

YOUR GUIDE TO GOING HANDS-FREE

Today's hands-free solutions put
greater business success within reach.



EXECUTIVE SUMMARY

In this difficult economic climate, we are all being asked to do more with less. We're more reliant on technology than ever before, and we need our technology to work harder and smarter – every day.

Moving from paper-based to automated data collection methods such as mobile computers or pick-to-light systems has proven to be a reliable source of boosting productivity and increasing order accuracy. But, while the gains achieved with these methods have been impressive to date, a closer look into distribution environments that rely solely on traditional automated data collection techniques proves that many operations are leaving improvement opportunities on the table. And, these opportunities can translate into a substantial amount of dollars.

However, until now it has been very tough to boost accuracy rates to near perfect levels while also increasing productivity. But today, advances in wearable and voice-enabled computers are driving accuracy and productivity rates to never before seen highs. Wearable mobile computers make warehouse operations hands-free, eliminating time spent picking up and re-holstering handheld computers. Interacting with voice-enabled wearable mobile computers also makes processes eyes-free, so workers never lose sight of the task at hand. Together the two methods can boost productivity by as much as 20 percent and drive accuracy rates above 99.9 percent.

And the most exciting news is that the benefits of wearable and voice-enabled computing solutions don't stop with just productivity and accuracy gains. Companies operating in hands-free environments are experiencing benefits across their operations including improved customer service, decreased training time, a reduction in damages and accidents, increased employee satisfaction, and increased compliance.

This Executive Brief examines the state of the hands-free market today and debunks many of the myths associated with the technology. It also takes a closer look at how hands-free solutions are putting greater business success within reach of companies of all shapes and sizes, including specialty retailers, general merchandisers, convenience stores, restaurant chains and healthcare, pharmaceutical, auto parts and publishing companies.

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THE CHALLENGE:

TAKE A HIGH-PERFORMING OPERATION TO AN EVEN HIGHER LEVEL

Moving from paper-based to automated data collection methods such as mobile computers or pick-to-light systems has proven to be a reliable source of boosting productivity and increasing order accuracy. In fact, a study conducted in 2008 by the Warehousing Education and Research Council (WERC) entitled, "DC Measures 2008," found that the Best in Class Perfect Order Index (POI), a benchmark consisting of four measures: 1) Complete; 2) On Time Delivery; 3) Damage Free; and 4) Correct Documentation and Pricing/Invoicing, had reached ≥ 99.1 percent, and the average POI of all respondents had reached 87.1 percent. But, while these numbers are impressive, a closer look into distribution environments that rely solely on traditional automated data collection methods proves that many operations are leaving improvement opportunities on the table. And, these opportunities can translate into a substantial amount of dollars.

CONSIDER THIS:

- A warehouse that picks 100 cases per hour with an accuracy rate of 99.6% incurs 42,240 errors per year.
- Boosting that accuracy rate just a bit, to 99.95%, will reduce errors by 36,960 per year.
- If each error costs a conservative \$15 that amounts to: \$554,400 a year in savings.

However, until now it has been very tough to boost accuracy rates to near perfect levels. But today, advances in voice-enabled and wearable computers are boosting accuracy rates to never before seen highs. And the most exciting news is that the benefits of voice-enabled and wearable computing solutions don't stop with just accuracy gains. Companies operating in hands-free environments are experiencing benefits across their operations including improved customer service, decreased training time, a reduction in damages and accidents, increased employee satisfaction, and increased compliance.

SOLUTION UPDATE: TODAY'S HANDS-FREE SOLUTIONS COME IN MANY SHAPES AND SIZES

When it comes to hands-free solutions, there are several options available today.

In a nutshell, hands-free solutions can take three forms:

- 1) Wearable Computers
- 2) Voice-Enabled Wearable Computers
- 3) Voice-Enabled Handheld or Vehicle-Mount Computers

1) WEARABLE COMPUTERS

If you are looking for an easy way to free up hands – wearable computing might be a good option for you. Wearable computers require very little change to existing warehouse operations that currently use handheld computers, so those not in a position to allocate resources to deploying voice may find wearables a good method of boosting productivity.

Wearable computers are worn on the body to eliminate the need to pick up and re-holster a terminal. Wearables used without a voice interface are typically worn on the wrist or belt (flipping up for use). Typical features include a keyboard and screen (or touch screen) and a battery pack that is either incorporated into the device or worn on the arm or at the small of the back. Optionally, a wearable solution may include a finger-mounted (“ring”) scanner that plugs into or communicates via Bluetooth with the wearable device in order to allow the user to scan bar codes.

