Supply Chain Digest Thought Leadership Series




A 360-Degree View of Voice Technology in Logistics 2014

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Introduction

Voice technology in distribution has certainly come a very long way over the past decade. Though in use as far back as the mid-1990s, even 10 years ago Voice was primarily adopted in the grocery and food service industries.

That in fact should be telling, as both sectors operate on very low margins and have significant labor costs in distribution. If adoption of Voice was heavy in those industries, it offers strong evidence of the cost saving potential that Voice brings to logistics.

However in the past 10 years Voice has penetrated virtually every industry sector, and has been part of the "hands-free" wave that includes not only Voice but "wearable" wireless terminals as well – the latter in fact sometimes deployed in combination with Voice.

Over that time, Voice has gone from a somewhat mysterious technology to mainstream solution, one that is at least somewhat familiar to almost every logistics and distribution manager. In fact, many of those managers and executives are largely responsible for the now rapid spread of Voice, as they changed jobs and pushed their new operations to adopt Voice solutions after seeing the powerful results at their previous firms.

Voice users themselves were also key to getting much broader support from leading Warehouse Management System (WMS) providers, which frankly were a little late to the table in building strong and out-of-the-box support for Voice. User pressure to get those capabilities as a condition for awarding a WMS contract was key to the strong level of support for Voice in the WMS industry today (though the breadth of that support certainly varies across vendors).

Despite a significant amount of information and case studies on Voice success available in the market, often each white paper or article seems to address a single facet of the discussion. *SCDigest* believes it is time for a "360-degree" view of Voice, giving users a concise review of just about all of the key issues and questions they may have.

In 2013, *SCDigest* developed a list of top supply chain technologies and solutions based on which have most favorable "pain to gain" ratios – meaning we favored technologies that provide a lot of operational gain for relatively little pain in terms of investment levels, deployment challenges, and/or success rates.

As *SCDigest* noted then, "For companies with heavy piece and case picking volumes, there is almost no reason not to invest in voice versus traditional handheld wireless RF terminals - you are likely to get 15-20%+ productivity gains and high ROI from the hands and eyes-free nature of the solution, and today Voice implementations are really straightforward. You can also look at Voice included as part of "wearable" mobile systems that provide bar code scanning and a display with Voice that keeps the hands-free element."

Logistics Trends are in Voice's Favor

The rise of Voice was driven by the technology's ability to reduce distribution costs, provide a very favorable ROI, and in many cases increase shipment and inventory accuracy, especially in order picking. But several industry trends are helping to turbocharge that growth.

1. **Smaller, More Frequent Orders:** The general trend in most industries away from full pallet orders to case and "each" picks provides a natural advantage for Voice adoption, as Voice enables much faster hands-free work for those types of picking tasks (even as some companies are starting to use Voice for pallet picking and movements – see below).

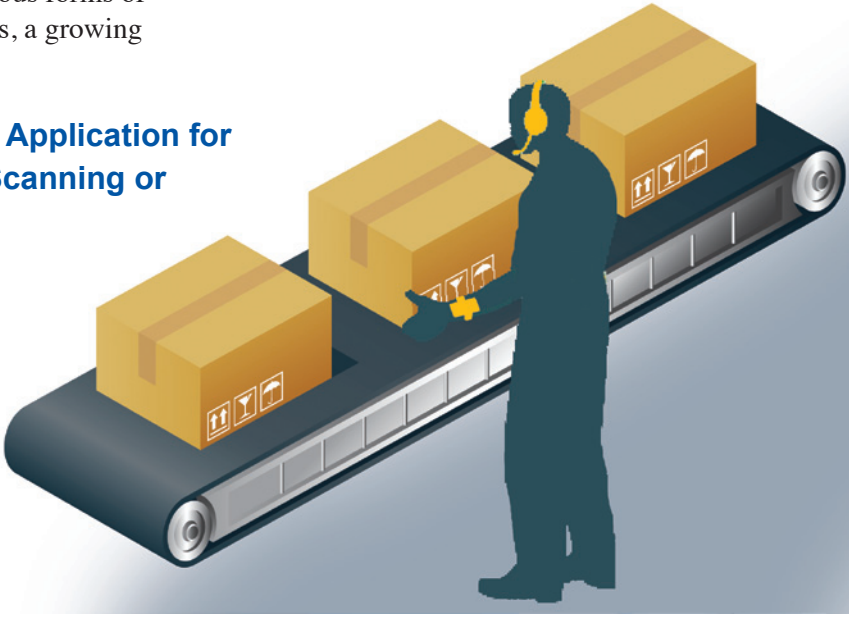
2. **Rapid Rise of E-Commerce:** The general trend above is amplified by the growth of e-commerce, where orders are almost always at the "eaches" level. Estimates vary, but data from the US Census Bureau continues to show e-commerce sales growing at roughly 15% year over year, month after month. Many e-tailers have in fact adopted Voice technology to improve efficiency – a key tool in making their e-commerce operations more profitable.

