

White paper

**Future-Proofing Your
Mobile Computers:**
How the Features You Select
Now Can Protect & Extend Your
Investment Years into the Future

Rugged mobile computers deployed to warehouses, DCs and other transportation and distribution environments often aren't used as long as expected, and as result cost the organization more than expected. According to a study¹, companies typically replace their DC computers after about 3 1/2 years, which is approximately seven months sooner than planned at the start of the deployment. Rugged devices can actually last even longer, but are retired prematurely because the processors, software, communications data capture capabilities contained within the rugged housing are considered inefficient or obsolete (see table).

Why are Mobile Computers Replaced in Transportation/Distribution/Warehouse Environments?	
Technological obsolescence	59.1%
Attractive trade-in value	50.0%
Prospect of more attractive TCO	47.7%
Desire to switch suppliers	18.2%
Other	4.5%

Source: VDC Research Group

Extending service life increases the value of mobile computers. When life cycles go down, so does the return on investment, and the total cost of ownership (TCO) goes up. The table below illustrates how changes in the replacement cycle impact the TCO for mobile computing deployments. It reflects how much the purchase price of a \$3,000 rugged computer used in warehousing and distribution contributes to the annual and monthly TCO. Note that replacing mobile computers after 3 1/2 years instead of four (which is about the average intended life cycle) increases the annual TCO allocation by \$107, or 14.2 percent.

Years in service	Annual TCO allocation	Monthly cost	± TCO expectations
3.0	\$1,000	\$83	(33%)
3.5	\$857	\$71	(14.2%)
4.0	\$750	\$63	--
4.5	\$667	\$56	11.1%
5.0	\$600	\$50	25%

Organizations have a tremendous amount of control over these costs, because they have more control over mobile computer lifecycles than they realize. It's relatively easy to future-proof mobile devices -- without building in excess cost -- so they can support future requirements and fulfill their full life cycles. This white paper explains how the features and options available for ruggedized mobile computers can extend the time they can perform in warehouses and distribution centers. It provides guidance on how to make decisions that will protect your investments by meeting user needs today and into the future.

A Migration Path

It is easier for businesses to identify mobile computers that will last long-term in the physical environment than it is to find devices that will satisfy their changing IT and business requirements. Equipment can be durable, consistent and long lasting, but

business processes and integration requirements are ever changing. For example, a few years ago voice-directed picking was relatively rare, but is now considered a best practice. Similarly, 2D bar codes are no longer a novelty and have a permanent place on many shipping label formats. Organizations need to consider emerging technologies when purchasing systems so that they can easily benefit from productivity-enhancing processes based on these technologies in the future rather than facing an expensive rip-and-replace upgrade to gain the functionality.

Voice-directed picking and 2D bar coding will continue to grow, and other emerging technologies will probably be commonly used three years from now. But which will they be -- new speech and voice applications? Delivering text, voice and video to handheld computers? Automated pallet verification with RFID? When these questions are answered, businesses will face a bigger one: can the benefits of these processes offset the cost of the technology needed to support them?

Ruggedized handheld computers available today can support all the future use cases highlighted above, and businesses don't necessarily have to pay a price premium today to get the functionality they might need tomorrow. By developing an understanding of current capabilities and features, companies can specify mobile computers that will satisfy current needs while providing a clear migration path to cost effectively integrate additional technologies as they are needed. The following sections highlight key considerations for different mobile computer components.

Operating Systems & Software

Microsoft™ operating systems (including Windows Mobile™, PocketPC™ and Windows CE™) dominate the market for enterprise mobile computers, particularly for ruggedized handheld and forklift-mounted models. These operating systems dominate the market for good reason, because the Microsoft environment provides access to thousands of developers, integration with leading enterprise software applications, compatibility with IT management systems, and a clear migration path.

