THE FUTURE OF SUPPLY CHAIN, LOGISTICS & MANUFACTURING: HOW TECHNOLOGY IS TRANSFORMING INDUSTRIES

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INTRODUCTION





INTRODUCTION The Future of Our Industry Is Now

The logistics, manufacturing, supply chain, and transportation industries are going through a time of rapid and unprecedented transformation. The future of these industries is paved with innovation and technology. It was not long ago that ideas like 3D printing, the Internet of Things (IoT), drone delivery, and augmented reality were things of science fiction. Today, merchants and service providers within these industries are cautiously adopting these technologies to provide faster, cheaper, more reliable and sustainable business practices.

In this e-Book, we will explore emerging technologies and applications which will forever change the industries of manufacturing, supply chain, logistics, and transportation forever.



Chapter One MANUFACTURING TECHNOLOGY CHANGES





12 Sweeping Technologies Rapidly Changing Paradigms & Execution of Manufacturing Processes

Manufacturing technology is not what it used to be a decade ago. Today's increasingly automated and software driven industries have reduced human intervention to pressing only a few buttons in some cases. The application of advanced technologies in manufacturing such as nanotechnology, cloud computing, the Internet of Things (IoT) are changing the face of manufacturing in ways unimaginable a few decades ago. In addition to cutting the costs, these technologies create speed, precision, efficiency and flexibility for manufacturing companies. Here is a look at some of the advanced technologies that are driving growth.

3D Printing

One of the biggest news in the manufacturing technology sector in the last few years is the proliferation and application of 3D printing technology. It has caught the imagination of the general public and the manufacturing community like nothing since the invention of the personal computer and the internet. Within a few years, the technology has evolved so much that it is now possible to produce almost any component using metal, plastic, mixed materials and even human tissue. It has forced engineers and designers to think very differently when thinking about product development. As more manufacturers adopt and use 3D printing technology, there is little doubt that 3D Printing will change the face of manufacturing forever.





Nanotechnology

Nanotechnology is the technology of the future, but the first generation of the technology is already here. It involves the manipulation of matter on atomic, molecular and supramolecular scales; thus bringing with it super-precision manufacturing. Currently applied mostly in space technology and biotechnology, it is going to play an indispensable role in every manufacturing industry in the future. In many ways, it has already changed the world. Examples of application in nanotechnology include:

- •Faster computer processing,
- •Smaller memory cards that have more memory space,
- •Clothes that last longer and keep the wearer cool in the summer,
- •Bandages that heal wounds faster,
- •And tennis and bowling balls that last longer.

In the future, there will be nanobots (microscopic robots) that will carry drugs to specific tissues in our body.

Cloud Computing

Cloud computing is the practice of using a network of Internet-connected remote services along various points to store, manage, and process data. Many companies are already using cloud computing, although the manufacturing industry is still taking time to warm up to the technology due to connectivity and security concerns. Over time, to the present day, cloud computing grows more stable and reliable. Manufacturers are increasingly implementing cloud computing software in manufacturing plants spread out in various geographic areas in order to share data quickly and efficiently. In implementing cloud computing, manufacturers reduce costs, gain greater quality control, and increase the speed of production. In the future, it is feasible that all manufacturing facilities will have a connection to the cloud.





Big Data and Predictive Maintenance Technology

Manufacturing industries can significantly increase their efficiency and productivity with the technologies that allow them to collect, process and measure big data in real time. These technologies include electronic devices that connect factories through the internet and web pages that double as dashboards for controlling the processes. Predictive maintenance technology helps predict snags and defects and thus cuts downtime and costs. In the future, manufacturers will implement big data and predictive maintenance technologies in every area of manufacturing. IoT is a part of big data and predictive technology that manufacturers are already using with remarkable success.

The Internet of Things (IoT)

The Internet of Things (IoT) is a revolutionary manufacturing technology that allows electronic devices connected to each other, within the existing Internet infrastructure, to communicate with one another without human intervention. An IoT device connects to the internet and is capable of generating and receiving signals. As such, the use of this technology is going to have a profound impact on the manufacturing industry. IoT enables connected devices to "talk" to each other, sending and receiving critical notifications. An example of a critical notification is a defect or damaged ping. Once the device detects a failure, the IoT connected device sends a notification to another device or a user. This type of small, but critical, application of IoT in manufacturing results in reduced downtime, increased quality, reduced waste and less overall costs.

Advanced technologies have been the driving force behind the growth of the manufacturing industries, and they will have a greater role to play in the industries of the future. As new technologies emerge, manufacturers will adopt them, or they will be forced to choose them to survive. On their part, the technologies will change the industries beyond recognition. For example, 3D printing is already changing the way many manufacturers design and manufacture their products.





7 Other Information Technology Movements Moving Manufacturing into Industry 4.0

Industry 4.0 is the brainchild of the German government and describes the next phase in manufacturing, known as the post information revolution. I came across a great primer from Boston Consulting Group that neatly describes the nine pillars of technological advancement that underpin Industry 4.0, all of which IT professionals and Manufacturing CxOs must understand in order to effectively compete in the next 10-20 years.

Big Data and Analytics

In manufacturing, analytics optimizes production quality, saves energy, and improves equipment service. According to BCG, in an Industry 4.0 context, the collection and comprehensive evaluation of data from many different sources—production equipment and systems as well as enterprise- and customer-management systems will become standard to support real-time decision making.

Autonomous Robots

Robots in manufacturing are evolving for even greater utility, becoming more autonomous, flexible, and cooperative. Eventually, says BCG, they will interact with one another and work safely side by side with humans. These robots will cost less and have a greater range of capabilities than those used in manufacturing today.





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Simulation

3D simulations of products, materials, and production processes are already used in the engineering phase of manufacturing, but in the future, simulations will be used in plant operations as well. These simulations will leverage real-time data to mirror the physical world in a virtual model. Operators will be able to test and optimize machine settings in the virtual world before the physical changeover, driving down machine setup times and increasing quality.

Horizontal and Vertical System Integration

Most of today's IT systems are not fully integrated, and nor are departments such as engineering, production, and service. But with Industry 4.0, companies, departments, functions, and capabilities will become more cohesive as cross-company, universal data-integration networks evolve and enable automated value chains.

Cybersecurity

Along with the connectivity and communications protocols that come with Industry 4.0, says BCG, the need to protect critical industrial systems and manufacturing lines from cybersecurity threats will increase dramatically. As a result, secure, reliable communications and sophisticated identity and access management of machines and users will be essential.

The Cloud

BCG reports that Industry 4.0 will require increased data sharing across sites and company boundaries. At the same time, the performance of cloud technologies will improve, achieving reaction times of just several milliseconds. As a result of this productivity boost, machine data, and functionality will increasingly be deployed to the cloud.





Augmented Reality

These systems are currently in their infancy, but in the future, companies will make much broader use of augmented reality to improve decision making and work procedures. In the virtual world, operators will learn to interact with machines by clicking on a cyber-representation. They will also be able to change parameters and retrieve operational data and maintenance instructions.



Chapter Two THE INTERNET OF THINGS





Industry 4.0: Powered by the Internet of Things & Digital Manufacturing

Industry 4.0: The Fourth Industrial Revolution

So what is "industry 4.0?" Roughly it is a broad vision of tomorrow's manufacturing: Products finding their way independently through the production process. In intelligent factories, machines and products communicate with each other, cooperatively driving production. According to Accenture, they define Industry 4.0 as:

Connected, intelligent products that communicate with users, new digital business models that harness collected data to offer additional services and as-a-service products, products on the assembly line that tell shop floor machinery how they are to be processed. The core of Digital Industry 4.0 is highly intelligent connected systems that create a fully digital value chain. Digital Industry 4.0 is also commonly referred to as the Industrial Internet of Things.

Connectivity has Brought us the Digital Industry 4.0 Revolution

In this bylined article, Ralf Russ, Accenture Managing Director, writes that by 2020, connected and intelligent products are predicted to be the biggest "user group" of the internet, estimated at 24 billion devices. But this is not just a revolution in consumer technology. In the Industrial Internet of Things world, connecting smart devices has the potential to transform how factories operate, buildings are managed, and vehicles are maintained and operated - in fact an almost limitless number of new industrial processes, functions and services.





Three key trends are changing the way of life for industrial companies and their employees today.

- Digitize: Production processes in all sectors, from high tech to industrial equipment, are being transformed by digital technologies.
- Industrialize: Leading companies are already integrating these technologies to improve and evolve pillars of their value chain.
- Optimize: Innovative manufacturers recognize that enhancing the manufacturing process for even simple products presents new opportunities for growth.

A Broad Look at the Internet of Things (IoT)

The Internet of Things (IoT) is a vision of a world where almost any kind of object can and many will carry some kind of transmitter to send and receive data from the internet. Think sensors and smart appliances everywhere, and all able to communicate, both by M2M (machine to machine) and M2H (machine to human).