Deploying wearable computers entails little retraining of staff and usually no software modification. The existing application designed for a handheld or vehicle-mount unit can usually run on a wearable device with no changes. Workers simply need to adjust to putting the wearable components on and the feel of the devices once on. Today’s wearable units typically weigh just a few ounces, so fatigue and comfort are typically not an issue.

Wearable computing can provide more benefits than the use of traditional handheld devices, including the ability to build better pallets, a reduction in devices damaged due to drops and other accidents in the warehouse, a boost in overall productivity and an increase in order accuracy.

2) VOICE-ENABLED WEARABLE COMPUTERS

In areas where distribution tasks require little or no keyboard and/or screen interaction, voice-enabled wearable computers can yield tremendous value. Wearables used with a voice interface can be worn on the wrist, if the operator needs a moderate level of interaction with a screen or keyboard, or on the belt, if only occasional screen or keyboard interaction is needed. In the case that voice is the only input required, a voice-only wearable terminal with a simple programmable keypad rather than a full display, offers a great money saving alternative.

With a voice-enabled wearable computer, the user also wears a wired or wireless headset and optionally, a ring scanner. A voice solution also includes voice software, usually running on the wearable computer, which codes and decodes voice signals into digital data, as well as backend software to support this function.

3) VOICE-ENABLED HANDHELD OR VEHICLE-MOUNT COMPUTERS:

As an alternative, logistics operations may choose to use voice-enabled handheld or vehicle-mount computers. This option offers the flexibility to use different user interfaces for different distribution functions or according to individual user preferences. Voice blends well with scanning, imaging, display, keypad entry and RFID. In voice-only mode, handheld devices can be worn on the body in a belt-mounted case. These options can also integrate ring scanners and wired or wireless headsets.

ALL THREE OPTIONS CAN PROVIDE TREMENDOUS VALUE TO YOUR OPERATION, BUT WHEN VOICE AND WEARABLES ARE PAIRED, OPERATIONS GLEAN THE GREATEST BENEFITS BY BEING BOTH HANDS- AND EYES-FREE. TABLE 1 BELOW SUMMARIZES SAMPLE GAINS.

TABLE 1

ACCURACY:	Before	After
Number of Selectors	50	50
Cases/Hour	100	100
Accuracy	99.6%	99.95%
Cost/Error	\$15.00	\$15.00
Errors/Day	160	20
Errors/Year	42,240	5,280
Cost/Year	\$633,600	\$79,200



ANNUAL SAVINGS \$554,400

PRODUCTIVITY:	Before	After
Cases/Day (7 hours)	35,000	35,000
Cases/Hour	100	115
Selectors Required	50	43
Average Salary/Hour*	\$15.00	\$15.00
Salary/Day	\$6,000	\$5,217
Salary/Year	\$1,584,000	\$1,377,391



ANNUAL SAVINGS \$206,609

MARKET UPDATE: A LOOK AT TODAY'S HANDS-FREE MARKET

Voice-enabled and wearable computer solutions emerged to meet specific needs. Wearable computers were developed to serve warehouses with heavy two-handed picking volume, such as beverage distribution environments, where use of a handheld terminal would slow processes. Voice was originally prescribed in situations with very high velocity and heavy each-picks, such as found in food service, grocery and other cold storage distribution environments. In cold settings, screens can fog up and employees wearing thick gloves can find it cumbersome and time-consuming to use scanners, keyboards or paper-based picking, and so it follows that these were the first settings to experiment with and benefit from the hands-free aspect of voice.

Today's array of voice-enabled and wearable computer solutions has however expanded the use of this technology from where it was pioneered to a wide variety of warehouse types, picking environments and warehouse functions. In fact, according to a 2008 study by the Aberdeen Group titled "Warehouse Automation: How to Implement Tomorrow's Order Fulfillment System Today," the level of adoption of speech-based technology for warehousing is 27 percent for Best-In-Class and 26 percent for Industry Average. And in a 2007 ARC Advisory Group/Modern Materials Handling survey, 69 percent of all respondents indicated that they were either exploring voice or strongly exploring its adoption in the warehouse.

According to Bill Roeder, Vice President of Business Development and Marketing at LXE, "Companies currently using voice come in all shapes and sizes." In fact, LXE has worked with more than 150 companies to deploy voice, including Advanced Autoparts, Black & Decker, Columbia Sportswear, Dunkin Donuts, Kellogg's, Simon & Schuster, Target, 7-Eleven and more.

