



MDM Special Report:

Disruptive Technologies: The Future of Distribution



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Looking to the Future

An introduction to technology that could transform the supply chain

By Lindsay Konzak

While it's easy to point to a handful of technologies that have transformed the business world over the last half century, a McKinsey & Company report, "Disruptive technologies: Advances that will transform life, business and the global economy," cautions readers who may view every new technology that emerges as the "next big thing."

But there are some technologies that truly will disrupt the landscape that distributors operate in. In this series, we look at:

- 3-D printing
- Augmented reality
- Delivery innovations including drones and driverless cars
- Robotics in distribution centers

While our focus is on these four key areas, think more broadly than that when contemplating the next frontier. Other technologies already in play or on the horizon that may affect your business or your customers' businesses (just as important) may include renewable energy, new ways to store energy, the cloud and the Internet of Things.

While we are calling the subject of this series of articles "disruptive technology," the truth is technology is only as disruptive as you allow it to be at the local level. Computers themselves were disruptive when they first arrived. Now most people are surprised if a company doesn't have at least one.

Challenges come with any innovation, not the least of which is cost, training, standardization and integration into current operations and processes. Despite these, distributors should look at these technologies and examine the potential impact on internal processes, suppliers' businesses and customers across industries.

The McKinsey report recommends business leaders think about emerging technologies this way:

Update your strategic plan with emerging technology in mind.

Use technology to improve your internal performance.

Evaluate how the technology shifts the

value you provide, as well as the value driven from manufacturer to distributor to end-user.

Think outside the box about risk and competition and where it will come from.

Think about talent. As with any technology, you may not need the skills in-house now, but will you in the future? What does that workforce look like?

A *Harvard Business Review* article by Clayton Christensen and Maxwell Wessel encourages leaders to identify their companies' strengths, as well as the strengths of other businesses developing and adopting these emerging technologies. They also point out that even with the rise of disruptive innovations, such as those we'll cover in this MDM series, businesses will continue to reap benefits from legacy applications for years and sometimes decades. An example in the consumer world that they provide: People still go to the movies, even though the ability to watch movies at home through a VCR was introduced a generation or more ago.

That doesn't mean that distributors should rest on their laurels. Companies must balance the old with the new and adapt as needed.

Finally, one piece of advice that any business owner or leader should follow, according to the authors of *Big Bang Disruption: Strategy in the Age of Devastating Innovation*: Consult your "truth-tellers." The authors say that leaders need to find "industry visionaries" who won't sugarcoat the future, even if you want them to.

We have a handful of consultants in the distribution industry who are happy to tell it like it is. Distributors also benefit from having a board of advisors or directors filled with people from outside the industry; that outside perspective can help leaders keep their eyes on the present with an ear to the future.

Just as many distributors said they wouldn't be affected by e-commerce just five years ago, but who are now scrambling to build a presence that fits their businesses online, these disruptive technologies have the potential to go mainstream and have enormous impact on the supply chain and operations of manufacturers, distributors and end-users.

3-D Printing Drives Supply Chain Shift

Access, customizability may make manufacturing a more local endeavor

The media is talking about 3-D printing, also known as additive manufacturing, more than ever. But adoption of the technology in everyday use is far from widespread. This article examines the role of 3-D printing in manufacturing today and how it might change the supply chain in the future.

By Jenel Stelton-Holtmeier

A lot of excitement surrounds 3-D printing in manufacturing, and for good reason, says Jason Young, CEO of diversified manufacturer ARC Group Worldwide, DeLand, FL. "I think manufacturing is going to change pretty significantly over the next 20 years or so, and 3-D printing will probably be one of the key drivers of that change," he says.

The potential benefits of 3-D are easily understood: faster time to market for new products, shorter lead times and easier customization, just to name a few. Because of that, the impact will be felt all along the supply chain.

But today, "there are far more people not using 3-D printing than are," Young says.

"With 3-D printing, we aren't even in the basement in terms of really having a good grasp on how that technology might change value chains," says Guy Blissett, specialist leader in wholesale distribution at Deloitte Consulting. "It has a very long way to go in terms of speed, precision and cost to fully transform supply chains in general."