Gartner estimates that in 2020 more than 26 billion devices will be able to communicate and signal via the internet. Cisco estimates the IoT market will add more than \$14 trillion to the global economy, of which McKinsey says \$310 billion represents incremental revenue for businesses.

Susan Hauser, Microsoft Vice President, said that "the challenge for successful companies in the coming year will be to harness this data to act on key insights, improve customer service, reduce time to market, enable new innovation in product and services development, and ultimately transform themselves with new business models and revenue streams."

One area where IoT is poised to drive innovation in particular is manufacturing. By embedding sensors across all devices and elements of the shop floor, businesses will be able to collect real time manufacturing data, enabling very precise monitoring of the production process. Companies will be able to do predictive maintenance to reduce downtime, better manage their inventories, and also to become more flexible and responsive to changes in market conditions. A SAS survey found that 18 percent of industrial machinery companies have already started to use 'IoT devices' to increase production and reduce costs.





Sansa Security predicts that 2015 will be the year where device sensors will by default use common, rather than proprietary, protocols to communicate, enabling devices to better interact and be controlled through a single interface. But businesses will need to make investments. Old equipment will need to be upgraded or replaced in order to support the new paradigm of digital manufacturing.

John Nesi, Vice President at Rockwell Automation, said that IoT technology is needed to address "global competitive pressures that are challenging industrial and manufacturing companies to drive inefficiencies out of their systems, manage workforce skills gaps and uncover new business opportunities." Done properly, the benefits will be "faster time to market, improved asset utilization and optimization, lower total cost of ownership, workforce efficiency, enterprise risk management and smarter expenditures."

The Internet of Things has been around and growing for many years, says Dr. Ahmed El Adl, CTO for the manufacturing industry at CSC. "There's no official definition of the Internet of Things, but new technologies – and some dating back to the '60s - are coming together, making it possible to connect and control nearly everything in real-time to make smarter decisions," El Adl says.

The Internet of Things will Power Digital Manufacturing

Digital manufacturing is the use of an integrated, computer-based system comprised of simulation, three-dimensional (3D) visualization, analytics and various collaboration tools to create product and manufacturing process definitions simultaneously.

The Internet of Things is a key element of the next stage of digital manufacturing. Ralf Schulze, industry strategist for business development at CSC, says "Industry 4.0" is the merger of information and manufacturing technologies: "IoT devices are one of the main drivers, but Industry 4.0 includes intelligent bridging between CRM, SCM and ERP systems, social media and other information sources. Smart materials will influence how they are used. Additive manufacturing will allow me to print my parts rather than have them produced on big machines. These are all aspects of Industry 4.0."

El Adl says manufacturers like GE and Cisco are moving quickly to embrace the concept of the Internet of Things in new product lines. "They're designing around the idea that they can connect everything, collect any data. When you view the stages of a product lifecycle in that context and ask 'Which stages should be redesigned to take advantage of this?' the answer is 'Every stage.'"





Some stages are feeling that influence now. Greg Rodgers, manufacturing industry specialist at CSC, says data generated by connected equipment can be used to make predictive maintenance practical. "We can learn about issues with a machine or analyze data to understand what's going on. We can use that data to make proactive maintenance decisions and change sales models. Plus, it opens up a whole new range of opportunities for manufacturers and service companies," Rodgers says.

Security concerns surrounding the Internet of Things are due to two factors, El Adl says. The first is scale. "The move from IPv4 to IPv6 will allow us to connect 340 trillion, trillion, trillion devices, so the scale of exposure is many times larger. And we need to learn new security protocols. IT organizations have experience securing devices using today's protocols, but we don't have much experience with IoT protocols like ZigBee. This should not stop you from exploring the IoT today. You can secure your island but you can't secure the world."

Schulze says "orchestrated manufacturing" is a strategy for capitalizing on change wrought by Industry 4.0 and the Internet of Things. "It starts by examining the impact of these technologies on the business model, to the business applications, and all the way from technology to how I structure my data and what analytics engines I use," he says. "The framework we've created is a very good start to help make products and processes smarter."





The 10 Most Important Things You Need To Know About The Internet Of Things

10 Things about the Internet Of Things that Supply Chain and Logistics Managers Should Know

The Internet of Things (IoT) is becoming a hot-button issue for the C-suite. Many senior leaders are concerned whether implementing IoT-based technology and processes is worth the time, money, and effort involved. Others worry they risk being left behind and losing their customers to competitors if they avoid it altogether.

In fact, Gartner found that 64% of large enterprises plan to implement big data projects. Sounds promising, right? Not really – considering 85% of them will be unsuccessful.

All of this data needs to go somewhere - but where?

During the America' SAP Users Group (ASUG) IoT webcast "Operationalizing IoT Data for Predictive Analytics, Dave Roberts, OSIsoft fellow specializing in cities and industrial clusters, observed that complexity in the IoT is attributed to technologies that support a wide variety of standards that seem to be emerging in the IoT space. "There's AllJoyn, Thread, IEEE, Open Internet Consortium (OIC), Industrial Internet Consortium (IIC), among others, that are promoting different standards on how sensors and assets will communicate with gateways and routers," he explained.





As a result, businesses are spending 50%–80% of their development time just prepping their data – collecting, cleansing, shaping, backfilling, and timestamping all of this information. Some are even going as far as creating a new job title –"data engineer"– responsible for getting this data together and shaping it so data scientists can accurately answer critical business questions with this information.

10 things Manufacturing Companies Need Consider when Operationalizing the Internet of Things

If so many companies understand the value of the IoT and are investing considerable time, money, and effort to realize its potential, why are so many still failing to achieve it? Dave Roberts sheds some light on why they are missing the mark by offering his Top Ten list of what every company should know about successfully operationalizing the IoT.

- 1. The value of the IoT is not technology. The real value lies in the creation of new value propositions and potential revenue streams. The key is taking this technology and using it to move toward new business models and services that will help realize them. According to leading analysts and thought leaders, the growth potential is significant. IDC believes the IoT market will hit \$7.1 trillion in revenue by 2020. Gartner foresees the IoT install base growing to 26 billion units by 2020. And Cisco predicts that the IoT is poised to become a \$19 trillion market.
- 2. IoT data will be more democratic than SCADA data. Historically, SCADA data has been locked away in somebody's process control network. To access this information, update it, and revalidate it, people needed a miracle. With IoT, you can freely and quickly bring up this information when and where you need it. This one aspect is revolutionizing business models, allowing businesses to enhance their services in real time.
- 3. Businesses outside of your industry may know something you don't. For example, highly powerful tools developed for clickstream analysis, fraud detection, cyber security, and genome sequencing are now coming to process industries. Don't snub other industries, thinking that you are different from them. They may have a few tricks in their pocket that you need.





- 1. Standardization leads to repeatability. The more comparable assets are in your organization, the better your forecasts will be. Machine learning is better with more, similar data. Anything less leads to misconstrued information and inefficiency.
- IT and OT are converging deal with it. Data engineering can take significant time and resources. However, it shouldn't stop you from moving forward with IoT initiatives. Instrumentation and controls engineers from the world of operational technology (OT) have to bridge the gap between the analytics and IT communities.
- 3. Sensors will not live forever. In other words, cheap sensors are not going to be 100% reliable, 100% of the time. Physical damage during normal maintenance and operation in hostile industrial environments (such as dust, vibration, water, and caustic materials) will occur. Even sensor batteries can discharge. Ultimately, all sensors fail either instantaneously or slowly degrade. Processes must be established to make sure sensors are fully operational and deliver correct data.
- 4. Your information is as good as your sensors. Reliability of predictions is only as good as the data feeding them. If you are going to run analytics based on sensor data, you better make sure that the sensor is in good working order. At times, you even have to go as far as validate the sensor data before it is reported or analyzed to answer critical business questions.
- 5. Data needs context. To develop a model that forecasts behavior, data scientists require context and time-series data. Otherwise it becomes very difficult to consume this information and truly see what happening now and in the future. People need real-time data to make the best possible decisions. With pervasive monitoring, this information is captured and delivered for business intelligence analysis.
- 6. The IoT brings a tsunami of data. IoT rollouts bring a proliferation of cheap, distributed sensors resulting in a huge volume of data in a short amount of time. Is your infrastructure ready to support it?
- 7. Don't forget what powers the IoT. Data integration and actionable information are the heart of collection and analysis of IoT data. Invest in the technologies, expertise, and processes that support integration, reporting, decision making, and action and maintain them well.





What is "The Internet of Things" Impact on Manufacturing & Logistics?

Network control and management of manufacturing equipment, asset and situation management, or manufacturing process control bring the IoT within the realm on industrial applications and smart manufacturing as well. The IoT intelligent systems enable rapid manufacturing of new products, dynamic response to product demands, and real-time optimization of manufacturing production and supply chain networks, by networking machinery, sensors and control systems together.

