ZEBRA CAPTURE YOUR EDGE

Manufacturing 4.0 and Plant Mobility

Augment Your Manufacturing Plant Floor with Rugged Tablets

The Challenge

Increasing demand, material costs, turnaround times and labor shortages

Two factors are creating tremendous pressure for manufacturers all over the world: the dramatic increase in the largest demographic of consumers of manufactured goods and a staggering shortage of skilled labor and high labor turnover. The global middle class was 1.7 billion people strong in 2020, expected to more than triple to 5.3 billion by 2030.[1] Along with the growth in size comes a major increase in predicted spending on manufactured goods as well — today the global middle class spends an estimated $35 trillion annually on manufactured goods, expected to nearly double to $64 trillion by 2030.[1] The result is a major increase in demand for goods — along with expectations for ever faster delivery of flawless goods. At the same time, many manufacturers around the globe are facing historic labor shortages that are predicted to exceed eight million workers by 2030, a situation that could cost as much as $607 billion.[2] And the cost of raw materials and labor continues to increase — all while manufacturers continue to face the challenge of cutting cost-per-unit (CPU).

In order to navigate cost increases, mounting demand pressures, uncertain supply chains and labor shortages, manufacturers need to automate as many aspects of a job as possible to improve productivity; enable training to bring less-skilled workers up to speed as quickly as possible; and cross-train workers to create a nimble workforce that can be deployed in different jobs as needed to more fully utilize the available labor pool. And while that is already a monumental undertaking, manufacturers also need a way to ensure that workers — regardless of skill level — execute every task accurately to ensure product quality. And with plant mobility, they can.

The Solution

Enabling plant mobility with rugged tablets with the right enterprise features

Rugged tablets can address these issues by enabling plant mobility. Now, workers are no longer tied to a fixed workstation — they can get the job done wherever they happen to be, and can always access the information required to make better and faster decisions. Whether you are manufacturing vehicles, food and beverages, pharmaceuticals, electronics, heavy industrial machinery and more, a rugged tablet provides the durability required indoors on the plant floor and outdoors on the receiving dock or in the yard.

With the latest Wi-Fi (Wi-Fi 6/6E) and cellular connectivity (5G/private 5G), the information workers need to maximize task efficiency and accuracy is always at their fingertips. Data entry is not only faster, but also highly accurate through tools that automate data capture, such as barcode scanning and image capture. Video calls can provide task-specific support by providing remote access to experts. On-demand training and the ability to require completion of training courses ensures continual improvement of the skill level of your workforce — enriching your investment in your labor pool, one of your biggest costs. And the ability to incorporate the capabilities of additional devices boosts value, reducing technology investments and the number of devices IT must support, while simplifying life on the job for your workers. For example, the ability to place a rugged tablet into a workstation cradle to instantly connect to a large display, keyboard, mouse, printer and more eliminates the need for separate computer workstations. And the ability to enable tablets to become communication devices that take the place of two-way radios and PBX handsets reduces the number of devices the business needs to purchase and manage — and the number of devices workers need to carry. Now, a single tablet can enable the multi-modal advanced collaboration required to keep workflows frictionless, improve workforce productivity and maximize the overall efficiency of the enterprise operations.

Where do rugged enterprise tablets fit on the manufacturing plant floor?

There are numerous use cases on the manufacturing plant floor where rugged tablets can help make decisions and complete tasks faster than ever, saving time and money. With mobile access to data, workers can get more done in a day, reducing labor costs and increasing production, quality and workforce productivity. While you could use a handheld mobile computer, for certain plant floor applications, the large display on a tablet is more suitable, allowing workers to see and enter information without wasting time on extensive scrolling. For example, engineers that maintain plant floor production line equipment need to access large, highly detailed equipment schematics, conduct a video call with a remote expert to help with a maintenance routine, view PLC data and more — all tasks that would result in a poor productivity-eroding user experience with a handheld mobile device.