3. **Recognition of Voice's Complementary Role in DC Automation:** As an increasing number of companies look to various forms of DC automation to gain efficiencies, a growing number of them are seeing Voice as a good complement to such automation – and perhaps a tool to improve the ROI of their investments. A natural example is using Voice to support case pick-to-belt with downstream sortation applications, a mainstay of DC automation projects. Here, Voice can provide the accuracy of bar code scanning without the hit to productivity such scanning can entail.

Those and other trends paint a bright picture for Voice indeed. A recent detailed market analysis by the analysts at Voice Information Associates found that the number of Voice-based users grew in 2012 by about 17% over 2011, and that growth is expected to continue at about that same rate over the next five years. That is far faster than the growth rate for traditional wireless terminals in distribution.

Add all that to the fact that many companies are now expanding their use of Voice to other applications in the DC beyond order picking, and in some cases perhaps even outside the DC itself, and it is no surprise the growth in Voice adoption remains strong – though clearly there are still thousands of distribution centers where Voice could provide a strong payback but has not yet been adopted.

Case Pick-to-Belt is Excellent Application for Voice in Distribution Versus Scanning or Manual Case Counting



Voice Technology Basics

While Voice has become well known at a high level among logistics managers, it may still be useful to quickly review a few technology basics.

As the name obviously implies, Voice is an audio-based wireless technology in which Voiced-based directions and responses from users are substituted for the screen-oriented approach of traditional wireless terminals in distribution, or in place of paper-based systems. It uses the same Wi-Fi communication networks that traditional wireless systems do, meaning if no such Wi-Fi network exists in a DC, it must be installed as part of the Voice deployment.

In practice, Voice-related software (see discussion below) takes the text-based directions of a Warehouse Management or Order Management system and converts them to audio commands that a distribution center associate receives through a headset connected to a wireless terminal that has Voice support.

As those instructions are communicated (for example, the next pick location), users confirm their activities back to the WMS with simple Voice confirmations words. Those often include replacing bar code scans say to confirm the worker is at the correct location with speaking the check digit of the location's bar code. (Though a growing number of companies are combining scanning of product serial numbers with Voice in so-called "multi-modal" approaches to wireless technology – see last section of this report.)

The Voice software translates these spoken commands back into data that the WMS can understand, in what literally becomes a real-time dialog between worker and system.

How Voice Creates Value in Logistics

Voice technology provides many benefits, but the one that delivers the most value is the hands-free nature inherent in its approach. Because Voice terminals of various types are typically worn on the body in some way (such as on a belt or arm, or in a holster), they do not have to be handled by workers as they perform their tasks.

That means workers have both of their hands free to pick orders, remove shrink wrap, or other tasks they are performing, versus continually picking up and putting down a traditional handheld terminal, or trying to pick an order with a terminal held between the worker's arm and body. One only has to watch a worker with a traditional terminal and one using Voice technology to see the significant advantages of Voice in terms of efficiency.