Digital control systems to automate process controls, operator tools and service information systems to optimize plant safety and security are within the purview of the IoT. But it also extends itself to asset management via predictive maintenance, statistical evaluation, and measurements to maximize reliability. Smart industrial management systems can also be integrated with the Smart Grid, thereby enabling real-time energy optimization. Measurements, automated controls, plant optimization, health and safety management, and other functions are provided by a large number of networked sensors.

Logistics companies were among the first to adopt mobile devices as a means to manage and monitor their processes. Initially the hand-held devices that delivery drivers used delivered benefits primarily by simplifying and automating existing paperbased processes.

With the emergence of lower cost, always connected, location aware devices, the current generation of mobile technology and the growing Internet of Things allows logistics companies to move beyond simply making existing processes better, by making it possible to dynamically track both vehicles and the packages they carry.





The Internet-of-Things can include connected intelligence in different elements of logistics infrastructure:

- Vehicles—This is perhaps the epicenter of IoT in logistics, with modern trucks, planes, locomotives, and ships bristling with sensors, embedded processors, and wireless connectivity.
- Sites—Vehicles and containers pass through or dwell in many sites on their journey, including ports, yards, consolidation/deconsolidation centers, warehouses, and distribution centers. A tremendous amount of intelligence and sensing capability can be embedded in the equipment and structures of the sites, including:
- Mobile equipment—e.g. forklifts, yard tractors, container handlers, mobile cranes, and so forth;
- Stationary or semi-stationary equipment—e.g. gantry cranes, conveyor belts, carousels, automated storage and retrieval systems;
- Site structures and ingress/egress points—e.g. sensors in dock doors, yard entry/exit gates, light poles, embedded in floors or under pavement, attached to ceilings and other structures.
- Roads/Lanes—Intelligence is starting to be built into roadways, railways, runways, canals/locks, and other transportation conduits. Because they cover so much more territory, the intelligence built into these is typically sparser than IoT in the vehicles and sites.

There are several benefits of the future use of IoT in logistics and transportation, which we will paint a picture of in tomorrow's post. The hyperconnected world and the "Internet of Things" presents tremendous opportunities for businesses to lead through innovation and evolution. To do so, companies need to understand the changing business dynamics driven by the new online paradigm.





Make Way for the Supply Chain Internet of Things (IoT)

Agility is needed in an ever-changing market. A supply chain that is transparent with an open configuration can accept the changes that the Internet of Things or IoT will bring. This nascent concept will provide faster communications from device to device without human input. Learn more to get ready for the next wave of communications: the supply chain internet of things.

The Core Benefits of the Internet of Things to a Supply Chain

Organizations can respond promptly to changes with IoT integration into their processes. Undesirable conditions, such as a transportation delay, will do more than set off an alert. Systems can automatically assess priorities, review choices and make problem-solving decisions. Some benefits of additional real data and enhanced intelligent automaticity within the supply chain internet of things are an increase in profits, a reduction in excess product that quickly loses value, faster response to changing client needs or supplier availability, the optimization of shipments and the assurance of complete deliveries.

With IoT, an organization can:

- Easily process profitable returns
- Consolidate shipments based on multiple factors
- Reroute goods instantaneously
- Service parts on-demand
- Quickly manufacture products with a short-lifecycle
- Make changes in the middle of production
- Use time-sensitive data to make more accurate predictions of demand





Supply Chain Internet of Things Changes the Face and Methods of Big Business

Companies are harnessing the potential of IoT. Their operations, functionality, services and products offered and real-time feedback regarding customer demand are changing as they accommodate and leverage IoT. Some major changes are underway.

GE has pushed its own IoT initiative, the Industrial Internet. It is currently selling outcomes-based services to clients, guaranteeing specific, measurable efficiencies through the use of GE's smart machines, big data analytics and cloud-aware software platform. GE has changed from providing solely physical assets to offering data.

Domino's Pizza is remaking their customer service features with technology. The creation of online and mobile ordering service embraces features like a 3-D pizza builder, games, a Pizza Tracker and pizza profiles for their customers.

Retailers are implementing IoT technology. Using Apple's iBeacon technology, customers receive relevant deals on their smartphones as they walk through different areas in a store. Retailers can change, develop and execute strategies based on real customer preferences and seeing what deals customers respond to and the types of items purchased. These supply chain internet of things technologies provides direct insight into customer demand.

IoT is able to provide pertinent data to end users, create more engagement with customers and use shopping behavior to prompts in real-time to uncover preferences and customer demands. New IOT interfaces and applications allow for more salient information faster with the potential to respond without human input. Built into a supply chain, users will see an increase in end-to-end visibility with clear timely data at all stages. Supply chains can become more agile and responsive to changing conditions, client preferences, and issues, delivering a higher level of service without sacrificing profit.





Management of More Data

Will the supply chain internet of things become a blessing or a curse? IoT is a tool and the automaticity it provides companies will prove to be an asset if the management tools and internal processes of supply chains can be equipped to handle the change. Obviously, if competitors are using IoT "smart" devices and getting data faster, critical decisions automated and response time shortened, this is going to separate them from the rest of the group and give them an edge in responding to customers and increasing efficiencies within their organization. These agile leaders will gain market share and customer loyalty in highly competitive industries while satisfying the demands of shareholders.





A Not So Distant Look at how the Industrial Internet of Things Could Change the Services Provided by 3PLs

As manufacturing, transportation, and every aspect of humanity evolves in modernity, reliance upon the Internet of Things (IoT) continues to grow and impact every facet of civilization. Another term, as it more relates to manufacturing, distribution, transportation, and logistics that has also been thrown around is the Industrial Internet of Things (IIoT). ThomasNet wrote an article, "Are Manufacturers Ready for the Industrial Internet?" and states:

Manufacturers' business models and competencies will have to evolve to take advantage of the Industrial Internet. The rewards promise to offer tremendous value to those companies that can adapt and produce machinery and equipment for it.

However, this represents a frightening, yet exciting and profitable, prospect: how will transportation management services, warehouse management systems, and other aspects of third-party logistics (3PL) benefit themselves by using the industrial internet of things in the future? Rather than leave you to your imagination for how this will work, let us take you on a journey into the world of tomorrow, where the IIoT rests within the heart and soul of every 3PL service.





Creation of Smart Containers

Smart containers will have Radio Frequency Identification (RFID) sensors that improve the transparency and accuracy with which a product is transported. In the past, identification of shipping container materials relied on human input to answer any questions about a given product, which includes what, how many, why, where an item needs to go. Furthermore, shipping containers may or may not be susceptible to damage from the elements; therefore, merchandise would arrive in poor condition, and a return on investment would be lost.

Using the Industrial Internet of Things, RFID sensors will provide a detailed account of all items within any given container and identify times when the environmental conditions of a given container pose a threat to the products. For example, sensitive equipment may be damaged by dramatic changes in atmospheric pressure. The sensor will provide an alert to drivers or other employees working within the shipping company. However, the IIoT will progress to a point where human action for addressing potential problems. The Industrial Internet of Things will have the ability to recall or redirect a vehicle, and computerized loading equipment can select the appropriate shipments for removal and redirection. In another scenario, the IIoT can ensure any such sensitive items are placed within an "indestructible" shipping container, which would eliminate the need for concern over environmental concerns. However, the end result of any logistics system is to improve efficiency and drive customer satisfaction through rapid, reliable service.

Smart Vehicles

Most think of trucks as the primary means of transportation; however, the IoT's impact on shipping includes planes, trains, ocean-carriers, and the eventual use of drones. Smart vehicles gather data and determine which, if any, factors affect a given product's shipping path. For example, all US vehicles manufactured after 2004 require the installation of a Tire Pressure Monitoring System. Since low tire pressure results in poor gas mileage, the parent company incurs an additional cost of shipping. The use of multiple monitoring systems in vehicles, or other means of transportation, reduces the chances of vehicle problems impacting services.

Tomorrow, the Industrial Internet of Things will use this information to identify potential problems before they exacerbate into a shipping failure or delay. Furthermore, the IIoT will identify periods of inefficiency during transport and make recommendations for future transports. The IIoT will also reach into another key aspect of shipping, infrastructure.





The Industrial Internet of Things and Infrastructure

America boasts one of the greatest infrastructures in the world, and America's roads are no exception. However, the most up-to-date 3PL services still have to worry about the actions of other people, such as drivers on roads, throughout the course of business. The IIoT can be seen today in the use of advanced safety technologies in newer vehicles, such as the ability to detect problems. Tomorrow's IIoT will detect erratic behavior of other drivers and produce an alert to other drivers. The Industrial Internet of Things will grow to alert local police departments of potential problems of other drivers, and eventually, IIoT technologies within the roads will disable these dangerous vehicles. In another futuristic scene, the IIoT will shut-down lanes or redirect traffic towards a safer, alternative path. Imagine a time when the road identifies approaching dangerous conditions miles before coming onto the scene of an accident. (Maybe this will decrease regulations which drive up shipping rates.)