Current Day

Even with the attention it's receiving, evaluating the role of 3-D printing in today's manufacturing environment is difficult, according to Tim Shinbara, technical director of the Association for Manufacturing Technology. Observers can see the technology being used in certain industries, such as medical or aerospace, but the industrial space is a bit further behind on the adoption scale.

In addition, people not already involved in the process tend to lump different technologies into one when trying to measure its prevalence. "There's a lot going on already with 3-D printing as it relates to polymers," says Heidi Hostetter, director of operations at Faustson Tool, a provider of high-precision machining to the aerospace, aeronautics, defense, energy, medical and semiconductor industries based in Arvada,

CO.

In many ways, 3-D printing with plastics and polymers has been commoditized, with companies such as FedEx Office and Staples offering the service through some retail locations.

But 3-D printing with metals and alloys is a different story. "Metal is the next big wave of opportunity," Young says.

That's not to say that 3-D printing doesn't have a role in manufacturing today. Companies such as 3D Material Technologies, an ARC Group company, are already using 3-D printing to speed prototype development. "Machining might be faster if you already have the design, and you're already running the machine for that product," Young says. "But on a general basis, 3-D printing is always faster for prototypes for very small production runs." And it is often less expensive than traditional machining for these limited runs.

That is because there is no need to build a mold for the prototype and calibrate the machine to those specific parts. All of that work is done through the design and engineering process and input into the printer.

Current use of 3-D printing expands beyond prototypes, however. "What you don't see behind the scenes is that half the business in additive manufacturing is tooling, all the products that can be made with 3-D printing that are used to make the other parts traditionally," Shinbara says. "That story hasn't really been told."

In the aerospace industry, "3-D printing of metals is allowing us to test if theory even works," Hostetter says. For example, before electronics and other parts can be put into a shuttle, you have to make sure all those items will fit into the shuttle housing, she says, and that's where 3-D printing comes in. "That's two-thirds of the recipe."

Barriers

Cost is still a significant barrier for 3-D printing. High-end precision machines can easily cost more than \$1 million, Hostetter says. And the alloy powders and materials the machines use can be expensive, as well.

In addition, many of the materials used in the process, such as titanium alloy powder, are volatile and require separate licensing to purchase. Those licenses can cost \$40,000 to \$60,000 each, she says.

Cost is part of the reason the early adopters are in aerospace, medical and dental industries, Shinbara says. "They have a way to amortize high-risk high tech across different platforms," he says. "Not everyone does." But even in those industries, if a company isn't a tier one supplier, the cost may put this technology out of range.

But cost is not the only barrier. Designers may have more freedom and flexibility to move an idea from "art to part," Shinbara says, but manufacturers are still limited by what materials are reliable, certifiable and available – a selection that is growing but is still limited right now.

There is also the complexity of the 3-D printer market. "There are thousands of them out there," Young says. "And they're all different technologies." You have to know what it is you want to do with the technology and then figure out which of the options will meet that need best.

Even if a company decides to outsource the actual 3-D printing part of the process, options in some ways are becoming more limited. "There just aren't a lot of 3-D printing services out there right now," Young says. And many of those that used to be accessible have been purchased by large manufacturers for internal product development, such as GE's purchase of Morris Technologies in 2012.

The talent needed to really take advantage of 3-D printing's capabilities is also limited, Faustson's Hostetter says. "Colleges don't have a strong curriculum to support design engineering efforts," she says. Designers need to better understand how those alloys work as powders and how they react as they are melted down and extruded by 3-D printers so they can include those considerations in the designs.

The Supply Chain of the Future

The challenges may be slowing adoption and application of 3-D printing, but none are insurmountable. And once they have been overcome, 3-D printing has the potential to fundamentally change manufacturing and how products go to market, Shinbara says.

"3-D printing, cloud-based design, cloud-based manufacturing – all of this enables folks with fewer resources to become more important in the industrial supply base," he says. The local/regional supply base will have more capabilities to be more responsive to local and regional needs. As a result, reliance on large facilities that can produce high volumes at low cost could lessen.

Because 3-D printers don't require molds or

extensive calibration to produce even extremely different parts, it also opens the door for more product customization. "Clusters" of "makers" could form around this technology, sharing production and research costs to meet the needs of local customers more efficiently than large manufacturing facilities.