A related benefit is the "eyes-free" aspect of Voice, in that workers do not have to look down at a screen to see their next command, or to move around the WMS application or enter data on a keyboard. This eyes-free nature of Voice also provides a significant amount of productivity gain. So, for example, a picker can immediately start travelling down the aisle as the system informs him or her of the next pick location via Voice, rather than picking up a terminal and looking down at the location on a screen. That shaves seconds on every pick that add up to real gains across the DC.

Similarly, if a pick location is empty and a worker wants to see if there is a substitute product, or check if a replenishment is on the way, that information can be accessed by a simple Voice-based question, rather than navigating through WMS screens on the terminal.

It is simply common to see productivity improvements of 15-20%, and perhaps more, when

moving to Voice from paper-based picking or even handheld RF terminals. Some distribution managers, who believe they run efficient operations and have good workers, are sometimes dubious such gains can be achieved, but the growing number of case studies attesting to such improvements is proof such results are not only possible but consistently achieved.

These specific levels of productivity gains are, of course, dependent on the details of the workflows in question and the rate at which the user must interact with the mobile device in order to accomplish the task. The more frequent the interactions, the greater the benefit. Even with Voice, however, there are scenarios in which Voice itself becomes an inhibitor to moving faster, and these applications will sometimes fall to light-directed work. An example would be "put to store" applications in retail DCs.

Voice has also been shown to significantly improve accuracy in order picking, certainly over paper-based systems but perhaps surprisingly even over handheld-based approaches. Why? It is believed Voice keeps workers more engaged and focused, and that reduces the odds a worker will scan a location and pick the product from the next one. Also, a worker can count off the quantity being picked, providing accuracy without the cost of scanning each item or case.

Finally, Voice creates value by improving morale and satisfaction of distribution center workers, reducing turnover. *SCDigest* has spoken with many associates in DCs using Voice, and almost universally they attest to how Voice has made doing their jobs better and easier, removing barriers to productivity.

A recent study from Voice Information Associates includes an interesting analysis of the payback from moving to Voice from both manual/paper mode and from wireless bar code scanning. The analysis is based on a one-shift DC operation that processes about 20,000 order lines per day, with a wage rate of $16.00 per hour and a cost per picking error of $12.00.

Combining the financial benefits of increased productivity from Voice and the reduction in errors Voice also provides, the study estimated that moving to Voice would save that type of DC environment almost $900,000 annually when switching from paper, and some $264,000 even when moving from traditional wireless scanning to Voice, as shown below.

Improved Productivity for Different Picking Technologies

Item	Picking Technology		
	Paper	Scanning	Voice
Total Cost Saving (improved productivity & improved accuracy)			
Paper-to-Scanning		$686,016	
Paper-to-Voice			$891,494
Scanning-to-Voice			$264,664
Deployment Cost			
Per Worker Station Cost		$4,500	$5,788
System Cost		$70,435	$78,777
Payback Period			
Paper-to-Scanning		1.2321 Months	
Paper-to-Voice			1.06 Months
Scanning-to-Voice			3.57 Months

Source: Voice Information Associates

The analyses found Voice would improve picking productivity in terms of lines per hour about 32% over paper, and about 15% over wireless scanning – and that represents significant savings.

Voice Applications in Logistics

As discussed above, Voice primarily entered the logistics market for order picking of cases and eaches, and that is still the primary place most companies start.

However, after several years of Voice vendors really pushing customers to take their initial successes to other areas of the operation, that expansion is finally starting to be seen.

A natural complementary application is replenishment at the case level into carton flow rack or standard racking. That replenishment work really is an order picking type of process, with cartons usually handled twice – once to pick the cartons from reserve storage, and again to put cartons in the picking locations. The advantages of Voice for customer order picking apply equally in replenishment tasks as well – and maybe more so given the double handling.