Increasing Security and Responsiveness

In close relation to alerting authorities about erratic drivers, the IIoT will have the ability to reduce shrink associated with unexpected opening of shipping containers. Furthermore, the Industrial Internet of Things will identify which items have been moved inappropriately, such as when a corrupt worker tries to steal merchandise. As a result, the IIoT may lock a driver out of the vehicle, alert authorities, or even initiate other security protocols, including an electronically controlled door lock.

Although some argue the Industrial Internet of Things and IoT, in general, will invade privacy and reduce employee satisfaction, it serves as a means of increasing 3PL provider efficiency by reducing human error and extraneous factors. Whether it's avoiding poor weather conditions, determining alternative routes, or increasing company responsiveness to problems, the Industrial Internet of Things will make the world a happier, safer place. Today, we track things. Tomorrow, we rest while the IIoT maximizes vertical integration of systems and prevents problems before they occur.



Chapter Three TECHNOLOGY'S ROLE IN PROCUREMENT





The Future Of Procurement: What Is Your Role?

In 10 years, your day-to-day job in procurement might be radically different. Compelled—and enabled—by the digital transformation of business, you might be spending much less time on administrative tasks and be able to focus on more strategic internal and external collaboration. You might be part of a smaller team performing only core functions. Or, if your title is Chief Procurement Officer, you might have been the driving force behind expanding your procurement organization's size and increasing its strategic scope.

The art of future-gazing is in part a matter of setting a vision, and in part a matter of realistic observation. In 2010, Ariba, an SAP company, asked a group of procurement executives and thought leaders to set the vision. The resulting Vision2020 report was a landmark piece of bold ideas about where the function was headed in terms of organizational structure, supplier collaboration, and the rising importance of data.

Come 2015, it was time to take that vision and make some quantitative observations

Enter The Future of Procurement, an Oxford Economics study. Over 1,000 CPOs, VPS, directors, category managers, sourcing managers, buyers, and other procurement professionals from around the world participated in the survey—a mighty feat of collective future-gazing. And now it's your turn. Have a look at the infographic on the next page for a high-level view of the research. And leave a comment to let us know what do you think the future of procurement will look like 10 years from now...what do you want it to look like...and what are you doing to make it happen?





THE FUTURE OF PROCUREMENT

R Executives

One survey, two perspectives

Oxford Economics and SAP surveyed more than 1,000 senior procurement executives and non-executive procurement practitioners around the world to get both perspectives on where the procurement function is headed. See what your peers are saying about how procurement is becoming more strategic, collaborative, and technology-driven than ever before.



THE TECHNOLOGY AGENDA

Procurement today is focused on automation and collaboration. But executives are much more optimistic about prospects for success. 77% of executives say B2B commerce networks will be important to procurement's progress over the next two years.

Success of automation in two years "Mostly automated" or "Completely automated"



THE HUMAN CHALLENGE

As the nature of work changes and technology advances faster than most workers can keep up, attracting and recruiting the right workers is a challenge for the procurement function—and one of the biggest opportunities to rise above the competition.
Practitioners...



Get more insight and results from this research program. Visit Ariba, an SAP company, to download the executive overview today.



A R I B A* An SAP Company





FROM HERE TO WHERE?

Changes in the procurement function drive sharply different views of what the future will look like.



PROCUREMENT GETS COLLABORATIVE

There is broad agreement that procurement is spending more time collaborating with other lines of business and external partners.

Executives and practitioners say, at their company....



GOODBYE TO BUSINESS AS USUAL

When it comes to realizing the full value of collaboration, it's all about relationships. These new ways of work are forcing change on the way procurement operates.

Key trends driving change in the procurement function "To quite an extent" and "To a great extent"





The Future Of Supplier Collaboration: 9 Things CPOs Want Their Managers To Know Now

As a sourcing or procurement manager, you may think there's nothing new about supplier collaboration. Your chief procurement officer (CPO) most likely disagrees.

Forward-thinking CPOs acknowledge the benefit of supplier partnerships. They not only value collaboration, but require a revolution in how their buying organization conducts its business and operations. "Procurement must start looking to suppliers for inspiration and new capability, stop prescribing specifications and start tapping into the expertise of suppliers," writes David Rae in Procurement Leaders. The CEO expects it of your CPO, and your CPO expects it of you. For sourcing managers, this can be a lot of pressure.

Here are nine things your CPO wants you to know about how supplier collaboration is changing – and why it matters to your company's future and your own future.





1. The need for supplier collaboration in procurement is greater than ever

Sixty-five percent of procurement practitioners say procurement at their company is becoming more collaborative with suppliers, according to The Future of Procurement, Making Collaboration Pay Off, by Oxford Economics. Why? Because the pace of business has increased exponentially, and businesses must be able to respond to new market demands with agility and innovation. In this climate, buyers are relying on suppliers more than ever before. And buyers aren't collaborating with suppliers merely as providers of materials and goods, but as strategic partners that can help create products that are competitive differentiators.

Supplier collaboration itself isn't new. What's new is that it's taken on a much greater urgency and importance.

2. You're probably not realizing the full collective power of your supplier relationships

Supplier collaboration has always been a function of maintaining a delicate balance between demand and supply. For the most part, the primary focus of the supplier relationship is ensuring the right materials are available at the right time and location. However, sourcing managers with a narrow focus on delivery are missing out one of the greatest advantages of forging collaborative supplier partnerships: an opportunity to drive synergies that are otherwise perceived as impossible within the confines of the business. The game-changer is when you drive those synergies with thousands, not hundreds of suppliers. Look at the Apple Store as a prime example of collaboration en masse. Without the apps, the iPhone is just another ordinary phone!

3. Collaboration comes in more than one flavor

Suppliers don't just collaborate with you to provide a critical component or service. They also work with your engineers to help ensure costs are optimized from the buyer's perspective as well as the supplier's side. They may even take over the provisioning of an entire end-to-end solution. Or co-design with your R&D team through joint research and development. These forms of collaboration aren't new, but they are becoming more common and more critical. And they are becoming more impactful, because once you start extending any of these collaboration models to more and more suppliers, your capabilities as a business increase by orders of magnitude. If one good supplier can enable your company to build its brand, expand its reach, and establish its position as a market leader – imagine what's possible when you work collaboratively with hundreds or thousands of suppliers.





4. Keeping product sustainability top of mind pays off

Facing increasing demand for sustainable products and production, companies are relying on suppliers to answer this new market requirement.

As a sourcing manager, you may need to go outside your comfort zone to think about new, innovative ways to collaborate for achieving sustainability. Recently, I heard from an acquaintance who is a CPO of a leading services company. His organization is currently collaborating with one of the largest suppliers in the world to adhere to regulatory mandates and consumer demand for "lean and green" lightbulbs. Although this approach was interesting to me, what really struck me was his observation on how this co-innovation with the supplier is spawning cost and resource optimization and the delivery of competitive products. As reported by Andrew Winston in The Harvard Business Review, Target and Walmart partnered to launch the Personal Care Sustainability Summit last year. So even competitors are collaborating with each other and with their suppliers in the name of sustainability.

5. Co-marketing is a win-win

Look at your list of suppliers. Does anyone have a brand that is bigger than your company's? Believe it or not, almost all of us do. So why not seize the opportunity to raise your and your supplier's brand profile in the marketplace?

Take Intel, for example. The laptop you're working on right now may very well have an "Intel inside" sticker on it. That's co-marketing at work. Consistently ranked as one of the world's top 100 most valuable brands by Millward Brown Optimor, this largest supplier of microprocessors is world-renowned for its technology and innovation. For many companies that buy supplies from Intel, the decision to co-market is a strategic approach to convey that the product is reliable and provides real value for their computing needs.

6. Suppliers get to choose their customers, too

Increased competition for high-performing suppliers is changing the way procurement operates, say 58% of procurement executives in the Oxford Economics study. Buyers have a responsibility to the supplier – and to their CEO – to be a customer of choice. When the economy is going well, you might be able to dictate the supplier's goods and services – and sometimes even the service delivery model. When times get tough (and they can very quickly), suppliers will typically reevaluate your organization's needs to see whether they can continue service in a fiscally responsible manner. To secure suppliers' attention in favorable and challenging economic conditions, your organization should establish collaborative and mutually productive partnerships with them.





7. Suppliers can help simplify operations

Cost optimization will always be one of your performance metrics; however, that is only one small part of the entire puzzle. What will help your organization get noticed is leveraging the supplier relationship to innovate new and better ways of managing the product line and operating the business while balancing risk and cost optimization. Ask yourself: Which functions are no longer needed? Can they be outsourced to a supplier that can perform them better? What can be automated?