Following are some of the ideal plant floor applications that are best suited for an enterprise tablet, as well as the benefits that an enterprise tablet can provide.

- **Mobile HMI**
- **Quality assurance**
- **MES**
- **Training**
- **Plant maintenance**
- **WMS**

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Mobile HMI (Human to Machine Interface)

Use case | Plant floor machine maintenance

The in-house technicians and engineers that manage the Programmable Logic Controller (PLC) can use a tablet to streamline many of the tasks required to proactively service plant floor equipment before the machines malfunction and result in either unplanned production line downtime — and/or the creation of faulty products that must be dismantled or scrapped. A rugged tablet can also become a mobile HMI interface to the manufacturing process controlled by the PLC, enabling engineers to start, stop and pause machines and equipment or modify a process, anywhere in your facility.

New processes and their benefits:

When Mobile HMI is enabled on a tablet, you can:

- **Improve productivity** — You get a workforce multiplier since workers can complete more work orders per day by eliminating paper — for example, engineers can service more machines per day. And since a rugged tablet can double as a mobile workstation, you can give workers new responsibilities.
- **Improve efficiency through streamlined workflows** — Eliminate multiple calls to the control room to ask for a reading on a specific piece of equipment, description of a schematic or searching through large physical equipment manuals.
- **Digitize maintenance records for increased productivity, speed, traceability and accuracy** — Paper checklists no longer need to be entered into the computer, replaced with electronic forms with drop down boxes and more that automate and error-proof data capture. The resulting digital data is a valuable repository that can help predict downtime and identify bottlenecks by comparing maintenance records across similar machines.
- **Improve safety** — Track your workers in real time via integrated locationing technologies, ensuring all employees are safe in the event an evacuation is required.
- **Better manage the workforce** — Since you can easily determine the amount of time each work order took to complete, you can spot workers that can benefit from additional training or workers that can act as mentors.
- **Enable better collaboration for faster and more accurate maintenance** — The ability to place a video call or add push-to-talk enables workers to instantly reach experienced engineers.
- **Enable Augmented Reality and digitized work instructions** — Visually guide workers through the steps to perform maintenance.
- **Enable new and less experienced workers to accurately complete maintenance** while in training.

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Quality Assurance

Use case | Anywhere, anytime quality checks

Conduct spot checks to ensure the quality of incoming raw materials as well as finished products coming off the production line, providing an additional layer of quality control. Items no longer need to be transported to a quality control station. Now quality control spot checks can be performed anywhere and anytime at the plant, complete with the ability to scan a barcode and snap a photo to document the specific products that received quality checks.

New processes and their benefits:

When mobile Quality Assurance is enabled on a tablet, you can:

- **Improve productivity** — You get a workforce multiplier since workers can conduct more quality spot checks per day.
- **Improve efficiency through streamlined workflows and digitization of data** — Capture data faster and more accurately with electronic quality checklists instead of paper that must be entered into the quality control system. Leverage the data to expand visibility to gain new insights that can help improve operations. For example, you can spot when more errors are happening regularly on a specific production line, determine why and address and resolve the issues. Workers can get instant answers to questions through the ability to place a video call. And you can add push-to-talk to help identify and resolve quality issues faster to minimize quality-related costs.
- **Digitized work instructions** — When manufacturing travelers and build books are electronic instead of paper, issues that can impact data integrity are eliminated — such as legibility or a lack of needed details.
- **Capture data faster and more accurately** — Electronic quality checklists replace paper checklists, while barcode scanning enables accurate capture of product information.
- **Better manage the workforce** — Since you can easily determine the amount of time each work order took to complete, you can spot workers that can benefit from additional training or workers that can act as mentors.
- **Enable less experienced workers to accurately complete quality checks** while in training.
- **Better manage labor shortages** — Enable remote experts to assist on-site inspectors to ensure quality standards are met, regardless of their location.

With tablets, quality control spot checks can be performed anywhere and anytime at the plant, complete with the ability to scan a barcode and snap a photo to document the specific products that received quality checks.