"Washington may call it a reshoring of the major jobs back from China to the U.S. or North America, but what we're seeing with 3-D printing is that it's more than just reshoring," Shinbara says. "It's really getting back your blacksmiths, silversmiths, cobblers of your local/regional village."

Distributors will have a major role in the village, Shinbara says. They're the ones with the local market knowledge; they're talking with the diverse customer base and will be able to identify demand trends as they emerge. "They will be the ones to drive this shift as they uncover what their customers really want. And they will be the ones who bring this information to their suppliers," he says.

While the return to a "maker village" may still be a ways down the road, 3-D printing will likely continue to improve the time it takes to get products approved and brought to market, Faustson's Hostetter says. "In 10 years, production windows won't look anything like they do now," she says.

For example, Faustson designed and manufactured an optical substrate for NASA's Kepler spacecraft launched in 2009. It took 18 months to prove out that part at the time, Hostetter says. As 3-D printing advances, that same process could likely be done in less than two months.

"Manufacturing is still stuck in this really long convoluted supply chain with long lead times," Young says. "3-D printing will be one of the main drivers in changing that and reducing the time to market."

Because of the volatility and specialized knowledge required to work with metal alloys, manufacturing – even with 3-D printers – will likely remain the purview of the manufacturer, Young says. "While people call it printing, it's still manufacturing at the end of the day," he says.

Printing with polymers, on the other hand, may open opportunities for distributors to produce some products for their customers, Deloitte's Blissett says. "Think about the electrical distribution business, the boxes that house much of the electronics in houses, your light switches and your outlets, the box that sits in the wall that holds the electrical for that. The ability to

print that out rather than import it from halfway around the world could have a pretty significant impact," he says. But the cost of 3-D printing still has a long way to move before that becomes a factor.

"The way we have viewed additive is much more a complementary, augmenting tool to traditional means than a disruptive substitute," Shinbara says. "If I'm a manufacturer and my shop is full of traditional technologies, I should

not be thinking I'm going to lose work because I don't have additive capability; I should be looking at it as what orders am I not getting because of either affordability or complexity that I could with additive."

In other words, Shinbara says, traditional manufacturing methods are not going away any time soon, but the new technologies are and will continue to have an impact by enhancing current capabilities.

Bridging the Digital & Physical

Augmented reality may have major impact on industrial markets

Google Glass is the most visible example of augmented reality, but a business case for the emerging technology is building. According to Gartner research analyst Tuong Huy Nguyen, the technology could be most valuable where workers do not have immediate access to information such as remote sites or in jobs that require one or both hands. While it's still early, manufacturers are already using augmented reality for factory planning and equipment repair. Applications are also being developed for use in distribution centers for more efficient order-picking and delivery.

By Lindsay Konzak

The rise of smartphones, tablets and wearables, including head-mounted displays such as Google Glass, is facilitating the development and adoption of augmented reality.

Google Glass, which lets users access applications like email and texts, navigate hands-free and take pictures or video through a screen that hovers just above their right eye, is the most well-known and well-publicized example of this emerging technology.

But while much of the talk surrounding augmented reality is on the consumer side, the technology's biggest impact may one day be on the manufacturing, distribution and logistics industries.

What It Is

Think of augmented reality as layering digital information onto the real world. The technology uses smartphones, tablets or even desktop computers with cameras. An increasingly popular way to access augmented reality applications in industrial settings is by wearing double-paned smart glasses that overlay data onto whatever you are looking at in the real world.

APX Labs' Skybox will let sports fans access real-time content on their smart glasses while sitting in the stands. The program can overlay a player's statistics onto the screen or replay a home run – all with the actual game going on in the background.

The technology has also been used to augment advertising and store displays. Toy-maker LEGO's digital kiosks in stores let consumers hold a box up to a camera; the LEGO product appears on the screen in 3D, showing the potential buyer what it will look like assembled.

Esquire magazine featured an entire issue dedicated to augmented reality; when readers held the magazine's cover up to a webcam, Robert Downey Jr. jumped out of the cover and spoke to them on the screen. Another example, as detailed in the Wall Street Journal, is the ability to hold a tablet over a movie review in a newspaper and have the film's trailer pop up.

