Are Logistics The Weak Link In Your Supply Chain? Five Innovations That Can Ensure Efficiency.

Purolator International

Introduction

When Subaru of America invested $140 million in its Lafayette, Indiana, manufacturing plant, it was able to increase annual production of its Legacy and Outback models by 100,000 units, to 450,000 vehicles, and add production capacity for its Impreza line. “We installed some equipment and increased line speeds, which allows us to produce a few more vehicles a day,” one senior executive explained to the *Lafayette Journal & Courier*.

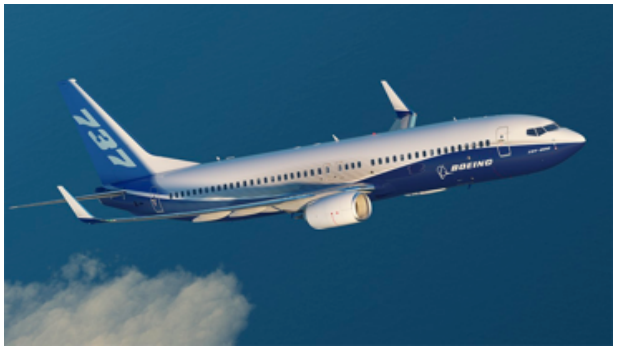
Left unsaid though was the laser-like focus on logistics that accompanied the expansion, driven largely by technology-enabled capabilities. The company “started to optimize” by adopting a lean process flow that allowed production to increase from 850 vehicles per day to 1,000, according to *Transportation and Logistics International magazine*. Integral to the company’s efforts has been the addition of “ground drones” to track inventory and provide real-time data that integrates with the facility’s warehouse management system (WMS) and transportation management system (TMS).

The Subaru example illustrates the critical role that logistics – innovative logistics – are having in helping today’s businesses meet today’s accelerated requirements for higher levels of efficiency, flawless execution, and, critically important, increased speed to market.

But, as industries continue to invest in improving efficiency, manufacturers can find themselves just one late delivery from a significant operations slowdown. Personal computer manufacturers, for example, are in the midst of a global shortage of critical semiconductor chips, which has resulted in production delays and driven up costs to consumers.

Another example involves the Boeing 737, which is assembled just outside of Seattle, Washington, where hundreds of suppliers provide the 367,000 parts necessary to make each aircraft. Not surprisingly, the manufacturer places enormous pressure on its suppliers for precision-like deliveries. With that many parts to manage, Boeing ensures production efficiency by relying on preassembled “kits” to guide workers through their day. According to *NBC News*, “instead of spending an hour or two assembling the equipment they need for the day, Boeing factory workers now arrive at work to find a kit containing all the screws, hammers, and other instruments they will need to get their specific jobs done.”

The Boeing 737 manufacturing process relies on preassembled kits to help facilitate the process and manage the 367,000 parts required for each aircraft.



But ensuring every kit has the necessary components can require herculean efforts. If one supplier misses a delivery and a stock-out occurs, the impact can reverberate throughout the entire assembly line. In a related example, the *Financial Times* reported that United Technologies, owner of aircraft engine manufacturer Pratt & Whitney, has stated that roughly 44 percent of its suppliers do not deliver on time.

It's easy to see then the urgent need to ensure that logistics capabilities keep pace with the demands of a technology-based, largely automated manufacturing process. The good news? Many logistics providers understand the transformative effect of technology on their industry and have invested in systems to allow innovative solutions. As a result, manufacturers can rely on these providers for service capabilities that either didn't exist or were unthinkable just a few years ago.

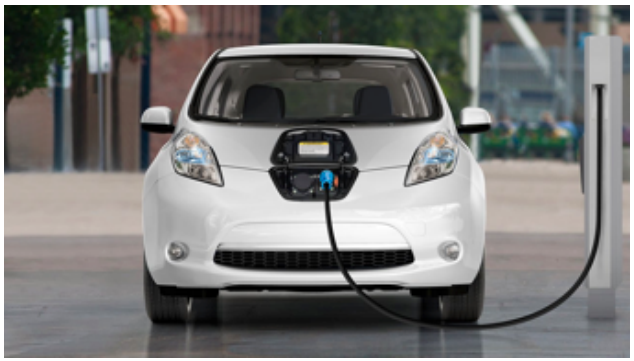
The following discussion will highlight five essential and beneficial logistics solutions that are helping manufacturers, retailers, and all other types of businesses better manage their supply chains. Important to keep in mind, though, is not every logistics provider has kept pace with the "latest and greatest" service trends, so service capabilities vary among providers. A business must do its homework and make certain its potential logistics partner has embraced innovation, is excited about how technology is changing logistics capabilities, and is interested in finding new solutions to address each customer's unique needs.

Innovation #1: Technology Drives Process Efficiency

During a 2017 Supply Chain Conference, representatives from the automotive industry seemed to broadly agree that technology is fundamentally changing their industry, including not just the types of products being developed but actual plant configurations and operations.

As an example, one participant from Ernst & Young (EY) consultancy pointed to the fundamental difference in manufacturing today's combustion engine, which includes roughly 1,500 parts, versus the "car of the future," which will include an electric motor consisting of about 35 parts. "So the logistics of how you put together the power train changes completely, and also where you get it from," the EY consultant Sven Dharmani explained. He specifically pointed out the complexity of battery procurement, since batteries tend to be quite heavy and in certain instances are prohibited from air travel.

