



The DC of the Future: Disruptive Technologies and Justifiable Solutions

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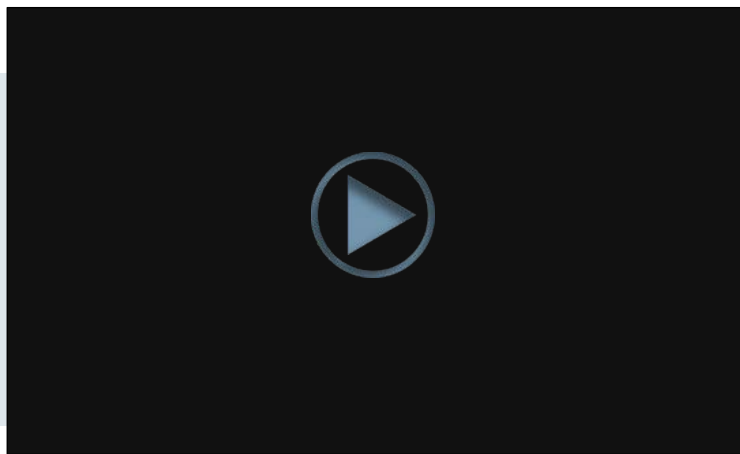
The distribution center is taking on greater importance than ever as a driver of growth and profitability. Top companies are investing in distribution operations to drive competitive advantage and gain market share. But are you leveraging today's technology to prepare your organization for the future? And are you ready for the next wave of technologies – from wearables to mobile manufacturing to the Internet of Things?

Today's Technologies are Under-utilized

Companies are looking at investing in automation to fill gaps in the labor force and increase efficiencies in distribution. The cost of doing so has almost reached a tipping point. As technology costs come down and the cost of labor increases, we see more companies investing in automation.

Amazon put 15,000 of its goods-to-person (GTP) robots in its fulfillment centers. Why did they make that huge investment? 1) Because these bots allow them to pick two to three times faster than before; 2) The bots enable shelves to be stacked closely together for greater storage density; and 3) Amazon expects to see 20% operating cost reduction for facilities that use them.

Justifying investments is not just about labor savings or accuracy anymore. It's about driving top line revenue from service improvements like same-day shipping, taking inventory out of the supply chain through faster replenishment to stores, and reducing capital costs through more efficient use of space.



Video (no audio): An example of GTP technologies in the DC

Right-sizing technologies that build packaging sized specifically for the outbound order or SKU, automated-guided vehicles (AGVs) that transport products from one area of the DC to another, and automated storage and retrieval systems (AS/RS) that provide high density storage and the ability to quickly and accurately pick products are all examples of under-utilized technologies that are available today.

Look at the Trends

While it's easy to get caught up in the excitement of a new product, if you really want to know what's coming on the horizon, then the focus needs to be on the trends and enabling technologies that make the products possible in the first place. Sometimes a technology that seems like a novelty is only one or two short steps from a breakthrough solution that changes everything. Think about the Palm Pilot. It was only a few short years after Palm's stock peaked at \$650 per share that Apple introduced the iPhone by combining cell phone functionality with the personal productivity apps. They revolutionized mobile communication and essentially cut Palm out of the market. Focus on the technology because the technology precedes the product.

3D Printing is Manufacturing-on-Demand

3D printers might seem like a novelty or high-end toy for some right now, but let me assure you that there are companies investing big money in the future of this technology. There is now a 3D printing factory located within the UPS Worldwide Hub in Louisville, KY making it possible to print virtually any product and deliver it anywhere in the world overnight. Amazon filed a patent request for trucks with 3D printers on board. Where do you suppose that's heading?

3D printing is essentially manufacturing on demand. Imagine you are working on a project car, like a 1969 Mustang, for which it's difficult to acquire parts. Instead of scouring junk yards or trying to find an aftermarket part dealer with the inventory, you can simply go online, pull off the CAD file for the sprocket you need and print it right when you need it. Airbus is already using more than 1,000 3D printed parts on its jets. This could potentially revolutionize the entire industrial and automotive parts distribution industries.

Customer expectations around personalized products and the need for mass customization could drive us to bring manufacturing into the store itself. Imagine you enter the shoe store, have your foot scanned and a pair of shoes is printed to fit the exact contours of your feet in the style and color of your choice.

The barrier that will have to be overcome with this technology is the materials available for printing. Today, there are more than 70 different materials for 3D printing including carbon, fibers, metals and even tissues (for human organs). As the printing materials become more robust and the processing faster and more refined, we'll see more applications for this technology. It could change the way we think about inventory and assortment. We could see the manufacturing and distribution functions merge and even blur the lines at the point of sale.