Roeder explains that, "Since its early days voice technology has evolved considerably, and much of the conventional wisdom regarding the technology is no longer true." According to Roeder, the top three misconceptions today are:

- 1) Voice can only be used for picking functions
- 2) Voice applications are inflexible
- 3) Voice is expensive

But according to Roeder, "These statements simply are no longer true."

DEBUNKING SOME COMMON MYTHS ABOUT VOICE TECHNOLOGY

First off, while it's true that order picking is particularly well suited for speech technology, research indicates that hands-free technology is being used for a growing number of warehouse functions. An August 2007 Research Brief from Aberdeen Group titled "Debunking Some Myths About Speech-Based Warehousing" reports that although picking is still the dominant speech-enabled function, between one-third and one-half of companies that use speech technology have also enabled functions like receiving, put-away, and shipping. (See Figure 2) And, according to Rich Hayden, Director of Business Development for Voxware, "Advances in network technology mean the use of voice will soon expand beyond the four walls of the warehouse." Hayden explains that, "Because most warehouses can transcend their traditional 802.11 wireless networks with connectivity to cell towers, it won't be long before voice technology enters the yard, the cab of a truck and the greater world outside of the warehouse."

SPEECH-TECHNOLOGY ISN'T JUST FOR PICKING

FIGURE 2



Secondly, early voice solutions developed a reputation for being inflexible. This was primarily because early solutions were vertically integrated – meaning one vendor provided voice-specific application software, voice-enabled hardware and the technology required to translate voice into data commands, and then that same vendor integrated and implemented the solution on behalf of a customer. This is no longer the case however. Today, voice has migrated to an open platform – meaning as with handheld and wearable computers, businesses using voice are now free to select the hardware, software, voice technology and integrator that best fits their situation and be assured of interoperability.

Also whereas speech was previously deployed on single-function wearable computers, it can now be deployed on multi-modal devices – devices that also feature bar-code scanners, display screens, and pen or keyboard functionality. These multi-modal devices can support a variety of work flows via a single device.

Finally, if you are one of those companies that investigated voice early on and wrote it off as too expensive, you owe it to yourself to take another look. Admittedly, companies deploying voice for the first time will incur some upfront costs. These costs include the need to purchase speech software from a third party, the need for professional services to configure and install the application, and the need to purchase voice-enabled hardware (if your current hardware is not already voice-enabled).

However there are two major advances that have gone a long way to reduce the cost of deploying voice.

- 1) Voice has evolved from being a “point solution” to a highly configurable “productized solution.” Early adopters of voice paved the way for the development of a mature product that according to Hayden, “meets 90 percent of our customers’ needs right out of the box.” Hayden explains that this has driven the cost of voice software and its implementation down by 40 to 60 percent. It also means that companies deploying voice typically recognize ROI in under a year.
- 2) The advent of multi-modal devices has done much to reduce the cost of the hardware component of the project. Where speech technology was previously deployed on single-function wearable computers, it is now commonly featured in off-the-shelf handheld and wearable computers that a company may already own, or be in need of purchasing.

HANDS-FREE USERS TODAY: SOLUTIONS AT WORK

In highly competitive industries such as food distribution – companies are forced to prove themselves every day and voice is one way these companies are gaining a competitive edge while also reducing costs and driving productivity. According to Jeff Williamson, Senior Vice President of Operations at Performance Food Group (PFG), one of the nation’s largest food distribution companies, “High quality and consistent customer service is paramount. That’s why we maintain a deep relationship with each of our customers, and also why we continually review our operations, looking for ways to take our service to the next level.”

In 2008, PFG implemented Voxware 3, a software application for voice-directed order selection, alongside mobile units from LXE to improve customer service. “Our customer satisfaction was already very strong, but we saw an opportunity to raise the bar higher through the right voice software,” noted Williamson.

The results speak for themselves. See below.

ACHIEVEMENTS IN UNDER ONE YEAR :

- Pick accuracy of 99.4%
- 50% reduction in truck shorts
- 40% improvement in services levels
- ROI in less than 9 months

And while PFG is very happy with these results, they still expect the numbers to get even better as their staff continues to adapt to voice-directed operations as a best practice.