8. Suppliers have a better grasp of your sourcing categories than you do

Understand your category like never before so that your organization can realize the full potential of its supplier investments while delivering products that are consistent and of high quality. How? By leveraging the wisdom of your suppliers. To be blunt: they know more than you do. Tap into that knowledge to gain a solid understanding of the product, market category, suppliers' capabilities, and shifting dynamics in the industry, If a buyer does not understand these areas deeply, no amount of collaboration will empower a supplier to help your company innovate as well as optimize costs and resources.

9. Remember that there's something in it for you as well

All of us want to do strategic, impactful work. Sourcing managers with aspirations of becoming CPOs should move beyond writing contracts and pushing PO requests by building strategic procurement skill sets. For example, a working knowledge in analytics allows you to choose suppliers that can shape the market and help a product succeed – and can catch the eye of the senior leadership team.



Chapter Four ROBOTICS





The Future Of Supplier Collaboration: 9 Things CPOs Want Their Managers To Know Now

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The Exploding Use of Robotics in Logistics and Manufacturing

The world has changed from the oil days of machine assisted assembly lines and manufacturing processes as more robots have entered the workforce. Robotics is not just a way to help companies, but many manufacturers have recognized how robots can improve their supply chain processes, benefit the company, and drive their future success. Rethink Robotics introduced Sawyer in 2015 and pioneered the "friendly" robot game with the introduction of Baxter in 2012, which will make the integration of human workers and robots seamless. Amazon Robotics, also known as Kiva Systems, hosted a competition earlier this month to locate the best order fulfillment robots available. With major companies taking the initiative to develop and encourage the growth of robotics in logistics and manufacturing industries, the possibilities for the future are endless. However, you need to know what's driving the mass expansion of robotics, how robotics benefit companies, and a glimpse of what it means for your company in the future. Only then, will you be able to appreciate how robotic applications are changing our world.





Driving Forces Behind Robotics in Logistics in Manufacturing

As society experiences more demand for rapid order fulfillment and accuracy in supply chain processes, manufacturers and supply chain management providers must come up with a way to meet consumer demands. Meanwhile, the number of drivers has dwindled over the past few years, labor unions have demanded higher wages and fewer hours, and other companies simply do not have the money to spend on hiring additional workers. Therefore, many companies have had to think of alternative ways to get the same amount, if not substantially more, of work completed in a shorter period of time. Robotics holds the answer to this problem.

Robotics also answers a second question of those involved in the supply chain: how will the company improve efficiency and save money? When a company needs to achieve dynamic scalability, the company needs a workforce capable of adapting to the changing environment. Previously, we have discussed the uncertain futures of manufacturing if the TPP, or TPA, is authorized and passed. Additionally, manufacturers must convince the public of the need for more workers in the industry, especially as many other occupations appear to be drawing more workers than manufacturing. However, robotics could eliminate any of these manufacturer concerns as the technologies become more widely used, affordable, and available.

Ultimately, the driving force behind the expansion of robotics in logistics and manufacturing processes is the consumer. Consumers want their products, which they have paid for, and faster, more efficient processes, from the manufacturing to delivery, will encourage repeat purchases, and therefore, company growth and success. Without the consumer demand, the demand for robotics would not exist.

Benefits of Robotics in Logistics and Manufacturing

While it does not need to be stated, you must remember that robots are not people. Robots do not have emotions. Robots do need sleep. Although, some may argue robotic programs have life-like responses to our needs.

Robots have the potential to create a limitless workforce that does not have additional expenses on a company. For example, retirement benefits, paid-time-off, overtime pay, adherence to daily work schedules, and other aspects of typical workers is completely eliminated when robotics are employed in supply chain processes.





Robotics also impact the efficiency and analysis of supply chain processes. Robotics can sort through incoming and outgoing packages faster, place them on the appropriate shelves, or shipping containers, and ensure the packages do not have any defects, which would cause unnecessary returns or delays in the order fulfillment process. Robots may also detect issues arising around them. For example, robotics could be used to prevent a truckload of merchandise leaving the warehouse if a wreck has occurred several miles away. Alternatively, robotics could provide the drivers with an alternative route prior to leaving. This may sound nearly identical the use of the IoT in supply chain processes. However, robotics would be comparable to the physical action that takes place following the identification of inefficiency. Therefore, robotics can be applied to the software aspects of supply chain processes, even though human input may still be necessary.

Robots are capable of inhuman feats, such as lifting heavy objects or reaching tiny areas. This impacts how items may be manufactured. For example, humans must create build an item from the inside out, as our tools only allow us to perform certain actions. Alternatively, a robot could use a tool of much larger reach and smaller grasp to enter a tighter space to perform a certain action. This leads to the possibility of locating faster, more efficient ways of building a product. Furthermore, newer robots have more applications as they may be repurposed to meet the needs of the manufacturing and logistics industry. Unlike their predecessors, modern robots are typically lightweight and easier to relocate throughout a manufacturing plant or order fulfillment center. Now, consider what means for the future.

Amazon: The Leader of the Bleeding Edge of Robotics in Logistics Practice

At the ICRA 2015 conference, an international forum for robotics researchers, Amazon hosted the "Amazon Picking Challenge," where robots from 27 entrants from around the world tried to autonomously grab items from a shelf and place them in a tub. In other words, the robots had to recognize the different shapes, colors, and sizes of the items to be picked on their own. According to an article 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...Team RBO from the Technical University of Berlin absolutely dominated the competition. Out of 12 objects encountered, RBO's robot was able to successfully pick ten.

RBO won the competition with 148 points—along with \$20,000 in prize money—while its closest competitor, a team from MIT, received 88 points.





However, beyond the bleeding edge, Amazon is truly already practicing the effective use of robotics in logistics with the purchase of Kiva Systems, which was renamed to Amazon Robotics, just lat month. The purchase of Kive Systems, for \$775 Million allowed the online retailer to get ready for the rush of the holidays this past year, as stated in the Wall Street Journal:

The Seattle online retailer has outfitted several U.S. warehouses with squat, orange, wheeled robots that move stocked shelves to workers, instead of having employees seek items amid long aisles of merchandise, according to people familiar with the matter.

At a 1.2-million-square-foot warehouse in Tracy, Calif., about 60 miles east of San Francisco, Amazon this summer replaced four floors of fixed shelving with the robots, the people said.

Now, "pickers" at the facility stand in one place and wait for robots to bring four-foot-by-sixfoot shelving units to them, sparing them what amounted to as much as 20 miles a day of walking through the warehouse. Employees at some robot-equipped warehouses are expected to pick and scan at least 300 items an hour, compared with 100 under the old system, current and former workers said.

At the heart of the robot rollout is Amazon's relentless drive to compete with the immediacy of shopping at brick-and-mortar retailers by improving the efficiency of its logistics. If Amazon can shrink the time it takes to sort and pack goods at its roughly 80 U.S. warehouses, it can guarantee same-day or overnight delivery for more products to more customers.

The robots could also help Amazon save \$400 million to \$900 million a year in so-called fulfillment costs by reducing the number of times a product is "touched," said Janney Capital Markets analyst Shawn Milne. He estimated the robots may pare 20% to 40% from the average \$3.50-to-\$3.75 cost of sorting, picking and boxing an order.

Now that is some serious savings, and thus the reason more and more companies will look to implement robotics in logistics: bottom line savings and overall efficiency, which leads to a more competitive and adaptive company.





Future of Robotics in Logistics and Manufacturing

The future of robotics contains the same level of certainty as the sun's rising in the morning. Robots are becoming an integrated portion of the workforce, and they will be there every day thereafter, unless a company ditches robotics altogether. However, this is not likely as each robotic investment is representative of long-term expense reduction, improved efficiency, and an invaluable source of information. The future of robotics will change in the coming years, and more people will face the cycle of entering a higher-level position that robots "cannot possibly hope to take over."

Meanwhile, companies employing robotics are working to please their customers, and if you consider the typical cost of a Sawyer robot of \$25,000, you are looking at the minimum annual salary for a traditional worker. Think about how this single purchase could last for decades to come. Within 40 years, a single Sawyer robot could save a company \$1 million. Ignoring robotics in logistics and manufacturing is no longer an option for any entity.





How Have Robotics & Automation Changed the Manufacturing Employment Landscape?

Robotics & Automation in the Manufacturing Employment Landscape

According to the most recent employment statistics highlights from the U.S. Bureau of Labor Statistics (BLS), manufacturing employment has changed very little in recent months. The one-month diffusion index, which measures the dispersion of employment change in manufacturing, fell from 51.9 in April to 48.8 in May (a value below 50 indicates that more manufacturing industries are losing jobs than adding).

A variety of factors may help to explain the decrease in manufacturing jobs (stabilizing economy, increase in production of goods, aging population, etc.). But one of the biggest centers around technological innovations (automation, robotics, Internet of Things, etc.) increasingly being used to drive more efficient warehouse and assembly operations.