Many have questioned the long-term viability of some potential uses of the technology, especially in the consumer space, but Gartner research analyst Tuong Huy Nguyen says that augmented reality could be extremely valuable in industries where workers are in the field, do not have immediate access to information or jobs that require one or both hands and the operator's attention.

The military was an early adopter of augmented reality, according to Nguyen.

APX Labs, which develops software for smart glasses, was started in 2010 when it created what it called "Terminator Vision" for the U.S. military. The software lets soldiers scan crowds, identify faces, take a picture, send it over the network, make a match and then present the results in seconds on their see-through smart glasses. The company then developed

MedSight, which gave combat medics remote and hands-free access to patient records.

Beyond military applications, however, augmented reality is young, Nguyen says. Most companies are just now laying the groundwork.

“We are really still in the infancy of this market,” he says. “The verticals you are seeing it in is more of a trial or prototype, trying to really understand, ‘What is this augmented reality thing, and what can it do for us?’”

In the Warehouse

Analysts have big hopes for augmented reality’s potential in the warehouse. Using headsets with screens that allow the overlay of digital information onto what’s in front of them, warehouse workers can tap directly into the order system.

Hands-free, pickers are told or shown where to go in the warehouse, how many of which box (the screen highlights the box in front of the picker to ensure they are grabbing the right one) and even which warehouse loading dock these boxes need to be taken to. Instead of scanning a barcode to validate the item, the augmented reality-driven smart glasses would scan it as soon as the worker picked it up and would indicate if it was the right item.

While many distribution centers are already using similar technology through devices such as barcode scanners, augmented reality takes it to another level, says Trak Lord, who leads metaio’s marketing in the U.S. The company’s software drives augmented reality applications such as the one described above.

And smart glasses can be used for more than picking and scanning, including for example, warehouse navigation or forklift maintenance. “We can drastically change the operations of an industrial or automotive company with a single application,” Lord says.

In the Field

UK-based Vuzix has partnered with enterprise software company SAP to develop augmented reality applications for field services.

In one concept video showcasing the technology, an electrician goes to a stadium, puts on his smart glasses, which then show him how to get to the room where a repair is needed. When he looks at the equipment, it highlights where the problem is through his glasses and shows him what needs to happen to fix it through instructions on the right side of his screen.

When he’s done fixing the problem, he uses a voice command to call a co-worker. Still hands-free, he’s able to talk with the technician

(appearing live in a square at the top right of his vision), who can then see what the electrician sees and collaborate with him on next steps.

Car-maker Volkswagen worked with metaio to deliver the unique service requirements to mechanics across its European network for its XL1 concept car. It didn’t make sense for VW to roll out extensive training for a car that very few mechanics would see due to its limited production run. But the car-maker also did not want an XL1 to roll into a VW dealer and not have mechanics who could service it, Lord says.

So it developed MARTA, which stands for Mobile Augmented Reality Technical Assistance system. The system lets service technicians point a tablet at the car; it then labels the parts and shows the technician the next steps based on what it sees. The mechanic can also leave notes for future service and can track anomalies or suggestions that are then communicated back to the design team for future improvements.

“The ability to put tremendously helpful insight into the hands of individuals at the time they need it so they can then take action is the real power of augmented reality,” says Guy Blissett, specialist leader for wholesale distribution for Deloitte Consulting. Blissett was also the author of the National Association of Wholesaler-Distributors’ *Facing the Forces of Change: Reimagining Distribution in a Connected World*.

In the Factory

Augmented reality is already being used by manufacturers for factory planning, equipment maintenance and product design.

In one case from metaio, KUKA, a robotics firm, used the company’s augmented reality software to determine if robotic arms would fit on a plant floor in the space allocated. The software allows engineers to super-impose 3D renderings to ensure that plans on paper translate to reality.

“If you literally move (the arms) too far to the left or right, it could destroy something,” Lord says. “... You have a limited amount of real estate.”

In another case, MAN Diesel, a ship engine manufacturer, used augmented reality to simulate the installation of a new engine. Using photos, augmented reality allows virtual positioning of an engine, as well as analyzes spatial requirements for maintenance of that engine.

The Takeaway

While augmented reality is in the early stages of adoption, interest among executives across

industries is high. Lord says he is frequently invited to speak on augmented reality as an emerging technology and is asked to talk about how it can be used to improve processes in industrial environments.