But it's not just the food industry that is experiencing great results from hands-free technology. Today's array of voice-enabled and wearable technology options has expanded the use of this technology from where it was invented to a wide variety of warehouse types. New vertical markets adopting voice include specialty retail (including apparel) and general merchandising, restaurant chains and convenience stores, healthcare and pharmaceutical, auto parts and publishing.

Elsevier, a leading publisher of Health Science and Technology Information, implemented Voxware's application alongside mobile units from LXE to increase their operational functionality. Before implementing voice technology, labels were printed on cardboard and Elsevier's RF guns sometimes had difficulties reading them. According to Randy Voss, Director of Distribution at Elsevier, the company also had, "very little insight into metrics such as productivity rates and picking errors." Workers were also slowed down by cumbersome RF units they had to juggle as orders were picked. "The RF units were continually at risk for damage as workers attempted to balance them with the order items, and when they went to holster the devices between picks," said Voss.

Once the voice-driven picking system was deployed, Elsevier was able to measure their increased accuracy and productivity rates and were no longer plagued with problems resulting from failed product scans. The wearable, voice-enabled units also allow workers to keep their hands free while fulfilling orders, meaning there Elsevier's RF units are at less risk for damage.

"The immediate measurable results that we got less than one year after our implementation are phenomenal, and we continue to see benefits as our workers continue to learn and embrace the system," said Voss.

SPECIFIC BUSINESS VALUE INCLUDES :

- Pick accuracy of 99.72%
- Reduction in training time (from 2 days to 4 hours)
- Productivity gains in each and case picking operations
- ROI in 9 months

WHAT TO CONSIDER BEFORE TAKING THE NEXT STEP

By now, you've seen a lot of evidence regarding the benefits of hands-free solutions. However, it's important to note that hands-free solutions may not be the best choice for every setting or application. For example, Roeder mentions that in a, "In a high-speed picking operation with a low number of SKUs, pick to light may be a better option." But with that being said, in many environments the potential ROI by way of productivity gains and increased order accuracy, is just too great to ignore.

The fact is, it's almost impossible to reach pick accuracy of 99.9 percent with a handheld solution because of the human tendency to error when a process is interrupted. When an operator wears a computer, whether he or she interacts with it via a keyboard or through voice, the picking process proceeds uninterrupted and pick accuracy increases. The pick is also inherently faster, and a few seconds saved per pick, per worker, per shift, per day, per week, will quickly add up to substantial productivity gains.

If you have made the decision to start exploring the value a hands-free solution can yield for your business, it's important to recognize that hands-free solutions do not offer a 'magic bullet'. Implementing hands-free solutions will only get you so far if you have process issues. Companies should begin their hands-free initiatives by looking for opportunities to improve basic warehouse functionality, and then use hands-free technology to take that functionality to the next level.

Once you are confident that the time is right to begin deploying hands-free solutions, it's important to carefully evaluate all major components of the solution. In the case of a voice solution, the four major components to consider are:

- 1) A wearable computer
- 2) Voice recognition software
- 3) A voice application
- 4) Integration with a WMS or legacy warehouse

Below are two checklists for evaluating wearable and voice-enabled hardware.

STANDARD FEATURES TO EVALUATE FOR VOICE-ENABLED AND WEARABLE MOBILE COMPUTERS:

Ergonomics:

Voice-enabled or not, wearable data collection devices should be comfortable to wear and easy to use, no matter the shape and size of the user. As a rule, a wrist-mounted unit should not exceed one pound in weight and it should not require the user to bend the wrist when using a ring scanner. Wearable solutions should be wearable on the right or left side of the body and the user should be able to put on and take off all the solution components in under five seconds without assistance.

Open Platform:

Choosing open platform, software-agnostic hardware and wireless infrastructure ensures the mobile computer will work with any standards-based application. For voice-enabled hardware, be certain the device has been certified by your voice vendor of choice, to ensure it has been tuned to work consistently no matter what the application.

Programmability:

All data collection devices should allow users to customize the interface to their specific needs. Even voice-only solutions should include a few buttons, which will enable users to perform key functions such as "repeat instruction."

Battery:

Supporting a display and/or voice capabilities taxes batteries, so battery management capabilities are essential (including rapid re-charging). The location of the battery is also a consideration. Batteries can be worn at the small of the back or on the bicep or on the wrist within a wrist-mounted computer. Be sure to consider the weight relative to the location.

Safety:

Ring scanners and headsets should feature breakaway design, so they will easily slip off the user if a component gets caught on an object, such as a conveyor.