A recent Pew Research Center survey shows roughly half (48%) of industry experts think robotic advancements will displace a significant number of blue and white collar jobs by 2025, while the other 52% predict these innovations will result in new skills and industries.

As noted by Adam Robinson in a post on the reasons there are fewer manufacturing jobs today, this "tech-savvy change in manufacturing" has led to a Catch 22 of sorts:

"The workers needed in manufacturing must [now] have a highly-developed set of skills to work in such technological environments. As a result, a worker may need a degree or other form of training beyond simple manufacturing, such as engineering, computer-electronics, or robotics."

Let's take a closer look at what this technological shift in manufacturing means for employees, both now and in the future





Promote workplace efficiency & employee creativity

Let's face it: Humans will never be able to compete with the productivity and efficiency provided by machines. Robots offer something humans can't deliver: accuracy, incredible consistency and unlimited performance. They perform the exact same motions millions of times without variation, complaint, or error. What's more, they don't need sick days or take vacations.

While many fear technological advancements are automating jobs away, the opposite is true. Automating repetitive, mundane, or dangerous work frees up employees to pursue jobs that require imagination, adaptability, and decision-making skills. In that sense, robots ultimately drive efficiency – not replace workers.

On the other hand, increased automation demands a certain skill set and educational training for employees to be able to operate a connected, technologically advanced manufacturing facility. Jennifer McNelly, president of The Manufacturing Institute, argues that manufacturers need to do more to develop their talent pool. "They can no longer wait for an educated and training next generation of manufacturing talent," she says.

Drive Reshoring

Roughly 1.2 million industrial robots are expected to be deployed by the year 2025, according to Boston Consulting Group (BCG) research. While 10% of today's manufacturing functions are automated, BCG predicts this number will rise to 25% as robotic vision sensors and gripping systems improve.

But what does this mean for manufacturing employment?

As noted in an Apple Rubber blog on the impact of robotics in manufacturing, increasing the use of robots will help to create jobs as well as keep manufacturing work in the U.S. "We are spending hundreds of billions of dollars doing this kind of work in China," says Rodney Brooks, co-founder of Rethink Robots, in the article. "We want companies to spend that here, in a way that lets American workers be more productive."





Increase employee safety

Each year, manufacturers lose valuable manpower to slips, falls, and other accidents that cause employees to miss work and cost companies hundreds of thousands of dollars in workers' compensation claims. In fact, BLS data reports slightly more than 3.0 million nonfatal workplace injuries and illnesses occurred in 2013, resulting in an incidence rate of 3.3 cases per 100 equivalent full-time workers.

But, with robots and automated systems replacing workers in many positions, another significant benefit emerges: improved employee safety.

As noted in a World Economic Forum article on the top emerging technologies in 2015, "Robots are ideal for tasks that are too dangerous for humans to undertake, and can work 24 hours a day at a lower cost than human workers."

Interestingly enough, the article notes that new-generation robotic machines are likely to collaborate with humans rather than replace them. And, with a clear correlation between employee health and workplace engagement, the likely result of such a collaboration is more fulfilled employees who can focus on more challenging work instead of safety concerns around the warehouse.

Final Thoughts

With market research showing Millennial workers will comprise 75% of the manufacturing workforce by the year 2025, the overall impact of technological advancements on the manufacturing employment landscape remains to be seen.

But this much is clear: From automation and robotics to computer-controlled systems, the manufacturing environment looks much different today than it did in years past.





Yes, Robotics are Coming, But People Still Power Manufacturing

At the end of the day, what is a good economy or a strong manufacturing base without attracting the best and the brightest? And, we can only do that if we step up to the plate as companies and people with great training, great technology, and great leadership.

The term, "human capital," was coined back in the 1960s by Nobel Prize-winning economist Theodore W. Schultz and later popularized by American economist Gary Becker.

It is the understanding of, and commitment to, investing in human capital that sets world-class companies apart from their competitors. While there are several components to developing human capital such as talent acquisition, performance management, rewards and recognition, succession planning, and system/process system design, one critical area is workforce development.

Model companies are outperforming others in large part because they manage and train differently. A well-trained workforce is a competitive advantage, allowing companies to drive innovation, customer satisfaction, quality, productivity, and growth. The beneficial by-products are engaged and loyal employees, satisfied stakeholders, and a thriving economy.

With so much depending on business outcomes, it is surprising that 43 percent of manufacturers have no formal knowledge transfer process in place, and 40 percent have no regular training budget, according to SME research.





In Tooling U-SME's white paper, "People Power: Human Capital Drives Manufacturing Competitiveness," the company reveals critical information to help manufacturing executives and leaders make better strategic decisions and more effectively manage operations. The report explores the benefits of investing in people, demonstrates the importance of human capital for meeting business objectives, and outlines industry best practices in training and development.

Training Best Practices

Successful companies recognize the importance of recruiting the right people for the right job and providing the right training. Current manufacturing training and development best practices often integrate competency models, blended learning, and a data-driven approach.

Competencies: Some manufacturers increasingly are turning to competency models—a structured system to develop the needed knowledge, skills, and abilities for specific jobs—to build the high-performance teams they need to meet the demands of their current business environment as well as in the future.

A study by Bersin & Associates, "Key Findings—Becoming a High-Impact Learning Organization," indicated that high-impact learning organizations are better able to drive value from a well-designed, well-adopted, and sustainable use of job/role profiles and competency frameworks. The study found that effective use of profiles and competencies provides a common language to describe talent throughout the organization. This language allows productive conversations in areas such as skill gaps, performance management, talent acquisition, and leadership development.

In today's manufacturing environment, it's necessary to validate that knowledge has been transferred—not just that a class has been completed. Competency models such as Tooling U-SME's Competency Framework provide the rigor needed to meet ISO quality objectives, guidelines, and reporting requirements, as well as those outlined by certification organizations such as National Institute of Metalworking Skills (NIMS), Manufacturing Skills Standards Council (MSSC), SME, and American Welding Society.

Blended Learning: One way companies can improve their workforce development is through a blended training approach, combining theory and application. Giving employees the ability to access training through various delivery methods such as instructor-led sessions, online training, and Webinars, increases their opportunities for learning, and in combination, provides the consistency they need.





Each mode of training complements the others, and provides employees with multiple opportunities to learn and apply the material. For instance, employees who can access online courses to build their base of standardized knowledge will be more prepared to take advantage of their time with an instructor. Or as they move to on-the-job-training, they will be ready to apply classroom or online knowledge. A blended training approach also gives employers the flexibility of customizing the mix to maximize outcomes.

Data-Driven Approach: Technology is changing the way people learn. Employers and employees expect training today to be on demand, anywhere, anytime. This approach, often based around online training, is gaining momentum with both employee training facilities and educational institutions—high school through college/university level—which feeds the employee pipeline.

Technology empowers employees by providing access to tools, knowledge, and other resources to help build them into high performers. This allows employees to access knowledge when they need it, no matter where they are, and can even help accelerate skill development.

Through a robust Learning Management System (LMS), it's easier than ever to track an employee's progress from onboarding through career management, allowing employers to design custom training programs for individuals and identify high-potential team members.



Chapter Five LOGISTICS & SUPPLY CHAIN IMPACTS





How these 5 Emerging Technologies will Forever Change the Service Offerings of 3rd Party Logistics Providers

Technology has always been the driving force behind logistics and even more so after deregulation of the transportation industry as 3rd party logistics providers offered technology solutions to customers. In the past centuries, people looked for ways to move goods faster, in greater bulk and more economically. The problems were solved primarily by the invention of the railway, automobiles (including trucks), modern ships and airplanes. The invention of the computer, the Internet, and related technologies revolutionized the logistic industry with such technologies as web-based programs like transportation management systems. Now the industry is on the brink of another revolution.

Today's emerging technologies are more concerned with speed, accuracy, security and seamless delivery. These technologies include 3D printing, drone, the internet of things (IoT), driverless vehicle and augmented reality. Here is a brief discussion of how each of these technologies will change the way 3rd party logistics providers work in the future.





3D Printing will shorten the supply chain

The concept of 3D printing has been around since as far back as the 1980s. However, it was only recently that the technology turned into a reality and became available on a mass scale. This revolutionary technology makes it possible for anyone to create products or parts of products using metals, plastic, mixed materials and even human tissue.

So how is it going to affect logistics and supply chain management? Additive manufacturing will democratize the manufacturing process, according to Ed Morris, director of the National Additive Manufacturing Innovation Institute (NAMII). It will enable manufacturers to "print" on demand, which will shorten the supply chain by making it unnecessary to have large quantities of finished products stacked in warehouses.