"They want solutions for maintenance, safety and training," he says. "... I think all companies are looking for ways to cut costs and run more efficiently."

Nguyen says executives can think of augmented reality as another way to leverage their existing assets. "Augmented reality is a tool to supplement your existing toolset. It won't replace other technology. It's a complement to

them," Nguyen says.

Augmented reality can help distributors and manufacturers bridge their digital and physical assets, he says.

Blissett views augmented reality as a "game-changing development" that could change the way distributors run their businesses.

"I challenge distributors to educate themselves about augmented reality and how they may incorporate it into their warehouse, their sales force, their field service, their drivers," Blissett says. "The opportunities there are extremely powerful, especially when combined with analytics."

The Rise of Robots in Distribution

Warehouses are the next frontier for automation

Industry-watchers say that robotics technology is growing more sophisticated and can increasingly perform a wider range of tasks and collaborate with humans. This article examines the potential impact on distribution operations.

By Anna Padilla

Robotics today encompasses more than the Hollywood vision of a bunch of Star Wars' R2-D2s running around warehouses, picking and packing orders. The definition can be expanded to a much wider spectrum of technology, says Guy Blissett, specialist leader for wholesale distribution for Deloitte Consulting.

"I think it is worth embracing a broad definition or vision of robotics and automation. Robotics doesn't have to be a humanoid-like machine with arms and legs and a head that can walk. Robotics can take many different forms," he says. Robotics can include pallet shuttles and automated storage retrieval systems, as well as automatic guided vehicles and autonomous indoor vehicles.

Material handling robots can be used for tasks such as bin picking, case and pallet transportation, robotic pick-and-place solutions, conveyor design, lift-assist systems, integrated sorting systems and more, the Robotics Industry Association says.

These systems continue to grow more sophisticated and can increasingly perform a wider range of tasks and collaborate with and even learn from humans, according to a report from Deloitte, *Intelligent Automation: A New*

Era of Innovation.

Thanks to its purchase by Amazon in March 2012, one of the most widely known robotics companies is KIVA Systems. KIVA Systems uses automation technology for distribution centers that incorporates mobile robots and control software. These orange ottoman-shaped robots are sent on missions by a central computer system to retrieve inventory pods that are brought back to pick and packing stations.

These robots can handle up to 1,000 pounds of weight and are equipped with a rechargeable battery system, as well as internal sensors that allow the robot to move freely within a warehouse without crashing into other robots or things.

According to the *Material Handling & Logistics U.S. Roadmap*, robots today are more capable, more intelligent and less costly than at any other time in history. And *A Roadmap for US Robotics – 2013 Edition*, quoted by the same report, says that by 2025, any technical and economic obstacles such as the ability to easily and effectively identify items and manipulate a picking arm to pick them will be overcome.

Jon Schreibfeder, an inventory management consultant in wholesale distribution and manufacturing, says that he is seeing more and more automation in the warehouse, including pick-to-light and voice-picking systems, as well as automated shipping conveyor systems.

"I'm not seeing that much in terms of actual robots in the warehouse yet, but I'm sure it's coming," he says. On the other hand, he has worked with companies who have implemented

driverless carts that are directed through the warehouse via sensors in the floor.

It is difficult to imagine robotics and automation not playing a key role in distribution centers in the future, according to Ken Tinnell, robotics general manager of the robotics integrator Bastian Solutions. "We believe we will see a massive amount of adoption. We don't think we can fill the demand in the next five years without pretty significant growth on our side," Tinnell says.

Robotics integration is not only realistic for Fortune 500 companies. Small to mid-sized distributors can take advantage, as well, industry observers say.

"The question shouldn't necessarily be should I or should I not buy a robot," Blissett says. "But how might robotics transform the value chain around me, and what role might I play in accelerating that transformation?"

The Growth of Robotics

The automotive industry has been using traditional robots for decades. And according to the Robotic Industries Association, the automotive industry still represents more than half of total orders, but non-automotive industries are rapidly increasing their orders of robots.

Top industries for growth in the first quarter 2014, according to RIA, were food and consumer goods (up 91 percent), plastics and rubber (up 55 percent) and life sciences (up 36 percent).