Manufacturing Execution System Integration (MES)

Use case | Digital assembly instructions on the production line

Provide digital assembly instructions for any station on the production line to ensure every step in assembly is completed accurately, safeguarding product quality — even if less experienced workers are performing the assembly task. And a tablet easily accommodates any type of assembly line.

New processes and their benefits:

When the Manufacturing Execution System (MES) is enabled on a tablet:

- Workers can scan the barcode on a finished assembly and/or capture a photo to document work in process.
- Workers can travel to the next assembly station with the tablet or access a tablet that is installed on the assembly line, providing flexibility in production line design.

Use case | Digital job traveler

When job travelers are digitized, visibility into the audit trail and status for all orders is visible instantly, every step of the process. The result is better management of work in process, customer expectations and financial data.

New processes and their benefits:

When job travelers are digitized on a tablet, you can:

- Eliminate the lag time between the collection of data on paper and when the data is entered and visible in the system.
- Eliminate lost or damaged documentation.
- Eliminate time spent managing volumes of paper documents.

To ensure accurate assembly on the production line, tablets can provide digital instructions at any station, as well as digital job travelers to better manage work-in-process, customer expectations and financial data.

Manufacturing Execution System Integration (MES)

Use case | Easily enable more intensive data entry tasks

Expand digitizing efforts to new areas of the plant floor, boosting productivity and enabling the digital collection of information that can provide a new level of visibility throughout your plant floor operations — such as real time traceability. When more intensive data entry is required to collect data, workstation cradles can turn tablets into mobile-driven workstations that can be strategically placed throughout the plant floor to enable instant digitization of the data. For example, an assembly worker or engineer may need to enter extensive notes about an exception, respond to an important email or request for information from a supervisor.

New processes and their benefits:

With access to the MES on a tablet, you can:

- **Improve productivity**, throughput, task accuracy and product quality on the production line.
- **Improve throughput** and accuracy in overpacking.
- **Improve efficiency** for data-entry intensive tasks.
- **Improve safety** — Track your workers in real time via the integrated locationing technology, ensuring all employees are safe in the event an evacuation is required.
- **Better manage the workforce** — Since you can easily determine the amount of time each worker takes to complete a step in assembly or an overpack, you can spot workers that can benefit from additional training or workers that can act as mentors.
- **Enables less experienced workers** to accurately complete tasks while in training.

Transform a tablet into a mobile workstation to enable more intensive data entry anywhere in the plant, allowing workers to easily provide detailed notes about an exception or respond to a time-sensitive email.

Training

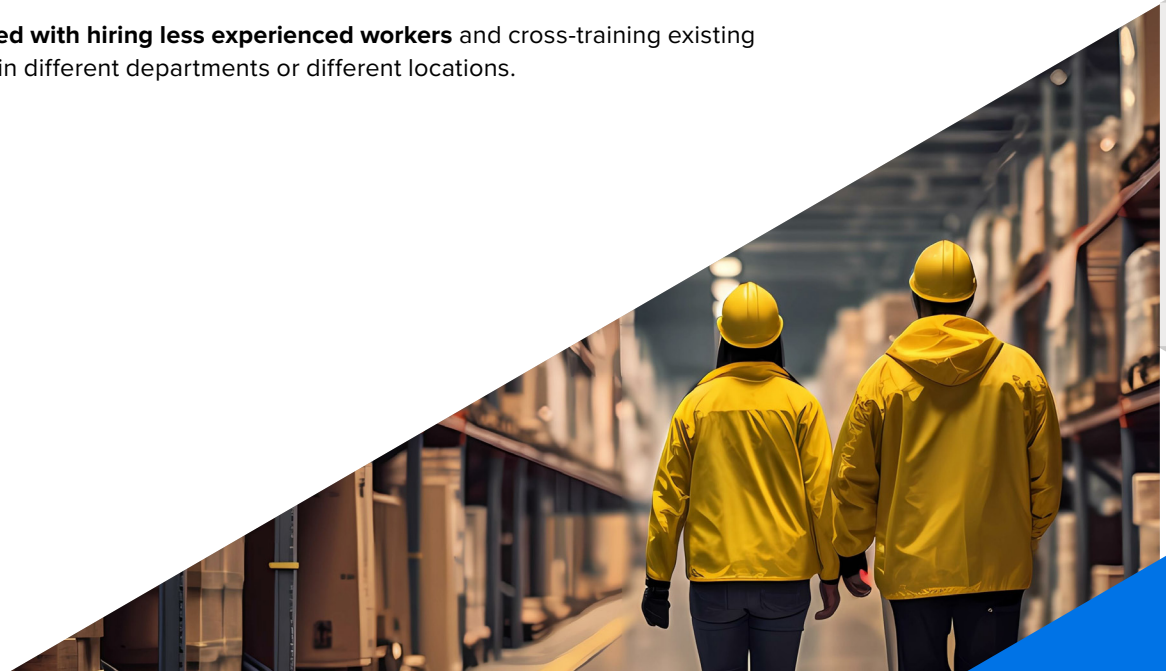
Use case | Enable comprehensive training, cross-training and training options