Electric cars, such as the Nissan Leaf, pictured above, have significantly fewer parts than traditional cars.



To successfully adapt, conference attendees agreed that automotive supply chains must be connected in ways they currently are not. "I don't just mean procurement and sourcing, or materials management and logistics," Scott Dewicki of Gartner consulting said. "I mean all of that. Supply chain is an integrated, end-to-end animal now."

In North America, General Motors accomplished this, as reported by *Automotive Logistics*, via a complete overhaul of its logistics and supply chain structure. The objective was "to attain a more 'end-to-end' perspective in supply chain and logistics, from suppliers through to sales, integrating areas that cover forecasting and analysis on both sales programs and supplier capacity as well as logistics and materials handling."

Previously, the company operated under a scenario in which different departments functioned in silos, often unaware of each other's priorities and lacking a clear view of the organization's big picture.

According to James Bovenzi, executive director of GM's North America global purchasing and supply chain organization, while each department was a "very strong pillar of this house," there were gaps and misunderstandings between departments.

"Individually, they were and are very strong, but they didn't always fully understand the impact that they had upon each other," he told the online magazine. "For example, the order fulfillment team might have decided that we should apply a particular special option package or promotion, which they would then enter into the sales and production schedule. The fact that we didn't have the capacity on the supply side in that short period of time wasn't necessarily visible to any of them; they just made a decision that was very appropriate for the knowledge they had."

Now though, thanks to an investment in a technology-led restructuring, these silos have fallen by the wayside, and departments now enjoy high levels of collaboration and insight. "We have visibility from the moment a part comes off the supplier's assembly line all the way through to

delivering a car to a dealer," Bovenzi said. "That will allow us to have the right containers, the right packaging, the right mode of transportation, inventory levels, and frequency of routes."

This General Motors success story illustrates the critical role technology has in helping even the world's largest manufacturers improve processes and efficiency. But what are the core efficiencies a business can expect to glean from an investment in technology? There are several:

Integration of Systems

One Singapore-based logistics executive specializing in next-day delivery of eCommerce shipments explained the key to her company's recent explosive growth by pointing to the impact of technology. "We believe that technology will set us apart," the executive said. "The whole system – the way we sort parcels [for delivery], route [vehicles], control our fleets, and run the whole operations basically – is configured by our technology."

Among other things, this involves the integration of operating systems. Many businesses have invested in separate warehouse, transportation, and account management systems but have not taken the extra step to integrate the systems. This means systems cannot "talk" to each other. A warehouse operator who needs to move inventory to a certain location can't know with complete certainty if a truck will be available at a certain time. And neither can that operator have complete visibility into inventory, since non-integrated networks will prevent a full accounting of inventory in transit.

An integrated platform can ensure synchronization between warehouse, transportation and distribution processes.

Integration "platforms" have become increasingly sophisticated in recent years such that, in addition to warehouse and transportation functions, additional applications can be encompassed, including distributed order management (DOM) along with store-level solutions for retailers. "With WMS and TMS and order management all on the same platform," Eric Lampier, senior director of product management with Manhattan Associates, told *Logistics Management*, "order management can send order updates and WMS can send inventory availability updates to the centralized available-to-promise engine that sits in order management."

Integration technology can be a costly investment, especially if a business decides to have a platform customized for its specific needs. Most business though can work with any of a number of commercially available solutions and make necessary adaptations. Another important consideration is the logistics integration platform offered by an experienced logistics provider.

A technology-based provider will usually maintain a system that can be easily integrated with a customer's system as a way to facilitate the processing of labels and shipment information. This eliminates a significant processing hurdle, and helps ensure efficiency, accountability and cost savings.

Smart Technology – the Internet of Things

While experienced logistics companies have long relied on technology to help track shipments as they move through their supply chains, new opportunities exist – namely, through the Internet of Things (IoT) – to take that capability to the next level. Although "Internet of Things" has become a key buzzword in today's business world, what exactly does it

mean, specifically with regard to supply chain and logistics processing?

One contributor to *Wired* explained that, "[i]n the broadest sense, the term IoT encompasses everything connected to the Internet, but it is increasingly being used to define objects that 'talk' to each other."

RFID tags allow businesses to capture critical inventory data and provide tracking capability, among other uses.

Matthew Evans, IoT program head at Tech UK, told *Wired*: "Simply, the Internet of Things is made up of devices – from simple sensors to smartphones and wearables – connected together. By combining these connected devices with automated systems, it is possible to 'gather information, analyze it, and create an action' to help someone with a particular task or learn from a process."

And what specifically are its implications for logistics?