The real decision is not whether or not to choose a Microsoft-based operating system for ruggedized mobile computers, but what additional capabilities the device can also support. Many warehouses have home-grown applications that were developed specifically for older, legacy mobile computers, and do not want to have to rewrite the applications when the devices are replaced. By choosing devices that support terminal emulation, companies build themselves a bridge between old and new environments. Terminal emulation (TE) based applications can also be desirable as they can run very quickly. TE applications can differ in how they perform, though. For example, some can provide multiple session support so users can switch between up to four different sessions without having to log out and re-launch each application. Users may be required to log in if a wireless connection is lost, while some TE solutions provide session persistence. If these situations could occur in your environment, check the terminal emulation specifications carefully. TE applications generally use function keys for operation, so an important consideration for TE applications on a mobile computer is how function keys will be supported. For example, does the computer have dedicated hard function keys or are they shifted keys or are they supported using soft keys on a touch screen display?

¹ "Total Cost of Ownership Models: For Mobile Computing and Communications Platforms, 2nd Edition," Venture Research, July 2007.

Due to the improvements that can be made in screen appearance for the users and the wealth of developer tools that are available, browser based applications are growing in use. It is usually important for in-premise applications that mobile computers are capable of supporting TE and browser based applications. This gives you the greatest flexibility to choose the applications that best deliver the functionality and performance that you need. Systems also need the capability to be locked down so that users can not be running non-work related programs, changing important computer settings (ex. wireless network security settings), accessing undesirable websites, etc.

Scanning Capability

After a long period of only incremental improvement, in recent years bar code scanning capabilities have experienced important innovations and improvements. For companies that are already using mobile computers with integrated bar code readers in their warehouses, some of the productivity-enhancing scanning options offered now were not available during the last deployment. For example, there are area imaging scan engines that can be integrated into mobile computers today that can read both 1D and 2D bar codes at distances from a very short range to 50 feet. Such long-range scanning was unheard of only a few years ago, and devices that could scan both near and far did not exist. This is an important advancement, because it allows warehouse workers to meet all their scanning needs (such as scanning a shipping label from arm's length away during receiving, to scanning a small part label from inches away during picking, to scanning a high-rack location label 50 feet in the air) with a single device without having to limit business processes around the range of the scanner, or to purchase and maintain separate devices. If current or future business processes call for reading bar codes at a variety of ranges, area imagers with range flexibility are an excellent choice.

Imaging technology in general provides more investment protection and future-proofing than laser scanners because imagers can read and decode all 1D and 2D bar code symbols. Lasers can read 1D bar codes and some 2D symbols, but not 2D matrix symbols like QR Code or Data Matrix. Warehouse and DC workers haven't traditionally had to read matrix symbols, but emerging business practices in manufacturing and supply chain operations are changing that. Matrix symbologies, especially Data Matrix, are especially well suited for encoded lot codes, serial numbers and other unique identification numbers, and can be applied to very small items. Growing demands for traceability and chain-of-custody documentation are driving increased use of these symbols, and could necessitate scanning in distribution centers.

Imagers can also be used to take time-stamped digital pictures of goods at receiving to document damage that occurred before the facility took possession, or to photograph outbound goods to prove they were shipped in good condition. Imagers are at cost parity with laser scanners for integration with mobile computers, so by specifying them companies protect themselves from having to upgrade in the future at no additional cost in the present.

RFID

Although RFID isn't widely used in warehouses and distribution centers, adoption is growing. Many companies begin using RFID for a limited portion of their product lines or to support a single customer, or to track their own inventory or materials through a critical process or chokepoint. Because initial deployments

are limited, it is important to have an RFID infrastructure that is scalable. Mobile terminals can provide scalability by being customer upgradeable to support RFID. In that way, RFID read/write capabilities can be added when needed, rather than having to equip all mobile computers with RFID readers that may go unused.

RFID has clear technical advantages (ex. read/write capability, doesn't require line of sight) and is the best choice for certain applications. One of the reasons RFID has not been adopted quickly is because there are many competing technologies, including many proprietary products that lock customers into a single vendor. Specifying standards-compliant products is always a good policy to future-proof technology investments, and is especially relevant and important for RFID equipment.

Bluetooth

Enterprises don't always know the types of peripherals their future operations will require, so it is hard to plan device requirements around them. Bluetooth™ makes it easy by providing a flexible, standard interface for integrating thousands of different peripheral devices. Bluetooth is built into mobile printers, bar code readers, headsets for both VoIP telephony and speech-directed systems, scales, sensors, GPS receivers, computer docking stations and many other products. In addition, Bluetooth improves device durability. The wireless connection eliminates the need for cables to connect to peripherals, which are a common source of failure.