Regardless of where in the plant a worker is or what he or she is doing, you can present or push timely on-demand training directly to the worker's tablet, reducing learning curves and making it easier to cross-train workers on new functions. The large display on a tablet makes it ideal for any type of virtual training class. Workers can take a self-paced course anytime, watch on-demand training vignettes on individual steps in a process or participate in an instructor led course. Tablets could enable Augmented Reality training to make it easy for workers to digest even the most detailed aspects of any process. And whether courses are self-paced or led by a remote instructor, with push-to-talk or PBX call capabilities, workers can instantly reach out with any questions.

New processes and their benefits:

With access to all types of training on a tablet, you can:

- **Ramp up** less experienced workers faster.
- **Ensure task accuracy** during onboarding/training periods.
- **Track the training classes** that each worker is taking, ensuring compliance with required classes.
- **Determine which courses/vignettes are viewed** repeatedly by specific users to help identify which manufacturing processes or functions may be best served for in-person instructor lead classes.
- **Reduce the risks associated with hiring less experienced workers** and cross-training existing workers on new functions in different departments or different locations.



Push timely on-demand training directly to a worker's tablet to reduce learning curves and make it easier to cross-train workers on new functions.

General plant management

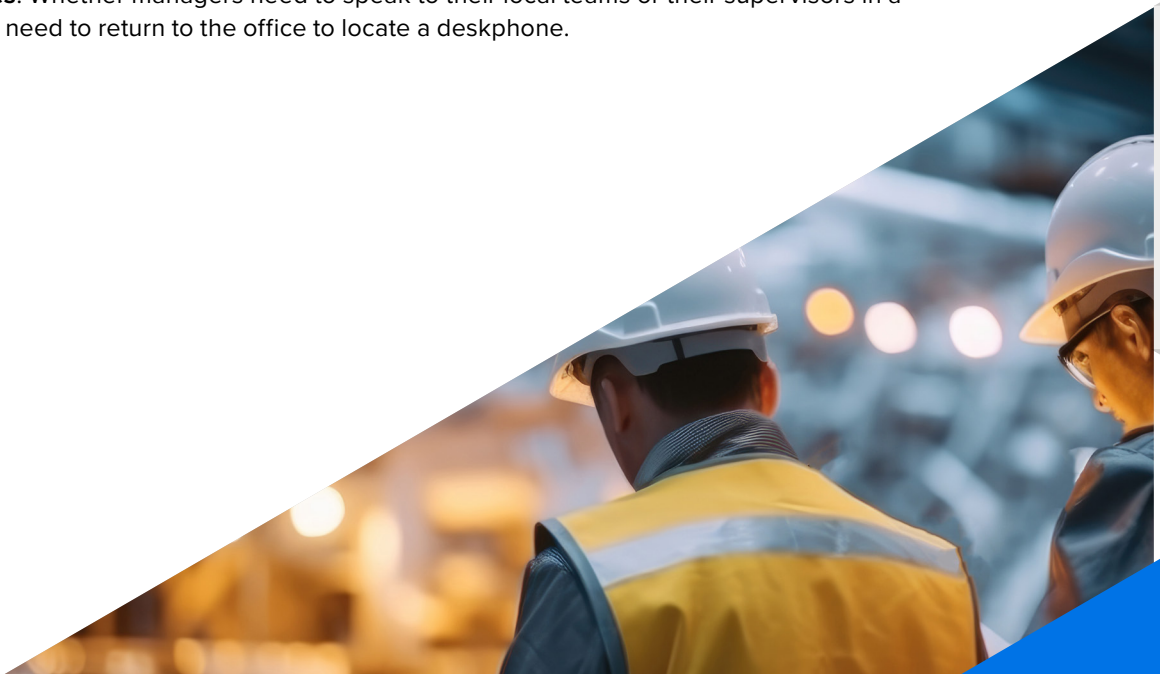
Use case | Keep managers on the move yet always connected