Although the IoT is in many ways still in its infancy, it is poised to have a transformative impact on the transportation and logistics industry, and serve as a great facilitator for retailers, manufacturers, delivery companies, and consumers. In many ways, its impact can already be seen:

- Consumers – as well as supply chain managers – benefit from real-time shipment tracking. In addition, tracking sensors help minimize risk of shipment loss or theft – and facilitate the claims process when a loss does occur.
- Devices attached to individual products automatically transmit data to an inventory system. When there is an unexpected demand for the item, the device will signal the warehouse management system, which in turn will trigger a reordering system.
- Radio Frequency Identification (RFID) tags attached inside shipping containers can transmit information about temperature fluctuations that may endanger perishable items, thus allowing a logistics provider an opportunity to take corrective action.
- GPS transmissions can help delivery drivers receive real-time traffic information and avoid congestion, thereby minimizing delays and helping to ensure high-quality last-mile efficiency.
- Cameras and sensors installed on forklifts can allow these heavy pieces of machinery to "talk" to each other, thereby minimizing the risk of accident.
- Sensors attached to trucks can help fleet managers gauge performance and proactively schedule maintenance, thereby preventing a time-consuming and costly in-transit breakdown.

What does the IoT look like?

Although the IoT is often spoken of as if it's a commodity – something that can be picked off a shelf and installed – the phrase actually refers to a broad range of products and services that act in unison to help improve efficiency. A few examples include the following:

Amazon has been among the leaders in exploring efforts to maximize IoT technology.

- Amazon, not surprisingly, has been at the forefront of efforts to maximize IoT technology. One example, as reported by *Internet of Business*, described how Amazon's fulfillment process has benefitted: "Every one of Amazon's orders is unique, meaning it manages millions of different products of various shapes, weights, and sizes. Amazon employees used to roam warehouse floors to scan for each product, but now they use Wi-Fi-connected robots to identify products by reading QR codes using built-in cameras…. While this takes place, workers can focus on packaging an order or restocking shelves. It's robots and humans working side by side through IoT."
- Udaya Shankar, vice president and head of Internet of Things for Xchanging, described the following scenario, as published in *Inbound Logistics*,"By putting an RFID chip in a pallet, and a combined integrated device in a shipment vehicle, data is transferred into the cloud, and the devices can identify the pallet and not only share its position using GPS coordinates but also bring in other data like weather conditions, traffic conditions, and driver-specific data (i.e., driving pattern, average speed)."
- A report by Cisco discussed the impact sensor-enabled applications are having in helping accelerate industrial automation in global enterprises, including General Electric, Bosch, and Rockwell. Whereas these manufacturing giants previously relied on proprietary networks and legacy systems, each has adopted IP standards, which are having profoundly positive results in improving overall efficiency. "IoT enables managers to understand what is occurring at a given moment in a factory environment – the performance of machines, ambient conditions, energy consumption, status of inventory, or the flow of materials. Preventative maintenance is a key use case of IoT, and this is particularly critical in a production-floor setting."

The list of examples is seemingly limitless. The fact is, logistics have been a key beneficiary of the IoT, with efficiencies and applications being realized on a regular basis. And, as the Internet of Things becomes even more fully integrated into businesses, we can expect the bar to be raised substantially with regard to logistics capabilities. Whereas today we are amazed that a sensor inside a carton can transmit pertinent shipment data, tomorrow that will be a routine practice, and we will instead be marveling at the next great thing.

Innovation #2: Technology and the Role of Big Data

For many years, businesses largely adhered to a "more is better" philosophy when it came to capturing information about, well, just about everything. Businesses couldn't get enough data points about products, processes, systems, and customer satisfaction. Until, that is, managers realized they were literally drowning in data with very little to show for it.

As reported by *MIT Technology Review*, by 2020, about 1.7 megabytes of new information will be created every second for every human being on the planet. While enterprise platforms generate an estimated 85 percent of this data, it's worth noting the role consumers have in creating data points: Facebook's 1.3 billion users worldwide generate 4.5 billion "likes" every day. Additional consumer digital data is created via movie downloads, mobile device location readings, and emails, among other venues.

> The challenge, then, is for a business to break through and zero in on data points that are truly meaningful.

Not surprisingly, most of this data is never used. In fact, according to *MIT Technology Review*, 99.5 percent of all data is never even analyzed. Or, as one *Forbes* contributor noted: "An unbelievable 90 percent of data captured is pure spam."

The challenge, then, is for a business to break through, and zero in on data points that are truly meaningful. The key is to apply the right drilling techniques and understand how the resulting information can help improve overall operational efficiency.

Logistics Efficiency

With "logistics" loosely defined as the processes required to move goods through a supply chain, it's clear the logistics industry is ideally suited to benefit from proper data analysis. With millions of shipments transported each day – destined either for a just-in-time manufacturing deadline, a retail establishment, a consumer's home, an international location, or any other destination – businesses can benefit from the important information to be gleaned from data. Not only can a business more efficiently monitor an actual shipment – its contents, weight, origin, cost, location – but important customer information can be determined – rate of returns, geographic preferences – as well as critical inventory data. Following is an overview of key efficiencies attained through effective data analysis:

Route Optimization. Minimizing delays and ensuring on-time deliveries are critical components of last-mile service, and a natural beneficiary of data-based efficiency. A "basic" optimization system would center on a web-based software system that "learns" a truck's current route using GPS location data, along with driver preferences and customer service requirements such as delivery time windows. At the same time, the system continually monitors data regarding current traffic conditions, weather-related issues, customer delivery changes, and all other delivery-related information, and it adjusts delivery routes as the situation warrants.