The implication of 3D printing for the logistics industry has potential upside implications. 3rd party logistics providers of the future will deliver raw materials instead of many finished products and may even provide 3D printing services at the point of delivery, which will be an additional source of revenue.

The Internet of Things (IoT) will increase transit visibility

Visibility is one of the biggest problems for goods in transit. The application of the Internet of Things (IoT) along with cloud-based GPS will make it possible to keep track of individual items and their conditions. IoT makes use of Radio Frequency Identification (RFID) chips that "talk" to each other. Chips attached to individual items will transmit data such as identification, location, temperature, pressure, and humidity.

The implication of this capability will be immense. Goods will no longer be lost or misplaced in transit since each product will transmit its location. With immediate notification comes direct action and the avoidance of damaged goods when the chip signals oncoming adverse weather conditions, such as high temperature or humidity. Not only that, they will also be able to transmit traffic conditions and drive-specific data, such as average speed and driving patterns back to the central office. As supply chain and transportation visibility is a hot topic for Logistics Managers and Directors, 3rd party logistics providers, who adopt this type of technology, are surely to reap the rewards of highly satisfied customers.





Drones will increase the speed of delivery

A drone is an unmanned aircraft that can either be controlled remotely or left to fly autonomously through software-controlled flight plans embedded in their system. Drones are small, light, inexpensive to operate and can go where other modes of transportation cannot. Although 3rd party logistics providers haven't started using the technology yet, there is little doubt that they will embrace it in the future.

In the future, 3PL companies will use drones to deliver small packages quickly in both urban and remote areas. Because of their high speed and precision, the use will shorten the supply chain and significantly reduce the costs of transportation. The only things, which are preventing the widespread use of this technology are issues related to government regulations, safety, size and weight limitations.

Driverless vehicles will cut the costs of transportation

Although still in the trial phase, driverless vehicles have shown great potential as tools for logistics and supply chain management. The ability of driverless vehicles to sense the environment and navigate with zero human interventions makes these futuristic cars/trucks ideal for delivering products to customers. A big part of transportation costs is the driver's salary. 3rd party logistics providers may substantially reduce their overhead by using driverless vehicles for delivery. Furthermore, such hot topics in the trucking industry as the trucker shortage and the long withstanding capacity crunch may cease to exist with the availability of driverless, autonomous trucks.

Another advantage of using driverless vehicles is that they are better drivers than people are, and thus the risk of accidents will be almost zero. They will not get drunk, race with other cars, take risks, become angry, lose concentration, doze off, talk on the phone, or send messages while at the wheel.

Augmented Reality will increase Improve the handling of goods and speed of delivery

Augmented reality (AR) provides a direct or indirect view of the real world augmented by computer-generated sensory inputs, including sound and video. AR gives you an enhanced view of the world around you in real time and makes you more aware of your environment. In the future, employees at 3rd party logistics providers will use AR technology, such as wearable devices, to gain critical information about the freight they are handling, such as contents, weight, and destination. Understandably, such visibility through AR technology will improve the handling of goods, increase the speed of delivery, and reduce overall costs.





Technology's Ever-increasing Role in Supply Chain Functions

For decades, the realm of transportation management, warehouse management, and order fulfillment remained set in near-prehistoric hands of isolated silos, inefficient processes, and limited accessibility. However, technology has risen to dramatically alter the execution of supply chain functions. Technology poses the greatest opportunity for small- and medium-sized businesses to take advantage of innovative tools to ensure end-to-end tracking, visibility, and processing of products.

In a Logistics Viewpoint survey, 50 percent of businesses reported sharing inventory across all channels or engaging in omni-channel practices. Additionally, the overwhelming majority, 98 percent, of businesses reported sharing inventory between online and retail locations. However, this sharing of information would have not been possible without the use of technology across the supply chain. Let's take a look at what is driving the role of ever-increasing technology in supply chain functions and how the supply chain is adapting to meet these demands.





What's Causing the Shift Towards Greater Use of Technology in Supply Chain Functions?

Many different factors play into why the supply chain needs an increased degree of technology in use. However, the direct causes are ultimately consumers and capacity issues. Before you can understand what this means, you must consider how supply chains do not necessarily need new technology. Conversely, they need a new type of technology; they need a combination of their existing management platforms.

Consumers Demand More Now.

Prior to the rise of the Internet, consumers had no option for obtaining products beyond retail stores and catalogs. Supply chain entities were focused on providing the right product at the right place at the right time. Today, supply chain entities need to have any product available at any place at any time. This seems impossible, yet more supply chain entities have learned to leverage consumer demand against supply chain efficiency. If latency, delays, and other problems occur in supply chain functions, it may lead to customer dissatisfaction, which in turn, results in lost profits for the supply chain. Now, let's think about the other chief cause of this switch.

Capacity Versus Capability Versus Demand.

In previous posts, we have discussed the driver shortage at length. We have analyzed its causes, possible solutions, and disadvantages in today's supply chain. However, some industry experts believe the driver shortage may not be all it's made out to be. Yet, shippers and supply chain entities continue to cry for more drivers and larger fleets.

Abtin Hamidi, according to JOC Magazine, believes the driver crunch is simply a masquerade for hidden shipping spaces. Think about the facts of the driver crunch. There are plenty of drivers hauling less-than-truckload loads in large, truckload trailers. You must also consider how dwell time, lag time, and driver delays are giving off a sense of impending doom and inability to cope. How much deadhead is being created by drivers moving empty-hauls from location A to location B? Ultimately, the fact remains: inefficiencies still exist in today's supply chain functions. However, technology's growing role will change the playing field.





What Did Technology Do to Supply Chain Processes and Management Systems?

Without thinking about the supply chain, how has data storage changed for the average household? The Cloud. Without thinking about shipping, how has technology changed the lives of every person on a communicative scale? Smartphones. Now, think about what these two advancements mean for supply chain functions and processes.

This Decade's Management Forecast: Cloudy

Introduced by Apple, the cloud quickly grew to become one of the most common aspects of data storage and retrieval. Many businesses did not realize cloud-computing technologies had already existed prior to the launch of the iPhone. However, cloud-computing capabilities is not limited to data storage and retrieval. It means smaller businesses can take advantage of software previously limited to the most financially powerful and successful businesses, which includes all levels of supply chain functions.

Cloud-based technologies allow multiple management systems, such as warehouse management, transportation management, and enterprise resource planning systems (ERPs), to communicate and share data. Furthermore, this means the costs of gaining the ability to share data is significantly less than using an integrated, on-site-exclusively sharing system. In a sense, sharing data gives everyone in the supply chain the ability to look into their functions and determine what needs to change. For example, e-commerce applications may be used to generate automated order picking, fulfillment, and shipping. Although communication between systems is a definitive marker of how technology is changing the supply chain landscape, it needs an additional data capture, and smartphones are the answer.

Smartphones Impact Real-Time Data Capture.

Regardless of demographic identity and location, smartphones have become one of the basic aspects of life in modernity. Every smartphone has at least five different apps. An app controls the phone's calling and texting capabilities. Another app accesses the internet. An app takes pictures, and another app works with email capacities. The last common app shows users exact GPS coordinates of the phone. Obviously, some smartphones have many more apps, but the last of the five is has the greatest impact on the supply chain functions.

Supply chain entities have grown to understand drivers will always carry their smartphones. Smartphones are a necessity for staying in communication and staying safe. With this in mind, some supply chain management firms, especially third-party logistics providers (3PLs), have found creating a TMS-, WMS-, and ERP-integrated, native app for the company can help cut costs.





When a driver arrives at a distribution center (DC), the app can provide direction for which loading to find, how long the loading will take, and provide digital paperwork to handoff at the destination. Now, this same concept can be applied to tracking a driver's movements and activities. For example, unloading freight at locations A and B may leave the truck with empty space. The app could let drivers know to pick up a nearby load for return to the DC or to drop off at another destination. Similarly, the app could notify DC staff of an approaching, delayed, or other problematic truck, and DC staff can change schedules, loading requirements, or other plans to meet the truck upon arrival.

The app may also be used to track mandated requirements for drivers, such as vehicle inspections, meal breaks, and consecutive minutes spent driving. The app helps to ensure drivers maintain an efficient schedule without spending extra time logging information manually.

The role of technology across supply chain functions cannot be understated. The supply chain has the tools to expand current technologies to smaller, disadvantaged companies; however, this expansion is the ultimate cost of living in a digitally-charged age. Technology will always have a place in the supply chain, especially as cloud-based computing, e-commerce, smartphones, and improved efficiency analytics continue to thrive.





4 Uses of Supply Chain Technology Applications Moving Shippers into the Future of Effective Management

In today's highly competitive marketplace, it's imperative for businesses to innovate new ways to streamline their supply chain and optimize productivity. With the aid of modern supply chain technology applications, you can create better visibility within your supply chain, which will enable you to have more control over your business and stay ahead of the competition. Technology can help to simplify your supply chain management, which will enable your business to operate more efficiently, give you more visibility and control over your inventory, and help to reduce your operational costs. Additionally, through a more stable and efficient supply chain, you can greatly enhance customer satisfaction and retention. Here are just a few ways to integrate modern supply chain technology applications into your business model and improve your supply chain management.