But companies are starting to use Voice in other areas as well. Receiving and Quality Assurance probably top the list, but we've also seen Voice-based truck loading and other full pallet move applications such as putaway and pallet level replenishment. Why? Because Voice-based instruction can still be more efficient than having a fork truck driver looking at a screen, and the same type of check-digit approach to confirmation can often also be used, reducing the time it takes to pick up and use a traditional bar code scanner. In these operations, Voice is used to enable the repetitive aspects of the task. Handling exceptions can then fall back on screen-based interactions on a multi-modal device, as described later in this paper.

Though not yet common, some companies are considering Voice for applications outside the DC altogether. For example, could route delivery drivers benefit from Voice over broadband connections to direct picks from the truck rather than looking at pieces of paper or a terminal screen? Or consider the the growing trend of fulfilling e-commerce orders from brick and mortar stores – would not the same advantages for Voice in DC order picking apply there as well?

SCDigest believes Voice will become increasingly pervasive in distribution, both in terms of the percent of distribution centers that adopt Voice in their operations, and in the percent of DC workers/application areas that turn to Voice. Such a transition is already well under way.

Understanding Voice Hardware

There are two primary components of a Voice hardware system:

- A wireless terminal
- A head set, which can be tethered to the terminal via cable or (increasingly today) wirelessly connected via Bluetooth.

On the terminal side, today virtually any wireless device for logistics now includes the circuitry that makes them capable of supporting Voice. Within that universe, there are two main types of terminals: (1) those that are dedicated to Voice applications; historically, these devices have not had a display; and (2) traditional wireless devices to which circuitry that supports Voice communications has been added during manufacturing.

That means that today, a company acquiring any new wireless devices for their operation (traditional handheld units, truck-mounted, or "wearable" device) will likely have native Voice capabilities.

To enable those capabilities will of course take supporting Voice software (see next section).

That means that if you have existing wireless devices that are just a few years old, there is a reasonable chance they include the Voice circuitry. That said, even if that is the case, the units may still lack the processing power and memory levels recommended for today's Voice solutions.

Older terminals are less likely to have Voice support, and/or to have the needed processing power, meaning they would need to be replaced in those areas where Voice technology is targeted.

It should be noted that Voice hardware capabilities are not equal across providers. Some will do a better job processing Voice signals from workers than others, meaning Voice is still far from being a commodity capability and should be subject to significant due diligence when evaluating vendors.

Users should also pay close attention to the quality of headsets, and the connections between the terminal and the headsets, whether those are cabled or cable-less solutions. Superior cabled connections will significantly reduce maintenance and damage issues that in the past have been common complaints among Voice users.

With regard to cable-less connections, in general it can be said that the more current the version of Bluetooth that is supported, the better the performance of that wireless connection.

The upshot of all of this is that today potential users of Voice have a very wide range of devices to select from and can be pretty confident that any new devices will have native Voice support (though of course that needs to be confirmed).

That means that even if a company is not planning to use Voice at the time of initial deployment, it can choose the type of terminal(s) most appropriate for different applications in the DC and be capable of moving to Voice at some later point. It also means that if there is any likelihood Voice might be adopted in the future (and the answer to that is usually Yes), Voice capabilities and terminal specifications should be part of the selection criteria, even if Voice will not be used right away.

Indeed, the future in most logistics operations is likely to be "multi-modal," in which Voice processing is combined with bar code scanning, RFID and/or even cameras, as this paper will address in a later section.

Next Generation Wearable Computers are Growing in Popularity, can be Combined with Voice

Understanding Voice Software

There are actually quite a number of different pieces of software that are or can be needed to make Voice work in conjunction with the hardware, as briefly outlined below:

"Host" System: In almost all cases, there is one of more "systems of record" to which the Voice system is connected. This is most frequently a Warehouse Management System (WMS), but can be an ERP/Order Management system or something else, like independent vendor compliance/audit software or Lab Information Systems.