Does optimization really matter? Indeed it does. One major carrier found that by having its drivers avoid left-hand turns it was able to save 10 million gallons of fuel each year, and shave six to eight miles from each route.

Inventory Management/Avoiding Stock-Outs. Four dreaded words for both consumers and manufacturers are "item out of stock." For the consumer, finding a product unavailable either means an arduous trek to find the product at another retail location or website, having to switch to a "second choice," or having to wait until the product is again available. For manufacturers, out-of-stock products mean lost sales and disappointed customers, with research from GT Nexus finding that of the 75 percent of U.S. shoppers who "suffered from an unavailable product," 58 percent of in-store sales became lost sales, meaning the consumer either bought from another retailer or did not buy at all, and 65 percent of online shoppers became lost sales.

Striking just the right inventory balance can be difficult. Too much inventory and a retailer risks profitability and wasted

capital. Too little, though, can frustrate consumers. But businesses today have a new tool in their arsenal – data-based inventory management.

At a basic level, radio frequency identification (RFID) tags can be used to capture real-time insight into inventory levels. Walmart was actually a pioneer in this area. In June 2003, the mega-retailer announced it was requiring its top 100 suppliers to apply RFID tags to all cases and pallets in lieu of barcode technology, which the company believed had become obsolete.

Walmart was a pioneer in using RFID tags to capture inventory data.

The RFID system, with its real-time transmission of shipment data, allowed Walmart managers to monitor inventory levels and ensure additional products were strategically placed to replenish shelves. The radio-based technology allowed managers to not only monitor product levels but to drill down and ensure proper sizing, color, and styles were sufficient.

The result? According to researchers at the University of Arkansas, Walmart saw a dramatic decrease in stockouts, a reduction of as much as 16 percent. The research also showed that out-of-stock products using RFID technology were replenished three times faster than items using standard barcode technology.

Walmart's embrace of RFID technology was not shared initially by other manufacturers and retailers. Among other things, the technology was quite costly – an estimated 50 cents to $1.00 per tag, which was prohibitively costly for many manufacturers and suppliers. However, as the price has fallen and results have become evident, a growing number of businesses are implementing the technology. Research by Kurt Salmon found that in 2014, just 34 percent of respondents had implemented RFID in their supply chain, but by 2016, that number had more than doubled to 73 percent.

"Those who are using RFID are seeing significant improvements in inventory accuracy and reductions in out-of-stocks, cost of goods sold, and other areas essential to staying competitive," Kurt Salmon's analysis stated. "RFID continues to be a critical tool for both omnichannel and customer engagement initiatives that are central to a retailer's future success."

Data and Predictive Logistics

Harry Potter fans will recall that third-year Hogwarts students studied the use of the crystal ball to see into the future. And Wizard of Oz fans will recall the Wicked Witch of the West using her crystal ball to track the movements of poor Dorothy and her friends as they traveled down the Yellow Brick Road.

Modern-day seers, though, are turning to the secrets hidden in data to help forecast the future and allow businesses to more effectively anticipate inventory, warehouse, and transportation needs.

Analyzed properly, data can help businesses predict future inventory needs.

Amazon, in fact, is apparently so confident of the predictive efficiency of data that it has a patent pending for what it calls "anticipatory shipping." As described by the *Wall Street Journal*, the Internet retailer plans to predict customer behavior – based on past purchases, time spent browsing on certain items, shopping cart contents, wish lists, and other factors – to anticipate future purchases. The retailer would move the expected-to-be-sold merchandise to a location (possibly a warehouse or truck) located near the customer so that the shipment could be nearly en route when the customer actually finalizes the transaction.

The *Journal* notes that "the patent exemplifies a growing trend among technology and consumer firms to anticipate consumers' needs, even before consumers do. Today there are refrigerators that can tell when it's time to buy more milk, smart televisions that predict which shows to record, and Google's NOW software, which aims to predict users' daily scheduling needs."

Although it is unclear how Amazon will specifically utilize the predictive capability, it is a sure sign of the important role customer data will have in helping retailers and manufacturers understand customer preferences and make smart decisions based on those findings.

To a large extent, this is already happening. Businesses that have long adhered to the principles of demand forecasting, which largely relied on trends and past behavior as the basis for future models, can now base planning decisions on data-driven findings.

As a business considers the role of data in improving logistics efficiency, it's essential to proceed with caution. As mentioned previously, today's businesses have access to more information and data points than ever before. A business can find itself drowning in data but at a loss for the process efficiency it truly seeks. A technology-based logistics partner will be able to help identify the key metrics a business truly needs to monitor, and it will have a process to help capture – and analyze – that critical information.

Innovation #3: Disruptive Technology is Driving Efficiency

While media reports abound about the potential implications of package-delivering drones and autonomous vehicles, the fact is we're a long way from these innovative concepts becoming common sights. Analysis by Gartner forecasts delivery drones will account for less than 1 percent of the commercial drone market by 2020 and will not be a major factor for several years. Similarly, plans for widespread use of ATVs to take over last-mile delivery duties remain on the drawing board, although Amazon and other technology leaders have been working diligently to make this goal a reality.