Your managers need to be out on the floor supervising workers and taking care of issues as they arise. But when they are out on the floor, they lose visibility into the business applications they need to keep their finger on the pulse of the operations.

New processes and their benefits:

When plant managers leave their desks but stay connected to all the tools on their desktop, right on a rugged tablet:

- **Management can remain connected to email and messaging systems while on the go,** including other managers, upper management, vendors and more — ensuring timely responses to all issues.
- **Managers can easily input heavy data entry on the go** on an as needed basis with the keyboard on a 2-in-1 rugged tablet.
- **Managers are always reachable and able to get on-the-spot answers to critical questions with push-to-talk and PBX calling capabilities**. Whether managers need to speak to their local teams or their supervisors in a corporate office, there's no need to return to the office to locate a deskphone.



With a rugged tablet, managers can remain connected to email, messaging systems, upper management, vendors and more, no matter where in the plant they may need to be.

Warehouse Management System Integration (WMS)

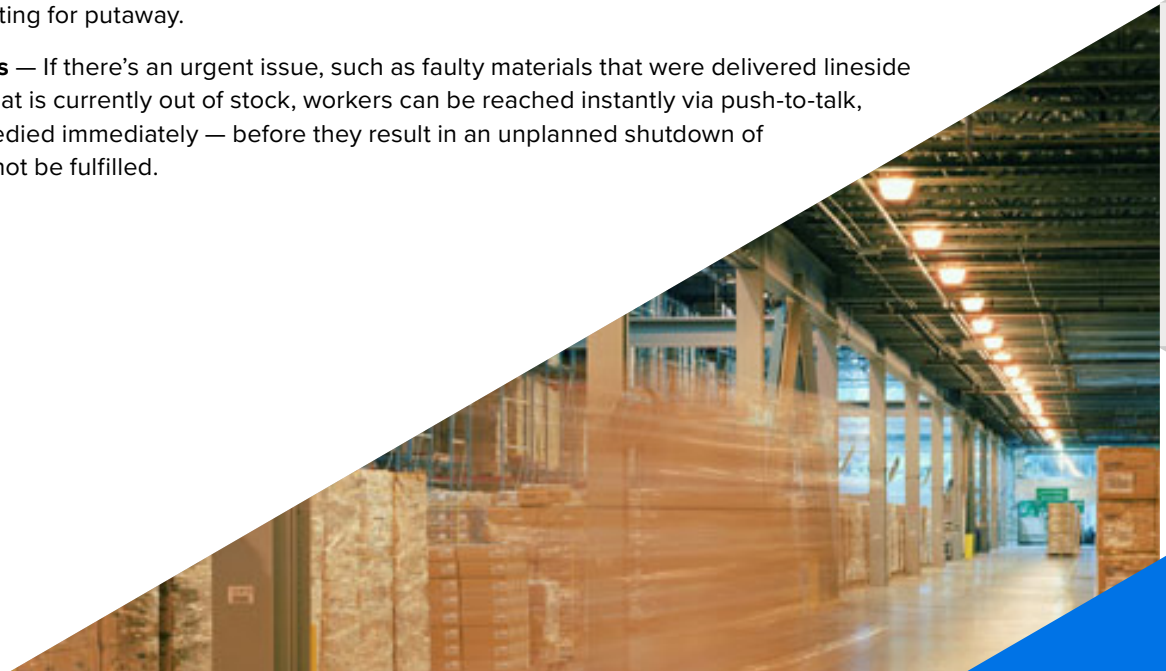
Use case | Digital production line replenishment/raw materials warehouse