Increasingly today, the WMS solutions of leading best of breed and ERP providers have "out of the box" support for some but not all Voice solutions. However, few have complete Voice support across all of their existing radio frequency applications. Most picking applications (full case, split case, etc.), for example, would be supported, but receiving or truck loading processes may not. That means companies wanting to Voice-enable those other areas either need to have the WMS provider do some additional work or use the application management software from a Voice software provider (see below).

Voice Recognition Software: The heart of a Voice system is naturally enough the software that actually recognizes the words spoken by a user and translates that into data for processing by the application programs, as well as translating host software data back into audio responses.

This is an area where the software has made significant progress over the past decade, greatly improving recognition accuracy and speed. That in turn reduces implementation times and later operational problems, helping to further decrease the time-to-value and increase the ROI from Voice investments. This is especially true in dealing with "noisy" DC environments.

In addition to the environmental noise factors, consider the challenges of accurately recognizing in real time what words perhaps hundreds of workers in a distribution center are saying, each using different tones, accents, and more – and the variability usually seen even in how a given worker may pronounce each word at a given moment.

While today all Voice software vendors have solid recognition capabilities, there are differences among them, especially in how they might perform in the specific environmental conditions of a given distribution center.

Here the debate is also joined over "speaker-dependent" versus "speaker-independent" Voice systems. In the latter approach, each Voice system user "trains" the system on the way he or she pronounces the 100-200 words typically used in a given Voice implementation. Speaker-independent systems use phonetic recognition to identify words regardless of speaker, such as is required in call center applications where tens of thousands of different customers may be dialing in.

There are pros and cons of both approaches, though nearly everyone agrees in recent years tremendous progress has been made in speaker-independent technology. The major downside of the speaker-dependent systems is the time required (20-30 minutes) for each user to train the system on their individual pronunciations, though some argue that comes at the benefit of greater accuracy/fewer failed recognitions.

Potential Voice users simply need to be aware that there are different approaches and weigh the pros and cons along with all the other factors involved in selecting a Voice hardware and software provider.

That last point may be the key one here. While to achieve single accountability many users decide to select one vendor for hardware and software, increasingly those decisions are made separately.

Voice Application Management: Many distribution centers run older, perhaps even legacy

WMS systems that do not have any native Voice support. Or, as mentioned above, an installed WMS may have Voice support for order picking, but not for other application areas.

If that is the case, potential Voice users have four main choices:

1. If possible, upgrade the existing WMS to a version that better supports Voice;
2. Build true Voice support into the existing WMS (not common);
3. Use floor-level applications from a Voice vendor;
4. Use one of the new generation "screen mapping tools" to achieve connectivity (see below).

Most Voice software vendors have applications for areas like order picking, or can create applications for other areas. These applications contain business logic, workflow configuration and more to enable a specific process. At a high level, a common scenario would be for the WMS to send a block of work to the Voice application, such as a group of picks by item, quantity and location.

The Voice application would take that data and issue pick commands to workers, confirming the work done, etc., eventually sending that information back to the WMS. This solution can work quite well, and has been deployed in probably thousands of distribution centers, but has the downside of generally not being truly "real-time" in communication with the WMS.

But for users that have limited Voice support in their WMS, deploying a robust Voice application that can optimize workflows and even provide real-time operational metrics is in fact often the smart choice.

Voice Screen Mapping: In the past two years, a new type of software to achieve integration of Voice with WMS's lacking Voice support has been brought to market. This involves converting existing RF data fields from the WMS into Voice commands, with the reverse being true for users' Voice responses.

This is generally achieved using what might be called a "screen mapping" approach, and in fact these solutions can often be used to actually simplify the existing prompts and screen flow that exists in the WMS RF application. Many existing RF programs have more screens then they need, for example, and can be collapsed into a brief series of Voice commands and responses.

This technology can also be used to achieve very rapid and relatively inexpensive WMS connectivity.