However, the use of innovative "disruptive" technology is very much a reality inside today's automated manufacturing facilities, warehouses, and distribution centers. Current uses are just a hint of what the fully robotic warehouses and distribution centers of tomorrow will be like. Savvy managers recognize two things: (1) robotics and automation are here to stay, and failure to keep pace will put businesses at a competitive disadvantage; and (2) investing in smart technology can lead to significant production and cost efficiencies – and improved customer service.

But how exactly is disruptive technology affecting logistics efficiency? Following is a brief overview:

Industrial Robots

According to research by PriceWaterhouse Coopers, as technology has become smarter, faster, and cheaper, robotic devices are increasingly found in small and medium-size manufacturers. But when it comes to using robotics to perform logistics-related tasks, the use of technology plummets. According to the Robotic Industries Association, only about 20 percent of warehouses have integrated automation, meaning there is a lot of opportunity for improvement.

- **Picking.** eCommerce retailers see tremendous opportunity to improve efficiency through implementation of automated "picker" robots. As the *Wall Street Journal* notes, picking – the process of taking items off shelves and packing them for shipping – is the biggest labor cost in most eCommerce distribution centers. And it is also the least automated. This is because, with literally thousands, sometimes millions, of SKUs to choose from, training a robot to identify and grab the right product has been impractical until now.

"Picker" robots help facilitate the picking and packing process for eCommerce retailers.

Technology is currently being tested to do just that and is reportedly in the final stages. "Several companies, including Saks Fifth Avenue owner Hudson's Bay Company and Chinese online-retail giant JD.com Inc., have begun testing robotic 'pickers' in their distribution centers," The *Journal* reported. "Some robotics companies say their machines can move gadgets, toys, and consumer products 50 percent faster than human workers."

Amazon, which has been at the forefront of developing robotic technology, hosted a competition to allow designers to showcase their robotic-picker developments. The competition, called the "Amazon Picking Challenge," featured 27 entrants from around the world. As described in *Quartz*, "Amazon built a shelf and filled it with a range of everyday items it sells – including Oreos, Cheez-Its, spark plugs, dog treats, and of course, a few books – to test out the challengers' picking potential." One robot, "Team RBO" from the Technical University of Berlin, was able to successfully pick 10 objects out of 12 encountered.

- **Palletizing/De-Palletizing.** Robotic devices are able to perform the labor-intensive and injury-inducing job of loading and unloading pallets. As described by manufacturer Bastion Solutions, many different technologies are available to configure the precise pallets a business needs. In addition, new technologies are emerging that can build pallets consisting of mixed cases

or products. Similar robotic devices are available to safely unload pallets and deliver goods to a predetermined location.

- **Truck Unloading.** Illinois-based Wynright Corporation offers a "robot truck unloader" that, according to *Robotics Business Review*, "is ideal for boxes, bales, containers, tires, and a variety of other products." The device is described as a self-guided, autonomous robot that can be used to unload a wide range of floor-loaded products on semitruck trailers or ocean freight containers. The robot is able to enter a trailer or container and immediately "sense" its surroundings, including the size and shape of cases. It is able to scan barcodes as it unloads the cases and track the weights and sizes. The robot places the cargo onto a motorized conveyor, which then transports the cases into the warehouse or distribution center.
- T**ruck Loading.** Wynright also manufactures a robot that will move product onto a truck. According to *Robotics Business Review*, the company developed its "truck loader" as a way to facilitate the loading process for its customer Frito-Lay. The truck loader builds half a stack outside the trailer, then drives it into the trailer and gently sets it on the floor. After positioning the first stack, the robot places the second stack on top of it and then works its way across the trailer. Once the robot reaches the other end, it moves back one case length and repeats the process until the truck is filled. According to Frito-Lay North America Senior Director of Warehouse Operations Andy Fisher, the truck loader has enabled significant productivity gains, namely an increase in case loading rates from 500 cases per labor-hour to over 1,100 cases.

While each of these examples is currently in use and generating significant benefits, it's important to note that logistics-based robotics is very much in the infancy stages. The fulfillment process is highly technical, with many, many moving parts. This is why many warehouse operators have been reluctant to incorporate new, "untested" automated strategies. But, with Amazon leading the charge and technology designers seemingly intrigued by the challenge, it is only a question of when before robots become commonplace on warehouse floors and distribution centers.

3-D printing

According to the McKinsey Global Institute, the global impact of 3-D printing could surpass $550 billion by 2025. "The technology is at a tipping point," an Institute report notes. "It appears ready to emerge from its niche status and become a viable alternative to conventional manufacturing processes in an increasing number of applications."

The technology is still in its formative stages among U.S. businesses, as managers get their arms around its potential – and its enormity. Although some companies – Hasbro, Ford, General Electric and Hershey's – have started to implement the technology for certain parts. Boeing, for example, said it expects to cut as much as $3 million from the cost of its 787 Dreamliner by using 3-D printed titanium components.