Wireless Printing

In addition to evaluating mobile computers, you also need to think about printers and the different ways you plan to use them in your facility. Support for your existing network interface protocols is an important factor in printer selection, because it will speed the deployment process. Bar code printers that support standardized wireless communications (i.e., Bluetooth, 802.11b/g connectivity, 802.1x security, etc.) can be easily integrated into an existing network, providing greater flexibility in printer placement throughout a facility. This eliminates the need for cabling, reduces the burden on the IT staff and cuts the time it takes to install a new printer, without compromising network security.

Combined with a mobile computer, mobile printers can enhance operations like receiving, put-away and picking. Wireless mobile printers allow workers to generate and apply labels literally anywhere in a warehouse or factory. By printing labels on demand, at the point of activity, workers print only the labels that are needed and are much less likely to apply the wrong label to an item or package. Positioning the printers closer to areas where the work actually gets done also eliminates "deadhead" trips back and forth from the workstation to the centralized printer. These walks to the printer may take only a few minutes, but multiplied across dozens of workers on multiple shifts, they represent an opportunity for tremendous time savings and productivity improvements. Eliminating unnecessary walking also helps eliminate distractions that lead to labeling errors and lost productivity.

Network Compatibility

Mobile computers alone won't future-proof warehouses and DCs against future needs; wireless networks must provide a migration path as well. Picking and put-away transactions will probably always be part of the wireless network traffic, but voice, video, location-based services, remote management and other beneficial transmissions are increasingly finding their way into

operations. Even if organizations don't envision using advanced communications and supporting different transmission types, they can prepare for them at no incremental cost.

Most companies require wireless LAN connectivity for the mobile computers used in their warehouses and DCs, but the selection criteria should go beyond basic 802.11-standard Wi-Fi compatibility. For example, enterprises with Cisco wireless LAN infrastructures should specify mobile computers with Cisco Compatible Extensions (CCX), which provide a bridge to integrate an extensive range of network related services and applications that are being developed, including Wi-Fi enabled real time location systems (RTLS), voice-over-IP (VoIP) connectivity so workers in the yard or anywhere in the wireless LAN coverage zone can communicate by voice through their mobile computers, plus text messaging, image transfer and video streaming to handheld devices.

Supported security is another important differentiator among wireless computers. Not all 802.11-standard wireless devices support the same security protocols, even though they are interoperable with 802.11 networks. 802.11-standard compatibility requires support for WEP and other basic schemes. If more advanced protocols such as FIPS, 802.11i WPA2 and certain types of 802.1x are used in the enterprise, make sure the mobile computers you select can support them.

Voice/Speech Support

"Voice" or, to a lesser extent, "speech" capability for a mobile computer can mean several different things. Typically "voice" can be divided into two different categories - 1) when a worker is using the device to talk with another person, and 2) when the worker is communicating with the mobile computer and an application program. Both categories have benefit and are applicable for warehouses and DCs.

The primary need for a worker to talk to another person in a warehouse facility is usually called PTT (Push To Talk) or walkie-talkie capability. In this case a worker wants to talk to someone else in the facility, usually to resolve a question or issue quickly. Some mobile computers, with the appropriate software, can be set up to allow workers to talk with other workers with mobile computers, or in some cases workers with standard walkie-talkies. It is also possible to have the capability for a worker to receive/ make "phone" or VoIP (Voice over IP) calls outside the facility with a mobile computer, but this need is not very typical.

Having a worker use what is commonly referred to as "voice directed" or "speech" or TTS/STT (Text To Speech/Speech to Text) or voice/speech recognition/synthesis is of particular interest to a growing number of warehouse/DC operations due to its benefits in productivity and accuracy. Voice-directed or speech-based picking and put-away processes are in the near futures of many warehouses and distribution centers. Voice/speech allows a worker to be "hands-free" and "eyes-free" and has been identified as the key technology for surpassing 99 percent picking accuracy and has produced proven results for lowering labor costs.² Because voice/speech is effective for increasing productivity and lowering costs, the technology is attractive at a time when other investments may not have ROI periods that are short enough to win approval. Mobile computer features have a direct bearing on how voice/

speech-directed applications can be implemented, and the costs associated with doing so. A mobile computer should provide support for multiple voice/speech alternatives, including different wired and wireless headsets.