CON'T:

Durability:

Resilient, lightweight materials are essential in rigorous warehouse environments, including temperature extremes. Look for plastic- or glass-filled materials, drop test results of at least four feet and a high IP rating. The headset connector can be a particular area of vulnerability with voice solutions, so it's essential to ensure a long-wearing design. Be sure to confirm temperature-specifics when appropriate.

Multi-Modal Capability:

Some distribution tasks require a combination of interfaces, such as voice for pick instructions and scanning to record important data like serial numbers, batch/lot numbers or catch weights – in these circumstances multi-modal devices are a must.

Multi-Language:

Devices must accommodate multiple languages and dialects, whether instructions are provided via text or voice.

Push-to-Talk Capability:

This function allows for voice communication with supervisors, whether a device is voice-enabled or not.

Display:

Some operations choose to use wrist-mounted or waist-mounted computers with touch screen displays to enable multiple inputs, or allow the operator to both see and hear instructions, or enable exceptions. In a wearable, maximizing display size yet minimizing form factor is critical.

Service and Support:

All industrial equipment is subject to wear and tear. Be sure to choose a vendor with a solid track record of superior service and support to ensure rapid service and return. If you are located in the USA, look for a vendor that services equipment within the USA.

VOICE-SPECIFIC FEATURES TO EVALUATE FOR VOICE-ENABLED MOBILE COMPUTERS:

Powerful Processor:

A powerful chip speeds processing of voice signals.

Simplicity:

A dedicated voice-only wearable computer boasts an elegantly simple user interface, with just a few buttons.

Noise Reduction:

Inferior systems can confuse ambient warehouse noise, or cross talk, with the user's voice. The ability to filter speech and eliminate echo in industrial settings can be a key contributor to the success of the solution. Look for:

- Highly refined noise reduction technology including an advanced codec (coder-decoder program)
- Precise tuning controls to improve performance in specific applications and environments
- Design features that eliminate electronic noise and echo to improve the fidelity of voice reception and play-back.

Speaker-Dependent vs. Speaker-Independent Recognition Engine:

A speaker dependent system is designed to only recognize the speech of users it is trained to understand. These systems are usually more accurate but not as flexible as speaker independent systems. A speaker-independent system is developed to operate for any speaker of a particular type (e.g. American English). These systems are more flexible; however, accuracy can be lower than speaker-dependent systems.

Wireless vs. Wired Headset:

Wireless headsets compress voice signals in the headset; data is sent to the wearable mobile computer for decompression and processing. Wired headsets, on the other hand, pass the voice signal, to the computer as an analog signal typically with better voice fidelity and lower cost. A wired headset with a 4-pin connector (as compared to the more common 3-pin connector) offers the greatest level of voice recognition accuracy.

Hygienic:

While some companies issue one wearable unit per user, many others share units. Any soft components and parts that touch the skin, such as straps and ear pads, should be issued one to a user, while the actual computer can be shared and snapped into place. Hard components should be easy to clean.

CONCLUSION

Advances in wearable and voice-enabled computers are driving accuracy and productivity rates to never before seen highs. While hands-free solutions may not be the best choice for every setting or application, in many environments the potential ROI is just too great to ignore.

The fact is, it's almost impossible to reach pick accuracy of 99.9 percent without going hands-free because of the human tendency to error when a process is interrupted. When an operator wears a computer, whether he or she interacts with it via a keyboard or through voice, the picking process proceeds uninterrupted and pick accuracy increases. The pick is also inherently faster, and a few seconds saved per pick, per worker, per shift, per day, per week, will quickly add up to substantial productivity gains.

In this difficult economic climate, we are all being asked to do more with less. A hands-free solution is one way to get your operations working harder and smarter – today.

To see hands-free solutions at work visit: <http://www.rfsmart.com/about/videos-downloads.php>

DID YOU KNOW?

LXE pioneered the voice market with the HX3 rugged voice computer, a full two years before the introduction of a competitive product? LXE also engineered ToughTalk, a collection of technologies that improve the fidelity of voice reception and play-back. ToughTalk improves the accuracy of speech recognition and is included as standard on all LXE voice computers. Specifically, ToughTalk:

- Produces clearer, more easily understood text-to-speech renderings
- Provides precise tuning controls to improve performance in specific applications & environments
- Prevents electronics noise from intruding into the headset & microphone
- Eliminates echoes between the microphone & headset

GET MORE INFORMATION.

For more information on RF-SMART and LXE hands-free solutions, please contact us at 904-493-2653 or <mailto:info@rfsmart.com>.