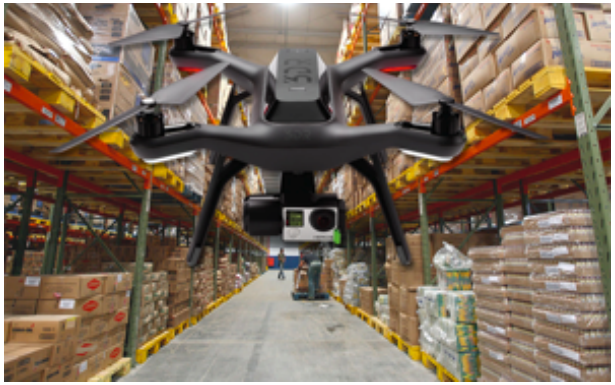
If the technology truly does take off, there could be a tremendous impact on supply chains, including last mile. Imagine a delivery truck equipped with a 3-D printer that can "build" a product while en route to a customer.

Drones

There is broad consensus that delivery drones will have a transformative effect on last-mile delivery – when the technology is ready. Concept-leader Amazon made its first successful drone delivery in December 2016 to a shopper in Cambridgeshire, England, which is where the company has been developing drone capabilities. Amazon will continue to test drone deliveries and build on successes by gradually introducing the concept to more congested areas.

However, *the New York Times* reports, even if consumer delivery testing continues to be successful, implementation of widespread drone deliveries is years away. As the *Times* notes, multiple obstacles will still need to be addressed, including regulatory threats from the United States and elsewhere.

Walmart is testing drones as a way to help manage inventory in its warehouses.



As Amazon and others continue to fine-tune the technology, drones can be found working in warehouses and distribution centers, helping to facilitate supply chain processes and add efficiency. Current capabilities include the following:

- **Inventory Management.** Walmart is currently testing the use of drones as a way to help manage inventory in its large warehouses. Drones are deployed to capture images – as many as 30 pictures per second – to capture real-time inventory levels, and to immediately flag items that are running low or are improperly stacked. That information is currently captured by workers who manually scan pallets of goods with hand-held scanning devices. Walmart's Vice President of Last-Mile and Emerging Science Shekar Natarajan told *Reuters* that the drone technology "could help catalog in as little as a day what now takes employees about a month."

Daimler is also implementing drone technology to help manage inventory. As reported by *Forbes*, Daimler was in need of a solution to track finished vehicles, which were often packed very tightly in large yards. So tightly, the article reported, that "you could not read the RFID tags that were packed in the middle." Daimler was able to partner with PINC Solutions, a manufacturer of drones for use in warehouses and yards, and was supplied with drones capable of reading tags of cars and trucks located in the middle of a line of vehicles.

Important to note is that while drones have shown great potential for use in managing inventory, the technology is far from perfect. According to Ken Piro of PINC Solutions, drones are limited in their ability to "see" inventory stacked behind other inventory. However, Piro sees a solution down the road: much smaller drones, perhaps as small as an insect.

- **Intra-Warehouse Deliveries.** Drones can also play an important role in improving intra-warehouse efficiency by transporting goods from Point A to Point B. Bob Barr of Accenture consulting suggests that drones can be used to move small items around the warehouse in a faster, simpler, and more flexible manner than conveyors or forklifts. He also notes the use of drones in placing materials on hard-to-reach shelves.
- **Security.** Several manufacturers and warehouse operators are using drones equipped with cameras to provide surveillance and perform safety inspections. Drone technology can be especially helpful for companies with expansive yard operations. Clint Reiser of ARC Advisory Group notes that drones can serve as "readers" in performing tours of a warehouse yard to confirm asset location. Reiser told *SupplyChain24/7* that drones can serve as a "second set of eyes" for shippers that want to gain better visibility over activities taking place in their yards.
- **Maintenance and Repair.** Drones can assist with maintenance work, especially in large warehouses and manufacturing facilities. A drone could be used to inspect a potential roof leak at a warehouse, noted Accenture's Barr. "Or," he told *Supply Chain Quarterly*, "repair technicians may no longer have to walk back to a supply cage, which may be a quarter of a mile away, to retrieve a tool or bolt. Instead, they could simply call the cage and have a drone fly the item to them, reducing travel time and nonvalue-added work." Barr even anticipates the day when a drone could perform simple repairs.

Self-Driving/Autonomous Vehicles

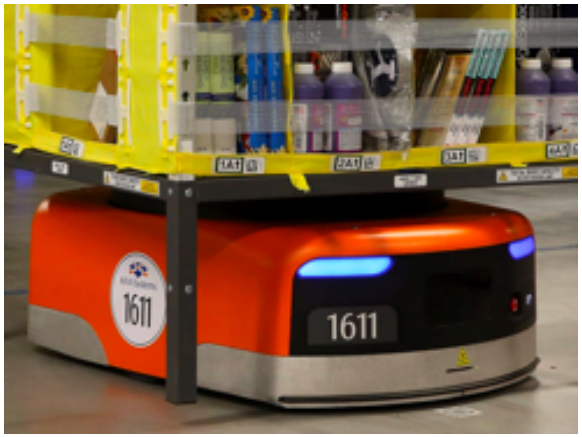
McKinsey projects that 80 percent of parcel deliveries will be made via autonomous ground vehicles (AGVs) within the next 10 years. The remaining 20 percent of deliveries will be made via traditional methods but will mostly consist of large, hard-to-deliver products and items that require installation and special handling.