Most manufacturers have a raw materials warehouse to store the goods required for assembly on the production line. Timely lineside replenishment of raw materials is critical — if any station on the production line runs out of materials, the line must shut down. And at up to $260,000 a minute, unexpected production line shutdowns can quickly translate into millions or billions of dollars, depending on the size of the manufacturer.[3] Rugged tablets mounted in your forklifts can augment picking and putaway operations:

New processes and their benefits:

With the Warehouse Management System (WMS) running on a tablet, you can enable:

- **Real-time picking orders** — Operators can receive timely picking orders to replenish the production line stations, ensuring the continual availability of lineside materials required to prevent costly unplanned downtime.
- **Real-time inventory visibility** — When operators pick and scan the materials, the inventory system is updated, providing the real-time inventory visibility required to enable timely re-orders — and ensure ample stock is always on hand to replenish the line at all times.
- **Real-time put-away orders** — Operators can receive timely put-away orders for incoming shipments, ensuring the materials are entered into the inventory system and placed in the correct area, ensuring availability for lineside replenishment — and eliminating false out-of-stocks due to misplaced materials or shipments that are sitting on the dock waiting for putaway.
- **Real-time communications** — If there's an urgent issue, such as faulty materials that were delivered lineside or a shipment of an item that is currently out of stock, workers can be reached instantly via push-to-talk, enabling issues to be remedied immediately — before they result in an unplanned shutdown of the line or orders that cannot be fulfilled.



With rugged tablets mounted in your forklifts, picking orders can be prioritized and sent to operators to ensure timely replenishment of production line stations, preventing unplanned downtime that can cost hundreds of thousands of dollars a minute.

Considerations when choosing a tablet: enterprise or consumer?

1 Overall TCO

According to VDC, a consumer tablet will cost nearly 60% more than an enterprise-class rugged tablet over a 5-year period, due to additional device failures and replacement device costs.[4]

2 Ruggedness

Manufacturing environments are among the most challenging and demanding enterprise environments. The tablet you choose should be purpose built to handle all the top reasons tablets fail on the manufacturing floor: drops on concrete; exposure to water, dust and extreme temperatures. In addition, you may have locations where hazardous materials are present, requiring a special model with C1D2 certification to ensure the safety of the user and anyone in the vicinity. And a lack of rugged design has a major impact on productivity and total cost of ownership (TCO) — consumer devices fail more often, and each device failure costs an average of 74 minutes of lost productivity.[4]

3 Productivity

According to VDC, due to lack of consumer tablet ruggedness, you can expect nearly double the lost productivity costs compared to an enterprise-class tablet[4] — consumer tablets generate 20% more trouble tickets[5] than their rugged enterprise counterparts. And an IT support technician spends an average of 70 minutes per trouble ticket to resolve the issue or initiate a return if the device is broken.[4]

4 Battery power

Each time a user runs out of battery power during a shift, an average of 54 minutes of productivity[5] are lost while users hunt for a fully charged device to complete the shift. Enterprise-class devices offer user replaceable and user-swappable batteries directly in the field, so devices never need to be removed from daily operations for charging. And the constant device availability increases the return on investment. In addition, many enterprise-class tablets support hot or warm battery swaps. With true hot swap, all functions are available during a battery swap — applications, connections to Wi-Fi, phone calls, text messages and more. With warm swap, the screen goes blank during the swap and no functions are available — but post swap, workers can continue right where they left off. And in both cases, there is never a need to completely reboot the device post battery swap.