Voice Management Consoles: Most Voice software will have control center software that allows customers to see and manage their Voice users and equipment, update user configurations, measure performance and other capabilities.

With that backdrop, below is a list of leading Voice software vendors, their location (though all operate nationally) and brief description of their solutions.

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Example Independent Voice Software Providers

Vendor	HQ Location	Description
SAE Systems Application Engineering, Inc.	**Houston, TX**	Selector Pro Voice Guidance features spoken navigational and picking instructions guiding selectors through their picking tasks. A single product scan confirms the GS1 GTIN product and accurately captures catch-weight, dates and lot information. Better productivity than voice alone without check-digits memorization, speech recognition inaccuracies and delays from voice training problems.
Genesta	**Rockwall, TX**	SyVox by Genesta improves productivity and accuracy using hands free multimodal terminals and speech recognition. Build your own application or leverage SyVox's middleware and back office offerings. Run SyVox in the cloud or on a unit. Scalable from one to hundreds of users, SyVox makes speech deployment easy and affordable.
Lucas Systems	**Wexford, PA**	Lucas Systems is the largest provider of multi-modal voice applications for Motorola mobile computers, with thousands of users in hundreds of DCs. Jennifer VoicePlus solutions from Lucas combine creative process design, configurable application software, and industry-leading speech recognition for better user performance, optimal operational results, and lower IT costs.
Wavelink	**South Jordan, UT**	Wavelink Speakeasy allows customers to quickly and easily add voice to wireless applications, such as terminal emulation or web-based applications. Speakeasy is redefining voice enablement, delivering increased productivity and reduced complexity. Customers globally are incorporating Speakeasy for a device-based, multi-modal solution that requires no middleware component or voice-specific hardware.
Voxware	**Hamilton, NJ**	Voxware VMS is the preeminent voice solution with cloud-hosting options. VMS easily adapts to changes in technology and processes, enabling organizations to quickly address shifting demands without disruptions to the operation. Innovative focus on software has proven to help our customers increase profitability by cutting costs and enhancing brand loyalty.
MCL Technologies	**Global HQ: Belgium** **U.S. HQ: Florida**	MCL-Voice, a premier voice recognition technology improving productivity while achieving higher data accuracy. • Create 100% Voice-directed applications • Multi-modal combines voice with multiple technologies • Utilize Cloud system management • Optimize recognition with Voice Analyzer and embedded calibration • Easily migrate to new devices regardless of operating system
Reddwerks	**Austin, TX**	Reddwerks software manages all aspects of warehouse operations from receiving to order processing to shipping, including managing conveyors and material handling equipment down to PLCs. Reddwerks is especially strong in the Tier 1 retail, distribution and e-commerce sectors. Our approach, "Distribution Science", takes the guesswork out of how to run distribution facilities.

What a Voice Project Looks Like

With all the news and articles about Voice benefits and success stories, details about what a Voice project actually looks like is often something of an afterthought. But it is important to understand the work and timeline required to implement a Voice solution in distribution.

Of course, every project is unique, with its own set of variables, resources, etc. So, we can only really speak in terms of typical ranges. The good news is that improvements in hardware and software in recent years have led to a significant drop in the time it takes to implement Voice projects – to the point where some companies, especially in additional roll-outs after the first DC, opt for so-called "fast track" projects that are deployed in just a few weeks.

But that is the exception, and not common for initial deployment at a first facility, so here we will concentrate on a more typical project for a first time Voice user.

WMS Capabilities are Key Variable

Perhaps surprisingly, a key variable is not so much whether a company's installed WMS natively supports Voice (percentage of installed WMS with Voice support is still fairly low), but rather how robust and effective the workflows for picking, replenishment, etc. are in the WMS. That is because there are now many options for that basic Voice connection to the WMS, as discussed in the software section above. But if the needed functionality isn't there, it must be created in a Voice sub-system.