In a sure sign of how the technology will be implemented in the logistics industry, the first commercial use of autonomous trucking took place in October 2016 when Otto, the self-driving truck subsidiary of Uber, shipped roughly 45,000 cans of Budweiser beer over 120 miles of highway in Colorado in a truck with no driver at the wheel.

Similar to development of drone technology, autonomous vehicles face multiple layers of regulatory challenges and logistical hurdles before being allowed broad access to the nation's highways. While these obstacles will be managed – eventually – driverless deliveries will remain more of a concept than a reality for the time being.

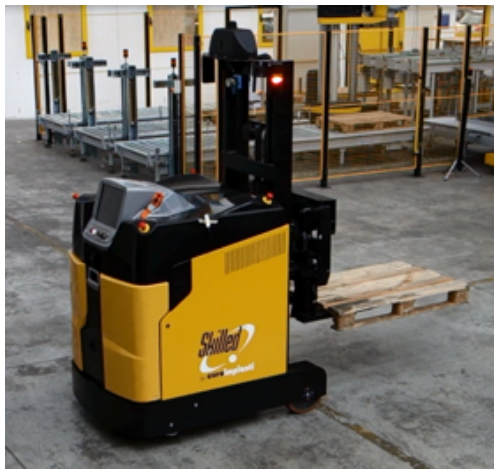
That said, autonomous vehicles are already in use in the warehouse, where self-driving carts and forklifts are increasingly common.

Autonomous Kiva robots can be found throughout Amazon warehouses.



Amazon first introduced the concept with the deployment of a fleet of robots manufactured by Kiva (which Amazon later purchased) to automate the picking and packing processes at its warehouses. The Kiva robot, as described by *Business Insider*, "is a square-shaped machine that runs on wheels. They're about 16 inches tall and weigh almost 320 pounds. They can run at a steady 5 miles per hour and haul packages weighing up to 700 pounds."

Driverless forklifts help drive efficiency in today's automated warehouses and manufacturing centers.



Driverless forklifts are also helping to transform warehouse and manufacturing floors. The concept of the driverless forklift is almost 60 years old, according to *Robotics Tomorrow*, when the idea was based on a forklift that followed an overhead wire. Today's driverless forklifts are "stepping into the future" and can approach a pallet, lift it, and then drive off to the next point, with no human assistance required.

Innovation #4: Comprehensive Logistics Solutions

Among Amazon's many contributions are the trailblazing path it is setting in terms of logistics efficiency, and the degree to which it is taking control of its transportation networks. According to the *Wall Street Journal*, the company spends almost 11 percent of sales – roughly $11.5 billion – on shipping annually and is determined to find ways to reduce those costs. Among Amazon's recent strategic moves are the following:

- In 2014 the company began testing its own "last-mile" delivery networks in San Francisco, New York, and Los Angeles. According to the *Wall Street Journal*, trucks loaded with Amazon packages and driven by Amazon-supervised contractors oversee deliveries direct to Amazon customers. The *Journal* reports that the effort is designed to give Amazon greater control over the shopping experience by minimizing delivery delays and helping to control shipping costs.
- Amazon announced in 2015 the launch of its own fleet of branded trailers to help process growing order volume. According to CNBC, the trucks are hauled by third-party tractors and used to deliver packages between Amazon warehouses.
- Amazon also maintains an air cargo network. According to the *Seattle Times*, in 2016 Amazon completed a deal to lease 20 Boeing freight jets for its own dedicated air cargo network as a way to facilitate delivery and assume greater control.
- Ocean transport is also reportedly in the company's sights, with the *Wall Street Journal* reporting in January 2017 that Amazon "has begun handling shipment of goods by ocean to its U.S. warehouses from Chinese merchants selling on its site." The company is reportedly operating via its Chinese subsidiary, Beijing Century Joyo Courier Service Co, and while Amazon does not own or operate any ships, the *Journal* reports, it is "openly acting as a global freight forward and third-party logistics provider."

Although CEO Jeff Bezos claims his company's moves are not intended to take over delivery management from its transportation suppliers but instead to "supplement it heavily," Amazon clearly intends to try and address its logistics costs from within.

And while most businesses don't have the option to purchase their own air cargo or truck fleet, there are ways to gain control of the logistics process and ensure seamless deliveries. Namely, by partnering with a logistics provider that can provide the "soup-to-nuts" services today's increasingly global supply chains demand. This is especially true as businesses face changing demands from consumers both at the B2B and B2C levels.

A report from PriceWaterhouse Coopers, "Shifting patterns – the future of the logistics industry," noted that as consumers – both B2B and B2C – expect faster delivery, greater shipment flexibility, and lower (preferably free) shipping costs, the pressure is on for businesses to find ways to streamline their logistics processes both in terms of reducing costs and adding efficiency. Greater collaboration among all moving parts is critical to success, but the report notes, "fragmentation, accountability, and a lack of consistency make collaboration more difficult."

The report cites examples in which a lack of coordination can stymie a company's efforts to improve efficiency: "Each company has its own labelling system, and some companies are wary of farming out the crucial last mile of the journey to an operator that may not reflect its own brand and service levels. And aside from the last mile, partnering agreements are the exception, rather than the rule." In addition, the report continues, "while containers are a standard size, the packages that go into them aren't. Nor are the forms and digital entries used to clear customs."