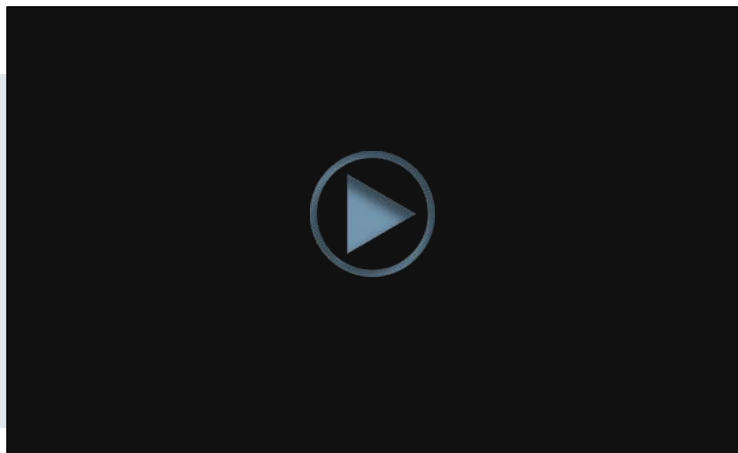
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Smart Wearables Make Us Work Smarter

Wearables seem to be the hot thing this year. Apple watches, Fitbits, augmented reality glasses, etc. are taking over the electronics marketplace. There is even a belt buckle that tightens when you stand up and loosens when you sit down. It can track your waist size and send a message to your smart phone to remind you to exercise when your waist size starts tracking upward.

The technologies behind those products are smaller, more powerful processors and better quality displays or screens. In the distribution center, we've been using wearables for some time; voice recognition, wrist-mounted RFID, etc. The key to adoption of these technologies is making them light, affordable and easy-to-use. But what happens when you take it a step further and combine that with advanced vision systems?

The barrier to taking this technology to the next level is the development of full-spectrum augmentation. Right now with Google glass technology, we are limited to presenting data in only the upper right visual field. But what if, using full spectrum augmentation, we could present information anywhere in the field of vision. It might look something like this:



Video (no audio): An example of wearables in the DC

Wearable glasses guide pickers through a warehouse, with arrows on the heads-up display to show the best pick path and lights that indicate the exact location of the item with a number floating above the item itself indicating how many to pick. A camera in the device is seeing what the picker sees and ensuring accuracy. Voice recognition allows pickers to interact with the system. And all of this is hands-free. Think about the safety and productivity advantages of that. These wearables would allow multiple pickers to be in the same zone and the same time in the case of pick-to-light or put-to-light systems. Right now, pickers can't be in the same zone at one time because they wouldn't be able to discern which light indicates their pick/put task versus the one assigned to the associate next to them.

So wearables really take off once we have full spectrum augmentation. Microsoft is working on this with its HoloLens technology. Keep an eye on this and similar vision technologies. It won't be long before we see wearables proliferate in the DC; watches that give task direction, shoes that vibrate to indicate direction, exoskeletons to help with heavy lifting and overcome ergonomic challenges. And with that we're not far from robotics in the warehouse.

Robots Aren't Coming. They're Here.

Improvements in vision systems (sensors), information processing and machine learning (intelligence) and precision mechatronics (movement) is changing the way we look at robotics. Robots that can see, think and act precisely are capable of a wider range of tasks, which when combined with a robot's inherent accuracy, consistency and capacity for uninterrupted work with zero ergonomic considerations you get a recipe for real productivity gains.

Today, robots are being used to load and unload trailers, palletize and depalletize, and move products via automated guided vehicles (AGVs). Now, we are seeing robots capable of each picking with vision systems that allow them to adapt to a changing environment and even determine the best way to pick up and handle uniquely shaped items. Each picking is the last barrier for robotics.

Programming a robot is a significant portion of the cost. And when a process changes, reprogramming is required. As robots become smarter and more capable, more controls are being placed in the hands of operators to program and reprogram without the assistance of systems specialists. This is helping to reduce some of the cost barrier to adoption. As improvements in artificial intelligence are made, robots may be able to take over some of those tasks themselves. Imagine the possibilities with robots that can teach themselves new tasks.

Until recently, the cost of vision systems held back this technology as well. But those costs are coming down as vision sensor technology improves, thanks to video game makers like Microsoft/Xbox with Kinect technology that is so good it allows the systems to see greater detail than ever before. Watch for improvements in sensors, movement and intelligence and the costs of robots to decrease. That's when we'll reach a tipping point in terms of adoption.

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IoT: Devices that Talk to Each Other

The Internet of Things (IoT) is projected to give the supply chain industry a \$1.1 Trillion (that's trillion with a T) boost over the next 10 years. But what is it? At the most basic level, it is technology that allows otherwise

unrelated devices to share data or talk to each other to make intelligent decisions. It's in the alarm clock that tells your bedroom light to turn on when it's time to get up and then starts the brew cycle on the coffee maker. It's in the garage door that receives a signal from your car that you are pulling into the driveway and turns on the house lights and adjusts the temperature for you. Perhaps it's the time clock that communicates with the WMS to release a wave when a certain number of associates have clocked in for the shift, or creates a wave based on the productivity statistics of the associates who have clocked in.

