investments. Executives we interviewed all were focused on cost reduction; while not surprising, there was recognition that mobile technology was continuing to play a more significant role in helping to improve efficiency and accuracy in their supply distribution chains. Given that the majority of the legacy applications in use today in warehouse deployments are text-oriented and keyboard-centric solutions, the opportunity to modernize is significant. Below are VDC’s recommendations to assist in the decision-making of these mobile solutions to successfully modernize the mobile technologies used in your warehouse deployments.

Make sure your vendor(s) understand warehouse and distribution center operations. Potential vendors need to be familiar with these types of operations, not just the hardware or software they’re offering. Make sure they are aware of what your associates’ day-to-day activities and understand the efficiency gains you are trying to achieve.

No two warehouses are alike. Explain the characteristics of your warehouse operation in detail. Your processes and workflow are unique to your business; ensure that your vendor(s) are able to accommodate your warehouse or distribution facility. Specifically, you should discuss your business-critical applications and determine if they can be modernized for use on modern mobile platforms such as Android. Choosing a vendor with domain expertise is recommended.



**Perform an accounting of your mobile computing devices.** Determine if your vendor's solution will allow you to continue to utilize your hardware. Also, make sure you can continue to leverage your existing vendor relationships.

**Consider the processes involved with integration with your existing systems.** What will be required for seamless integration with your warehouse management and control systems, or other solutions? What are the ramifications of changes to any of these systems? Make sure you can easily integrate systems now and in the future and are not limited by custom integration software.

**As with any significant technology investment, you should ask for references.** Determine how the vendor supports customers and handles problems.

## Conclusion

Mobile solutions are relied upon and are mature in the warehouses and up and down the supply chains of large consumer goods retailers; however, most warehouse environments have been slow in their adoption of new technologies in general. While certain mobile deployment may be mature in warehouse environments, they are aging and approaching their end-of-life. Modern mobile solutions can deliver productivity and greater efficiency to critical processes such as inbound/outbound handling, storage and inventory control, pick and fill. These solutions not only offer the opportunity to leverage your present IT infrastructure, but also the ability to gain access to your legacy systems such as "green screen" telnet clients on a modern mobile platform. Finally, new mobile deployments will be required as workforces age, and new workers join the workforce; they will expect modern mobile solutions and mobile solutions will also be instrumental in helping with knowledge transfer.

## ABOUT THE AUTHORS



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**Eric Klein** is a market research and consulting professional who specializes in the design, analysis, and delivery of project-based research. Over the past 15 years, Eric has worked with a wide array of firms across a number of industries, leading quantitative and qualitative research in areas such as innovation in management, manufacturing operations/automation, and in a variety of market research and management roles, intelligence to Fortune 500 firms. His previous employers include: AMR Research, The Yankee Group, and Affiliated Computer Services (ACS). Eric holds a Bachelor of Science degree in finance from Boston University.

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## ABOUT VDC RESEARCH

Founded in 1971, VDC Research provides in-depth insights to technology vendors, end users, and investors across the globe. As a market research and consulting firm, VDC's coverage of AutoID, enterprise mobility, industrial automation, and IoT and embedded technologies is among the most advanced in the industry, helping our clients make critical decisions with confidence.



Offering syndicated reports and custom consultation, our methodologies consistently provide accurate forecasts and unmatched thought leadership for deeply technical markets. Located in Natick, Massachusetts, VDC prides itself on its close personal relationships with clients, delivering an attention to detail and a unique perspective that is second to none.

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