This lack of coordination often stems from "too many cooks in the kitchen" syndrome, whereby multiple vendors have responsibility for a small part of a company's logistics plan, but no one has overall visibility into the big picture. Naturally, this results in redundancies, miscommunication, lapses, and overall poor performance.

This is why a growing number of companies are attracted to logistics providers that offer comprehensive management of

all logistics needs – a single provider to manage the entire supply chain.

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Handled correctly, the logistics provider will oversee all logistics needs – transportation, warehouse, distribution, fulfillment, and customs. Among the benefits of using a single-source provider are the following:

- **Visibility.** 360-degree insight and awareness of all processes is the goal of every supply chain manager, but with so many different parts – and multiple logistics partners tasked with different parts – visibility can be quite difficult. Instead, with a single entity overseeing "the whole pie," visibility is almost inevitable in several ways, including the following:
  - Real-time insight into inventory levels and locations
  - Seamless coordination between different departments and functions
  - Tracking capability for all inbound and outbound shipments
  - Flexibility to use "best possible" transportation solutions, rather than having to settle for previously scheduled service
- **Accountability.** When multiple players are involved, it can be easy to "pass the buck" when something goes wrong. But with a single provider in charge, finding fault is not an issue. Instead, a single-source provider will immediately know when a problem arises and take steps to implement a solution.
- **Scalability.** Rather than require a single business to pay the entire cost of renting a warehouse to store inventory, a comprehensive provider will allow its customers to share warehouse space with its other customers so that businesses only pay for what they use. This is extremely beneficial to companies that do not need access to an entire warehouse or that see extreme fluctuations in inventory needs.
- **Security.** A single-source solution means fewer touches and an uninterrupted chain of custody. This in turn means fewer opportunities for damage or theft to occur and a decreased likelihood of shipments being misplaced during the transit process.
- **Continuous Improvement – Partnership.** A single-source provider can be a trusted partner who is considered a valuable member of a company's team and fully aware of that company's operating processes and strategic goals.

An experienced provider will maximize its technology system – and continually invest in new capabilities – in order to develop increasingly innovative solutions. A technology-based provider will never be satisfied with the status quo, and it will continually be on the lookout for more efficient solutions.

Innovation #5: Increased Reliance on Nonasset-Based Providers

An article in *Forbes* recently highlighted "the new breed of logistics providers" that own no assets – fleets or warehouses – but are able to provide logistics services by leveraging data gleaned from partners who do own assets. In these situations, a shipper would not be beholden to a single transportation provider's set schedule and instead would have the flexibility to choose from a broad range of possibilities.

For example, a manufacturer in San Diego with shipments headed to Canada, who relied on a provider that owned its fleet, would likely see its shipment travel hundreds of miles out of the way for a distribution center stopover before heading north of the border. Or a shipment would simply sit idle for an extended period until a scheduled truck arrived to pick it up. This is because few asset-owned providers offer direct ground service to the Canadian border.

On the other hand, a nonasset-based provider would be able to take a bird's-eye view of all Canada-bound routes and select the most direct and appropriate one. In many instances, shippers are pleasantly surprised to shave days off their transit routes, thus improving their speed to market, reducing costs, and pleasing their customers.

A nonasset-based provider can also be very helpful for eCommerce retailers who have a strong interest in locating inventory in multiple locations close to their customers. While Amazon has famously addressed this need by dramatically increasing its number of warehouses and fulfillment centers, most businesses have neither the need nor the resources for such an expansion. Instead, an eCommerce business can often rely on its nonasset-based provider for access to warehouse space in preferred geographic locations. Thus, the retailer has the flexibility to store inventory precisely where it is needed along with the scalability to allow consumer demand to drive warehouse decisions.

As the *Forbes* analysis notes, nonasset-based logistics companies are able to offer more cost-competitive services at almost 50 percent less than industry averages "because they don't have the costs associated with maintaining assets or dealing with the pressure to ensure economies of scale."

Conclusion

When *Inbound Logistics* asked a sample of logistics providers to list their greatest challenge, the top response, cited by 62 percent of survey participants, was "technology investment."

It's no surprise then that in a separate survey, sponsored by Capgemini Consulting, 40 percent of shippers said they were dissatisfied with their logistics provider's technological capabilities.

These findings are indicative of two clear signals: (1) logistics providers that have invested in technological fluency will have a clear competitive edge over their competitors; and (2) shippers are eager to take advantage of technology-based innovations that are sweeping the logistics industry.

As this discussion has made clear, logistics capabilities are changing at a breathtaking pace. And while some of the most hyped innovations – drones, self-driving trucks – are still in the developmental stage, businesses today are benefitting from a wide range of logistics solutions that were unthinkable just a few short years ago.

For businesses, these innovations provide a wonderful opportunity to add efficiency and improve interactions with customers. However, a business must take the first step to determine if it is being well-served by its current logistics provider. If the answer is no, then it's probably time for a change.

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But size alone doesn't make Purolator different. We also understand that the needs of no two customers are the same. We can design the right mix of proprietary services that will make your shipments to Canada hassle-free at every point in the supply chain.

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Purolator International
1.888.511.4811
wedelivercanada@purolator.com
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