"In total, the overall number of robots ordered for use in non-automotive industries grew 18 percent over the first quarter 2013," says Jeff Burnstein, president of RIA. That compares with the overall units ordered increasing by 1 percent.

While much of the growth is in manufacturing, the robotics industry is also seeing increased interest and adoption for use in warehouses.

"Thanks to the automotive industry, they have improved the reliability by giving feedback to the robotic manufacturers that are now making a highly reliable piece of equipment," Tinnell says. "Ten to 15 years ago, a robotic arm would cost a million dollars. Now you can buy that same robot for \$50,000. That is a 95 percent decrease in cost."

In the highly repetitive manufacturing environment of the automotive industry, robotics technology was refined, proving robotics to be a sensible business option and advanced enough to be refurbished into a solution for distributors.

The Business Case

"The use of automation will continue to drive

more efficiency, improve performance, reduce processing time and lower cost for distribution operations," says Ken Ruehrdanz, distribution systems market manager of Dematic.

Robotics and automation integrators such as Aesynt, Dematic and Bastian Solutions see their roles as educating distributors about the wide array of robotic and automation solutions available. They are also focused on building a business case for their solutions.

"Customers we work with are just learning about the opportunities at a higher level. For the longest time, their vision was siloed and not very opportunistic. I would say companies are gun shy," says Neil DiBernardo, director of professional services of Aesynt. "You have to change their viewpoint on robotics."

Aesynt's ROBOT-Rx is a medication vending machine that fills prescriptions. The robotic system was originally developed by pharmaceutical distributor McKesson Corp. It was sold to a private equity firm in late 2013 and renamed Aesynt.

The system allows pharmacists to spend more face time with doctors and patients. The robot picks the medication and places it in bar-coded envelopes. These envelopes are sent to the pharmacist, and the barcodes connect through a computer system that automatically records patient history and drug inventory.

In a warehouse, the application of robotics and automation could shift the work in distribution centers from a person-to-goods process to a goods-to-person process.

This shift from having a worker walk through distribution centers to retrieve goods to robotic and automation systems bringing items to the worker not only makes business sense but also can help the attitude of distribution center workers, says Lou Mangino, vice president of operations at Benco Dental, Pittston, PA, a distributor of dental supplies and equipment.

Benco Dental has used a Dematic zone-routed conveyer system in its distribution centers since 2002. Mangino says the system "just makes life easier."

Mangino says Benco has seen a 15 percent to 20 percent productivity increase since installing the convey and sort systems in its distribution centers.

"You are using a machine that you pay for once, that you have to feed and care for a little bit, that just provides a ton of benefit not only for the associates but for the customers," Mangino says. "You get more accurate picks, you get more efficient picks, and you reduce your over-

all cost structure. So you are passing that along to bottom-line company profits and benefits to your customers.”

Tinnell says cost is falling for the systems themselves. “For distribution centers, cost is very much in their favor, and that is why there is such a rapid adoption of robotics right now,” he says. “Typically returns on investments for robotics right now are less than a year maybe two depending on what they are doing.”

But distributors should always consider why they want to implement this technology, and not just implement new technology for technology’s sake, Schreibfeder says. “With any technology we have to see a payback in a reasonable amount of time.”

Robotics integrators like Bastian Solutions offer the ability to retrofit and refurbish robotic systems as a company’s business model changes. These companies hope this flexibility will increase distributors’ adoption of the technology.

Baxter, a robot produced by Rethink Robotics, is one of the most humanoid-like robots in industrial robotics. Baxter is designed to work alongside workers using a behavior-based “common sense” interface that can be taught in 15 minutes.

There is ongoing fear that robotics will eliminate jobs in distribution centers and other industries. The Deloitte report encourages companies to develop talent strategies, such as staffing and training, to adapt to how automation changes job descriptions and organizational

models.

Benco focused on maintaining the people side of distribution when integrating robotics into its operations. “We really tried to engineer this into the system. How can we make the system better for the employees?” Mangino says.

Adoption Advice

Distributors considering adopting robotics or automation into their warehouses should adjust their perception of robotics to take advantage of the technology, Aesynt’s DiBernardo says.

“The more progressive the customer is, the more opportunities we can help them with,” DiBernardo says.