The implications of IoT in the warehouse are staggering. Imagine a self-managing warehouse where objects and systems interact with one another using real-time data about exact location, speed and planned route to redirect resources on the fly to avoid or eliminate bottlenecks and sequence tasks based on order service requirements and cut-off times. You can liken it to Google Traffic or Waze. The cars (cartons/orders) send a signal to the system indicating direction and speed, as well as the final destination and stops (picks) required

along the way. The system detects traffic jams (bottlenecks) and signals traffic cops (operators) to clear them. When there are delays the system, it sends directions for a detour around the back-up in order to get you to your destination on time (within the promised service levels). Emergency vehicles (expedited orders) also travel these roads and are given priority and clearance to pass. And this all happens in real-time. The internet of things will create an explosion of data which will be a jackpot for companies that can leverage it through analytics and use of the information to make better decisions.

Standards and security of systems are the current barriers to full adoption of this technology. Many companies are working independently on these technologies, but what is lacking are standards for development. Some of the applications are being built on open source technology which is a risk when you are talking about sharing proprietary or personal information over a network. These issues will have to be worked through as adoption rates increase.

The Changing Face of Labor

According to the US Census Bureau, 60 million Baby Boomers will exit the workforce by 2025, but only 40 million new workers will enter. The cost of finding, training and retaining increasingly scarce labor is bringing us to a tipping point. Labor is typically more than 50% of the operating budget, so escalating labor costs have a significant impact on margins. Automation is just one response to reducing costs and filling the gap created by a rising tide of departing workers.

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The tipping point occurs where the rising cost of labor intersects with the decreasing cost of technology. Customer expectations are on the rise with no sign of letting up. Companies are responding by pushing the service envelope for every bit of competitive advantage they can get. That means faster, better and less expensive than ever before.

Ultimately, we are heading toward a self-managing warehouse where we leverage automation and robotics, and people are equipped with wearables and trained on how to maintain and manage the technology rather than how to execute the tasks. We may not ever get to a truly "zero-person DC," but we can come close. And that changes the way we design distribution centers and even where we locate them in the future. Much of what we do in DC design today is for humans. A DC run by robots and automation requires a smaller footprint (narrower aisles and safety zones, smaller parking lots and locker/break rooms, and fewer restrooms). It allows you to build vertically so it requires less land. That could make it more affordable to locate closer to the urban centers where customers live and work, further reducing the time and distance between customers and products. Perhaps the operations have a mobile component with 3D printing on demand via truck. It's all possible and very likely in the near future.

Prepare Yourself for the Coming Wave

The key to knowing when these things will occur is in watching for changes in the technologies and barriers. If you focus on the products themselves, you will be behind the curve. Technologies change and trends come and go. But it's important to always keep an eye on new developments. As the pace of innovation continues to accelerate, the capability gap between early adopters and their slower competitors is widening, creating a sustainable advantage that disrupts the basis of competition. The gap can also make it difficult for laggards to compete or catch-up. Don't get caught on the back side of the wave. Get in front of it. Here we provide a few suggestions for ways to prepare yourself for what lies ahead.

1. **Stay Educated:** Read the latest tech and industry journals. Assign someone on your team to research new and emerging technology trends and be responsible to provide updates on new findings. Attend trade shows and webcasts to exchange ideas with others who are thinking about these things as well.
2. **Think Outside the Box:** Look beyond just the distribution industry for emerging technologies and their possible impacts. Remember that X-box/Kinect video game systems brought us the vision systems that will soon enable robotic picking.
3. **Look Broadly for ROI:** Distribution is now a Board Level conversation, and it demands investment based on top level business drivers. Learn the language of your company's Board of Directors, not just the language of distribution, as technologies can and are being justified in new ways. But don't chase technology for its own sake just because it's "shiny and new." Remember, it has to be about the business case.
4. **Develop a Roadmap:** These are large, multi-year investments involving all aspects of the business. So you need to develop a roadmap. For example, building specialized, high-velocity distribution facilities for high-volume products can streamline omnichannel fulfillment and reduce total costs. However, in order for that fulfillment strategy to be both efficient and effective, companies must invest in enabling technologies such as tightly integrated planning and execution systems coupled with automation and automatic identification. Success requires involvement from IT, Store Operations, Merchandising, Finance and other parts of the business.



How can we help?

Fortna helps companies optimize their distribution operations, build a business case for investment, and implement solutions that drive competitive advantage. To learn more, ask to speak with one of our Associates.

Call: 800-367-8621

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Fortna is a professional services firm helping companies with complex distribution operations meet customer promises and competitive challenges profitably. We develop a solid business case for change and hold ourselves accountable to those results. Our expertise spans supply chain strategy, distribution center operations, material handling, supply chain systems, organizational excellence and warehouse control software.