5 Enterprise-class wireless connectivity

Your tablets are only as valuable as the reliability of their wireless connections. Enterprise-class tablets offer wireless options that can include the fastest protocols for the network connectivity you need: Wi-Fi 6/6E, 5G and private 5G. And if the tablet is in a vehicle, the wireless radios can take advantage of any external antennas that might be installed on the vehicle for a highly reliable connection — a feature consumer tablets typically don't offer. For example, tablets and other mobile devices in large facilities with heavy machinery and a lot of metal infrastructure are prone to dropped and frozen wireless connections that disrupt the flow of work. In addition, consider the quality of the Wi-Fi radios. All radios are not created equally — some offer features that deliver rock solid 'wired' style wireless connections that give workers near instant application response times. And since each wireless network connectivity issue typically results in 24 minutes of lost worker productivity[4], routine disruptions can be very costly, impacting plant throughput, workforce productivity and the ability to meet delivery dates.

On the other hand, enterprise-class wireless radios offer maximum connection reliability, increasing screen refresh time when interacting with applications, potentially shaving seconds off of every wireless application interaction. So whether your manufacturing plant is measured in thousands of square feet or thousands of square miles, with a rugged enterprise tablet with enterprise-class wireless connectivity options, you're covered.

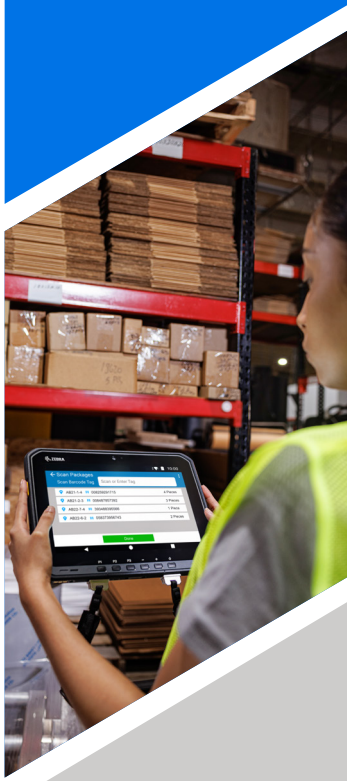
6 Integrated enterprise-class data capture functionalities

Heavy barcode capture needs are typically met with a dedicated handheld scanner that offers the right ergonomics for the job, such as a trigger handle. But what about workers who need to capture barcodes occasionally throughout the day? In order to ensure the level of performance that won't slow down your operations, the tablet you choose should have an enterprise-class camera or dedicated scan engine that offers the following features:

- Omnidirectional point-and-shoot barcode capture — eliminating the need to take the time to align barcode and tablet scanner or camera
- Ability to capture damaged, poorly printed and dirty barcodes that are common in industrial manufacturing environments

Consumer tablets typically offer a consumer-class camera for image and barcode capture, but it will likely require the purchase and management of specialized software to capture barcodes. The consumer camera is not likely to capture barcodes right out of the box — unlike an enterprise integrated scanner or camera. In addition, capturing barcodes with a consumer grade tablet camera will typically be slow, require alignment of the tablet and barcode and will lack the scanning algorithms that will enable the capture of the damaged, scratched or dirty barcodes common in demanding manufacturing environments. The end result is slow and cumbersome barcode capture and regular exceptions that require manual entry of barcode data, eroding worker productivity.