Finding a good technology partner is critical. A distributor should work with an integrator who will match its technology to the company’s needs. “Balance the technology you want to use with the ROI and the size of your business,” Benco’s Mangino says.

A company should visit other distributors using robotics or automation to find the technology that fits best with its needs.

A distributor should also ensure that the system it chooses can easily add technology later to accommodate the business as it evolves.

The last step is modeling.

“Definitely model because modeling will really tell you what automation/robotic system you will want to use,” Mangino says. “We marry up the system based on our volumes and our needs at the time.”

Behind the Drivers of Driverless Delivery

Drones & driverless cars face obstacles to near-term business adoption

Of all the technologies explored in MDM’s Disruptive Technologies Special Report, drones and driverless cars are the least close to fruition. The technology is advancing quickly, but many obstacles stand in the way of a practical application for businesses.

By Scott Merrill

As Winston Churchill once said, “It is always wise to look ahead, but difficult to look farther than you can see.”

In the case of drones, driverless cars and other technologies that used to be better suited for Star Trek than the real world, it’s tough to know how much of a threat or disruption they are to how distributors traditionally approach

delivery and other operations.

Most experts say that the technologies are still “farther than you can see.” There’s no fear that drones are going to take over our skies in the near-term. And driverless cars still have a long way to go. But the technology itself is developing quickly.

“The big barrier is not the technology; it is far more the regulation and the legislation that has to be put into place to get people comfortable with the idea of drones making deliveries and taking pictures and unmanned vehicles driving up and down the roads,” says Guy Blissett, specialist leader for wholesale distribution for Deloitte Consulting.

Here’s a closer look at the current and po-

tential uses for these technologies:

Drones

Ever since the 60 Minutes television segment featuring Jeff Bezos on Amazon Prime Air, which would deliver goods by drone, the industry has been abuzz with talk of drones. But is the hype warranted?

Logistics giants UPS and FedEx have also expressed interest in testing drones for the final miles of a delivery, although they have been much quieter than Amazon. UPS told *The Verge* online: "The commercial use of drones is an interesting technology, and we'll continue to evaluate it."

Research firm Frost & Sullivan estimates the global market for small, unmanned aerial vehicles at \$250 million to \$300 million, according to BusinessWeek. Much of the focus seems to be on the military and consumer markets; drone manufacturers such as DJI are targeting hobbyist consumer markets with drones that include HD cameras. Movie studios are investing in drones to round out their filming capabilities.

"I'm not sure that it is ever going to be part of distribution," says Jim Thompson, former CEO of Vallen Corp., which is now part of Sonepar, and principal with NewMGroup, a consulting group.

Thompson, who owns a drone and has tested the technology himself, says that he has safety concerns when looking at drones as a method for delivery. He says drones tend to kick up a lot of dust when they drop down low; they also have exposed fan blades that could hurt someone if they get too close. In his experience, drones also can get caught in updrafts.

Privacy concerns are top of mind for most though. "You now have a high-definition camera that literally looks into people's homes during deliveries. You can't help it, it's going right to the front door," Thompson says.

According to Thompson, drones could be feasible if used on a line-of-sight basis within a closed, controlled environment, such as within a distribution center or on a job site.

"I think there is an application for that. Everyone's wearing hard hats and safety glasses. I think that's what this is all about," Thompson says.

Blissett agrees. "I could see this being used is from a sort of reconnaissance, survey, photography perspective," he says.

For example, Blissett says drones could be used at a construction site. A distributor could launch a low-cost drone to fly around the site,

through the building and into other less accessible areas to assess how far along the project is and gauge inventory levels. The distributor may also be able to use them to assess what the likely needs will be going forward. "To me, that creates a tremendous amount of opportunity."

Another application for drones could be in the distribution center. Qimarox, a manufacturer of material handling systems, has been toying with the idea of using drones to build pallet loads.

"Because of the limitations in terms of capacity and ergonomics, using people to stack goods on pallets is no longer an option for most manufacturers of fast-moving consumer goods," Jaco Hooijer, operational manager of Qimarox, says on the company's website. "Using drones, they can fully automate the palletizing process, while retaining the much greater level of flexibility and scalability entailed by using real people."