Conclusion

Nearly every feature on a mobile computer carries implications for how well the device can support changing requirements and remain in service. Businesses do not need to know their exact requirements for tomorrow to make good device decisions today. Instead, they need to be able to identify the features that provide flexibility. The table below lists the features that determine if mobile computers are future-friendly or raise red flags about their ability to provide a long life cycle.

Component	Future-Friendly Characteristics	Red Flag Characteristics
Flexibility	Ability for a customer to easily add capabilities like voice, RFID, scan handles	Adding capabilities requires purchasing a different computer
Operating system	Supported by strong ISV community; multiple APIs and application development tools available; supported by mobile device management systems; TE support; lockable browser.	Proprietary; small developer base; consultants, contractors or the manufacturer's tech support staff needed to make software changes or develop drivers.
Bar code scanning/imaging	Supports 1D and 2D bar codes, variable read ranges; imaging capability.	No 2D support; imager with limited focal range.
RFID	Read/write capability available; customer upgradeable to add RFID functionality.	Can not be customer upgraded for RFID, must purchase different computer.
Peripherals	Bluetooth connectivity.	Fixed-connection only via RS-232 or USB; limited ports.
Wireless networking	802.11 a/b/g compatible; enterprise security protocols supported; CCX certification (for Cisco customers).	Proprietary networking protocols; default-level 802.11 security; no CCX certification.
Voice/Speech support	Easy integration with multiple voice/speech systems including wired and wireless headsets	Inability to support voice/speech systems or only able to support one solution.

The value mobile computers bring to warehouse and DC operations relates directly to how long they are kept in service, which in turn relates directly to how the devices are built and the features they include. Choosing wisely lets organizations cost-effectively introduce new business processes and technologies that will

² "What's Really Working for Pallet, Case and Piece-pick Operations?" Aberdeen Group, January 2007.

increase the value of automation, rather than driving up the total cost of ownership.

About Intermec's CK3

The Intermec CK3 mobile computer supports multiple uses and technologies in a single device - thereby reducing equipment needs, training time and overall system cost. The CK3 can perform mobile computing, scanning, wireless printing, voice directed picking and RFID. Users have the ability to easily add functionality.

- Add an IP30 and you have an RFID reader to find product faster.
- Add portable or fixed printers and print wirelessly saving time to first label and transit time traveling to the printer.
- Add a scan handle for faster and more comfortable intensive scanning. The scanning capability is unmatched - easily scanning both 1D and 2D barcodes in any orientation, reading poor quality/damaged barcodes, capturing images and scanning barcodes from 6 inches to 50 feet.
- Add a voice module to get voice directed picking for faster and more accurate picks.
- Use them all together to have a multi-modal communications platform to get answers faster, act quicker, locate workers and communicate in real time.

The CK3 runs Microsoft Windows Mobile 6.1 and has support for voice/speech applications, and is available with Intermec's Terminal Emulation and Browser software, which allows systems administrators to manage Web browsing and provide secure connectivity to browser-based data collection applications. The

CK3 includes integrated Bluetooth and Wi-Fi certified 802.11 a/b/g radios, is CCX certified and supports multiple wireless security protocols. Input options include a long-range imager capable of reading 1D and 2D bar codes, and Intermec's IP30 snap-on RFID reader.

About Intermec

With more than 18,000 warehouse solutions installed worldwide, Intermec has extensive experience in helping customers create mobile and wireless technology platforms to improve operations immediately and take advantage of future opportunities. Intermec mobile computers are rugged enough for years of service in warehousing and distribution environments and are flexible enough to support new peripherals, software applications and business processes as they are developed. With the flexibility of the CK3 mobile computer you have the ability to perform everyday applications and add on capability as the need arises.

Intermec Inc. (NYSE:IN) is a leader in global supply chain solutions and in the development, manufacture and integration of wired and wireless automated data collection, Intellitag® RFID (radio frequency identification), mobile computing systems, bar code printers and label media. The company's products and services are used by customers in many industries to improve productivity, quality and responsiveness of business operations, from supply chain management and enterprise resource planning to field sales and service. For more information, visit www.intermec.com.

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