In addition, you may need to capture specific types of data — for example, an automotive manufacturer needs to capture the vehicle identification number (VIN) and the tire identification numbers (TINs) on vehicles to ensure compliance with safety laws. Enterprise tablets can offer enterprise OCR camera technology, with finely tuned software that enables a press of the scan button to capture, format and send specific types of data directly to the right application — such as TINs or VINs. The need to enter long text strings manually — and the opportunity for data entry errors — is eliminated.



7 Availability of additional solutions to create an 'all-in-one' device — and enable advanced collaboration

In addition to streamlining manufacturing processes, manufacturers are also looking to minimize the volume of devices that must be purchased, managed and carried by workers — and improve workforce collaboration. Consumer tablets typically will not provide the ability to integrate additional optional enterprise capabilities — or may support a capability such as push-to-talk, but require you to locate, develop, test and manage the enabling software. On the other hand, some rugged enterprise-class tablets offer fully-developed ready-to-use solutions that add key capabilities that eliminate the number of devices workers need to carry and manage — and reduce the number of devices your organization needs to purchase and maintain, reducing your carbon footprint. Ready-to-use solutions available for some of today's enterprise-class tablets include:

- Two-way radio capabilities, enabling push-to-talk (PTT) over Wi-Fi and cellular networks
- PBX handset functionality, allowing workers in the plant to take calls as needed from partners, customers and co-workers
- Secure text messaging, providing two benefits: an easy way to ask questions in noisy areas of the plant, plus an alternate means to collaborate that provides a written audit trail
- Docks that enable tablets to be inserted to automatically create a fully featured workstation on demand, complete with large monitor, keyboard, mouse, network connectivity and more — and removed in an instant to transition back to a mobile device

8 Support costs

Since consumer devices aren't rugged, they malfunction and break more often, generating more trouble tickets than their rugged counterparts — and rippling into higher IT support costs. According to VDC, you can expect IT support costs for the typical consumer tablet to run nearly 2x more than rugged enterprise tablets.[4]

9 Software ecosystem

Check for an available software suite of ready-to-use proven applications and device security solutions that make devices easier for IT to manage and secure — and easier for workers to use.

10 Expansion accessories

Enterprise tablets typically have enterprise accessories that make it easy to tailor the tablet to your specific use cases. For example, a 2-in-1 keyboard makes data entry easy. Specialized vehicle docks and mounts enable tablets to be utilized as vehicle mount mobile computers in your forklifts and other material handling vehicles. Desk chargers and multi-slot chargers simplify and reduce the cost of backroom management. Workstation cradles turn tablets into fully featured workstations, potentially eliminating the need to purchase and manage desktop computers at assembly line stations on the production line. And specialized cabinets can store, charge and manage device check-in and check-out at the start and end of every shift.

In addition, look for a manufacturer that has an active 'evergreen' device accessory strategy, where accessories are typically compatible with the next generations of the tablet you purchase as well as possible new tablets in the future. This allows you to migrate to newer technology at a lower cost when new tablets become available. With consumer tablets, required accessories typically run about a third of the cost of the tablet[4] — and generally are not compatible with new models.

11 Lifecycle

While a consumer tablet has a lower price tag, it also has a shorter lifecycle — typically designed to last one to two years. Alternatively, check the life expectancy of the enterprise tablet you are considering. A longer lifecycle means the purchase of one enterprise tablet that will last 3+ years, versus a consumer tablet that loses consistent reliability after the first year of service and will typically fail 3x more frequently than enterprise class tablets, significantly increasing your TCO[4]. In addition, specific enterprise tablet models may be available for sale for years, versus the rapid churn of consumer models. Since you can purchase the same model when your workforce expands, you can eliminate the complexities of mixed model deployments. And unlike consumer tablets, service and support is typically available well after the end of life of a model — sometimes up to five years after end of sale.

Increase throughput, product quality and workforce productivity on your manufacturing plant floor with rugged enterprise tablets.

For more information on Zebra's manufacturing solutions, please visit

www.zebra.com/manufacturing

For more information on Zebra rugged tablets, please visit

www.zebra.com/tablets

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