Qimarox however noted drones' weight limitations; currently, it says, they can lift products up to 2.3 kilograms, or a little more than 5 pounds. The company says that technology is developing quickly so that weights up to 10 kilograms, or 22 pounds, would be "possible within the foreseeable future."

Driverless Cars

While the technology driving driverless and self-driving cars may still be a ways off from widespread adoption, it's coming faster than you may expect, says Raj Rajkumar, a professor at Carnegie Mellon and codirector of the General Motors-Carnegie Mellon Vehicular Information Technology Collaborative Research Lab.

"The technology is progressing pretty rapidly, maybe faster than what people were anticipating even a couple of years back," Rajkumar says. "In terms of adoption, it will still take time. The driving process is a very complicated process, one of the most complex activities we undertake as human beings. To reach completely driverless vehicles without any human being in the car, we are probably at least, in terms of adoption, 10 years away."

Rajkumar cites four challenges that driverless and self-driving cars face: affordability, social acceptance, safety and liability. Affordability will become less of an issue as the technology matures, but remains a significant hurdle for adoption. Social acceptance, or people being "comfortable with the concept of vehicles running around without anybody in them," is the second hurdle, he says.

From a safety perspective, while the technol-

ogy is sophisticated, it still isn't able to handle unknown obstacles as effectively as would be needed for full adoption. Things such as a caved-in road, an accident or severe weather conditions could all throw a loop in the ability of the car to continue its navigation.

"The road conditions need to be right, the lighting conditions need to be right, and the weather conditions need to be right," Rajkumar says.

Finally, there is liability. "If anything goes wrong, who's liable? Is it the person who owns the car? The person who deploys the car in a driverless fashion? Or is it the insurance company, or the manufacturer? Agencies like the National Highway Transportation Safety Administration have to create a framework that will in turn basically dictate what can happen; should not happen in driverless cars. Progress needs to happen on all fronts."

What role can driverless and self-driving cars play in the more immediate future in distribution? According to a Deloitte "Signals for Strategists" report, some companies are using them for less traffic-intensive situations, such as transporting materials around a mining site.

"International mining company Rio Tinto is using a fleet of autonomous hauling trucks developed with Komatsu to improve efficiency and worker safety in its Australian iron mines," the Deloitte report says. "Earlier this year, its fleet, which can move and navigate with limited human intervention, reached the milestone of moving 100 million tons of material. BHP Billiton, another major mining company, has also announced investments in mine automation."

Despite this technology being heavily pursued at the moment, distributors should expect its development to be slow.

"The automotive industry seems to be looking at it on an incremental basis," Rajkumar says. "It's not the overnight 'no person in the car,' but incrementally adding automation capabilities. Cruise control becomes adaptive cruise control, for example."

When the technology is matured to the point of being feasible for delivery operations, the benefits could include things such as decreased

accidents and decreased fuel costs, through the use of convoying or platooning.

"Vehicles driving on the highway could, for example, drive very close to each other – and therefore occupy less space on the highway – and because they travel close to each other, you get the benefits of aerodynamics, and you have to spend less fuel," Rajkumar says.

Fleet Tracking Technology

Technologies already in place today can help a distributor improve their delivery operations. As technology improves, more advanced fleet tracking and management is available. By better monitoring their fleets, distributors can more effectively manage costs and get a better view of their driver's habits. Companies like GPS Insight, Teletrac and Fleetmatics offer services that provide a real-time view of vehicles out for delivery.

"All of this can boil down into identifying inefficiencies in a fleet's performance and being able to create actionable intelligence so management can take corrective action," says Harold Leitner, vice president of business development for GPS Insight, a software company for vehicle tracking.

GPS Insight provides tracking software that uses real-time data, collected from a distributor's fleet, to help manage and monitor the efficiency of the distributor's logistics.

"We found that the distribution clients who truly incorporate location-based data into their day-to-day operations are seeing huge increases in driver productivity – in the time it takes to create routes and dispatch vehicles – all of which affects the bottom line," he says.

Leitner talks about one company that, through the monitoring of its fleet's down time, was able to make an extra stop each day, ultimately resulting in an extra \$300,000 in revenues each month.

By using fleet management software, distributors can also monitor things such as cycle times, gas consumption, accidents and even "high-G" events, such as a hard braking or high-speed turn.

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