Naturally, if there is a lot of Voice application work that needs to be done in a Voice software company's tool set, that is going to take more time than if the Voice system is primarily replicating existing WMS functionality.

So with that, below are listed major steps in a Voice project and their typical duration. It assumes vendor selection, budget approval, and all the other steps leading to a signed contract are complete and the project is ready to start.

A 7 to 23-week timeline is admittedly very broad, but that is simply the reality, depending on the types of factors discussed above, which include a company's own availability of resources and ability to digest change.

Not surprisingly, the typical Voice project is somewhere in the middle of this range, lasting about 12-14 weeks for the initial implementation. Resulting roll-outs to other distribution centers would almost always be much faster, assuming a similar host software environment.

One other thing to consider has to do with whether the Voice system is being added as part a new WMS implementation. If so, this obviously requires another level of coordination if the total system is going to go live at the same time. Sometimes, delays on the WMS side, for example, may mean that the Voice vendor has to wait to do its work, and may not be ready on the go-live date even though it could have been ready if the WMS had hit its schedule.

This coordination is something new WMS/Voice users really have to monitor closely, just as they do with new automated material handling systems and WMS.

Typical Voice Project Timeline

Step	Description	Time Range to Complete
System Design	Definition of the "To Be" process using Voice	1-8 weeks, with WMS capabilities the key variable as discussed above. This is admittedly a very broad range, but reflects the full scale of scenarios encountered.
Application Development including interface development	Moving from function/process design to the point of being ready to pilot the system	2-8 weeks, with the same WMS variable
Pilot evaluation/system testing	Initial user and system testing	1-2 weeks
Changes based on pilot testing	Fixing any workflow issues, bugs, process changes, etc.	1-2 weeks
User training	Education of DC workers on system operation	1-2 weeks, with the sheer number of DC workers one consideration
Go-live	Heavily monitored Go-Live week	1 week
Total Timeline		**7-23 weeks**

Recent Voice Trends

A few additional trends relative to Voice technology and deployment are also worth noting:

Right Tool/Technology for the Each Area of the DC: It was fairly common in the past for companies to standardize on a single type of wireless device in the DC – say a traditional handheld RF terminal – and roll those out for all areas and tasks to be wirelessly enabled. Alternatively, fork truck drivers might get truck-mounted terminals, and everyone else the handhelds.

Today, it is much more common for companies to look more closely at blocks of work, and select physical terminals and related supporting technologies such as Voice specific to what will deliver the best results for those work areas.

The resurgence of "wearable" RF terminals – small form factor devices that are generally worn on the forearm and also offering hands-free operation – is a key factor in this changing approach, as these devices offer users an important additional option in terminal selection. But some companies are even choosing different handheld devices depending on the processing areas of the DC where they will be used.

Multi-Modal Thinking: For all the benefits of Voice, there are increasingly applications where bar code scanning and perhaps RFID processing may be used in conjunction with Voice. While speaking a check digit on a location bar code to confirm a worker is at the correct pick face works just fine, no one wants to speak a 20-digit bar code into the system.

So, many companies are embracing so-called "multi-modal" strategies that combine automatic identification technologies, often in the face of growing industry requirements for bar code data capture, which include:

- Pharmaceutical product serialization

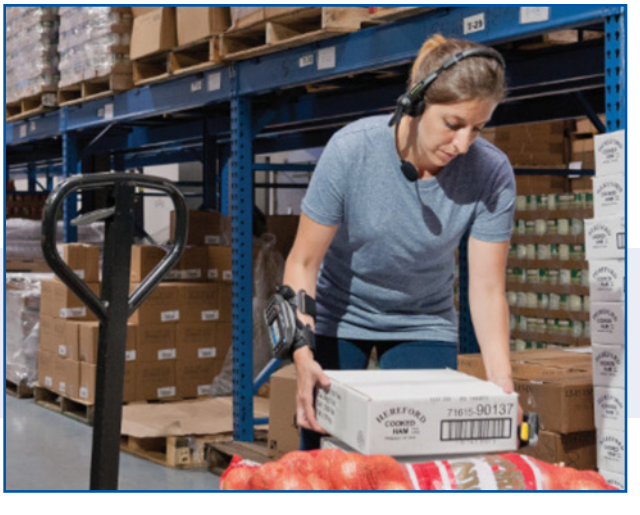
- GS1 case-level bar-coding standards in produce and other perishable applications
- Potential requirements for data capture coming out of the evolving requirements of the Food Safety Modernization Act
- Opportunity/requirement to capture serial numbers in high tech, consumer electronics, and other sectors
- High accuracy requirements in support of direct-to-consumer shipments and omni-channel fulfillment processes in stores

The point is simply that many of those distribution operations that had significant scanning requirements in the past gravitated to traditional scan and display-based approaches using handheld terminals. But a multi-modal approach that combines Voice with scanning or RFID is increasingly seen as the better strategy.

Rapid Deployment: While not for everyone, as briefly mentioned above the general growing maturity of Voice technology and new tools, such as the screen mapping solutions, have made it possible to roll a Voice solution out to a DC in a fraction of the time it took in the past – sometimes in as little as a matter of weeks. This is because the screen mapping solutions can provide almost instant connectivity to a WMS or other applications.

There are many reasons why such rapid deployment is not right for a given situation, and that significant work is often required for As Is/To Be process development, changed management issues, IT integration work, etc. However, there is no question that the timelines for Voice projects are trending down, and that what would be considered rapid implementations are in fact occurring in some cases, increasing time-to-value.

Multi-Modal Approaches, with Voice Combined with Bar Code Scanning for Serial Numbers, are Increasingly Popular



Summary

So, there we have it – a concise but detailed overview of what is happening with Voice technology in distribution.

There are several key takeaways:

- Voice enjoys a number of operational advantages that consistently deliver double-digit productivity gains for many companies and applications, derived from the hands-free and eyes-free approach Voice delivers.

- A number of supply chain trends are increasing the relative attractiveness of Voice versus other technologies, such as changing order profiles towards more piece and case picking and the rapid growth of e-commerce.

- Companies are increasingly looking at multi-modal approaches, combining Voice with bar code data capture for long serial numbers increasingly required in many industries and applications. That trend runs in parallel with the movement by a growing number of companies to match the specific wireless device - from traditional handhelds to wearable terminals and more - to different groups of tasks within a DC.

- There are a broad and growing number of Voice software solutions that provide basic Voice recognition capabilities, Voice application development, WMS or other host connectivity, network management and more. There are different approaches - potential users should look hard to find the potential vendors that best meet their current environment and operational and IT requirements while providing a flexible path forward.

- Voice connectivity options continue to grow. New approaches can tap right into and actually improve existing WMS wireless/RF workflows in a way that requires little actual or no programming. This is not only reducing the cost of implementing Voice, but also significantly reducing deployment times.

Voice isn't for everyone, or every distribution application. But the clear advantages of Voice in many applications, the consistent track record of double-digit productivity gains and rapid ROI, and growing ease of deployment combine to make it clear that companies that haven't at least looked at Voice for their operations are ignoring a potential source of real value and bottom line improvement.

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Research Made Possible By: Motorola Solutions

Motorola Solutions is a leading innovator in warehouse mobile computing, scanning, wireless, RFID and two-way radio technologies. By natively mixing voice guidance with scanning and screen reinforcement on its broad portfolio of open and interoperable products, Motorola's picking solutions deliver workflow-optimized access to mobile data across handheld, wearable, and vehicle mounted mobile computers equipped with capabilities above and beyond voice alone.

Leading solution providers utilizing Motorola technology have the workflow and technical expertise you need when optimizing your warehouse processes, so you can realize a compelling return on investment for your voice-directed or multi-modal project.

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