1. Computerized Shipping and Tracking

With the aid of modern technologies and web-based software, like a transportation management system (TMS), you can simplify the supply process and dramatically reduce shipping errors. Utilizing systems like TMS, ERP, and even CRM enables savvy business owners to consolidate all aspects of their supply chain in one place. The software will allow you to digitally organize inventory data, monitor and manage shipping, and tracking information, and create electronic bills of lading or invoices with ease. Through the use of supply chain management technologies, you can greatly reduce the time spent shipping, receiving, tracking, and compiling order data, which will save your company both time and money.

Not only will the use of widely available supply chain technology applications improve the operational efficiency of your supply chain, it will also greatly enhance the customer experience by providing consumers with the ability to continuously track the status of their orders. Through digitalized tracking, you can significantly reduce shipping errors and more rapidly respond to the errors that do occur. In this day and age, having technology is essential to running a thriving corporation that is both business and consumer-friendly.

2. Radio Frequency Identification (RFID)

Radio Frequency Identification (RFID) is a vital piece of technology that can provide innumerable benefits to the business owner. RFID chips are placed on every product and provide a way for business owners to easily track their inventory. Due to the increased visibility RFID chips provide, they will substantially improve your supply chain efficiency by detecting any order anomalies as they occur, enabling employees to immediately correct mistakes. In addition, it allows for easier and more consistent tracking, enabling business owners to have maximum control and visibility over their products at all times. Since RFID chips provide computerized product management, they can eliminate the potential for errors, simplify the supply chain, and reduce operating costs.

Radio frequency identification (RFID) has become one of the megatrends in logistics. It is surprising then that despite the hundreds of millions of RFID tags sold this year alone that, according to results from the 2014 GS1 US Standards Usage Survey, finally saw the technology living up to the hype in the logistics industry in the last few years.

Here are only a few ways that RFID technology has changed, and is continuing to change the not only the way we think about logistics, but also how interact with the world around us. Check out the infographic below for all the facts! Source: Morai Logistics





3. Use Social Media to Streamline Supply Chain

Social media is a popular technology that has swept the world. With over 288 million Twitter users and 1.23 billion Facebook users, it's no wonder many businesses are turning to social media to gain visibility for their company. In fact, over 70 percent of all Fortune 500 companies rely on social media as part of their marketing strategy and supply chain management. Through the use of social media, you can create more open communication with customers, increase the visibility of your company, improve the demand on your products, utilize cost-effective and time-efficient marketing strategies, lower your operational costs, and enhance your company's overall productivity. Social media can be used to interact with customers, respond to questions, report accidents or weather conditions that may impede delivery schedules, and create automated updates about your inventory.

4. Big Data Will Envelope and Empower all Other Supply Chain Technology Applications

The scale, scope and depth of data supply chain technology applications are generating today is accelerating, providing ample data sets to drive contextual intelligence. The following graphic provides an overview of 52 different sources of big data that are generated in supply chains Plotting the data sources by variety, volume and velocity by the relative level of structured/unstructured data, it's clear that the majority of supply chain data is generated outside an enterprise. Forward-thinking manufacturers are looking at big data as a catalyst for greater collaboration.







Big Data also allows more complex supplier networks that focus on knowledge sharing and collaboration as the value-add over just completing transactions. Big data is revolutionizing how supplier networks form, grow, proliferate into new markets and mature over time. Transactions aren't the only goal, creating knowledge-sharing networks is, based on the insights gained from big data analytics. The following graphic from Business Ecosystems Come Of Age (Deloitte University Press) (free, no opt-in) illustrates the progression of supply chains from networks or webs, where knowledge sharing becomes a priority.



Value is based on the production of goods and services

Source: Deloitte analysis.

complex, dynamic, and connected value webs



Value is based on knowledge exchange that drives proactive production of goods and services

Graphic: Deloitte University Press | DUPress.com





Simplify Your Supply Chain with Supply Chain Technology Applications

The more links there are in your supply chain, the more convoluted and complex that chain becomes. By simplifying the supply chain and disposing of unnecessary links, you can improve efficiency and reduce expenditures. Work directly with the manufacturers whenever possible, rather than purchasing through an intermediary source. By working directly with the manufacturers, you can greatly reduce expenses and create a simpler and more efficient supply chain. Reducing the links in your supply chain will also enable you to lower the risks associated with shipping and receiving. Given shipping and other functions of the supply chain are contingent on such factors as weather, international border security, economic collapse, and natural disasters, simplifying how you accurately combine supply chain technology applications with data as much as possible in your analysis of suppliers to include vendors, shipping partners, and more, will improve the reliability and efficiency of your supply chain and leave your business less vulnerable to unforeseen disaster.

In order to improve as a business, it's essential to continually adapt to emerging supply chain technology applications in order to stay ahead of the competition. By integrating modern technologies into your business plan, you can greatly enhance your productivity as a company while cutting costs and improving customer satisfaction and client retention. Customers will likely be turned off of a business that routinely has shipping delays, shipping errors, or products that are out of stock. Enhancing your supply chain can minimize risk and improve your reputability in the eyes of the public.





What does the Future of Transportation Management Systems Look Like? A Look To 2018 and Beyond

Behold, The Future of Transport Management Systems

Transport management systems, also known as TMS, have come a long way since the 1980s when rudimentary applications with basic features were introduced. Until recently, the main aim of TMS was to help shippers increase efficiency and cut transportation costs by allowing them to choose modes and manage transportation orders. While this is still true today, the latest TMS applications aim to offer comprehensive solutions to deal with the complexities of global shipping business as well as third party logistics.

Still, the use of transport management systems is largely confined to big shipping and 3PL companies due to high implementation and maintenance costs, which have deterred most small to mid level shippers. According to a report published by Inbound Logistics, only about 35% of shippers are currently using TMS and most of them are large companies. This means that most small companies are missing out on the benefits of TMS applications.





But the picture is changing rapidly. Developers are increasingly targeting small to mid level shippers who form the bulk of the shippers worldwide. TMS applications are not only becoming more affordable; they are also incorporating features to provide comprehensive shipping solutions rather than just the management of transportation. As a result, a growing number of shipping companies of all sizes as well as 3PL companies are embracing them in unprecedented numbers.

Transport management systems are continuously evolving to meet the ever-increasing expectations and demands of tech-savvy users. Each new generation of TMS products is coming with enhanced mobility, improved usability, new forms of optimization, and better analytics. They are no longer focused only on freight savings measures; the latest systems are designed to improve delivery capabilities, increase warehouse efficiencies, reduce inventory, and improve cash flow.

A study carried out by ARC Advisory Group has found that the demand for TMS applications has been growing steadily over the years. The growth is likely to continue until 2018 and well into the mid-2020s when the market is expected to reach saturation. While tier 1 companies are expected to continue to drive the growth, small to mid level companies can be expected to grab a bigger share of the market in the future owing to their sheer number.

Here is a look at what the future holds for TMS in 2018 and beyond

Cloud-based Transport Management Systems: The main reason small and mid-level shippers have been slow to embrace TMS is the high cost of implementation and maintenances, as mentioned above. Developers are moving toward cloud-based systems, which are cheaper to implement and maintain. With cloud-based TMS, shipping companies no longer need to have expensive servers and a team of dedicated staff. Also, by its very nature, a cloud-based system can be accessed from anywhere, which makes it easier for shippers to get real-time information to make on-the-spot decisions.

Becoming one with the other office systems: Just like word processor, spreadsheet and presentation started out as separate applications and merged to become one single office system, today's TMS applications are evolving to become one with the office system. When that becomes a reality, users will no longer have to worry about costly integration. Also, the next generation transport management systems will be built on the Enterprise Service-Oriented Architecture (Enterprise SOA) technologies, which will allow resources to be shared (and split, when needed) more efficiently.





Full integration with cutting-edge technology: Technology has always been the driving force behind the evolution of TMS and logistics. The latest transport management systems are incorporating cutting-edge technologies like mobile phones, GPS satellites, 3D printers, big data and artificial intelligence (AI) to enable transportation management in ways that were like science fiction only a decade or so ago. By 2018, most TMS applications will come with advanced route, freight and network optimization features using all these powerful technologies. Use of 'meta intelligence' to leverage TMS visibility: Developers are already experimenting with 'meta intelligence' to leverage TMS visibility and big data in the decision-making process. The aim is to integrate TMS with marketing, sales, distribution and customer service based on the business intelligence obtained from the transportation network. In the future, it will be possible for shippers to know the environmental and financial costs of every load in every lane, anticipate and adjust for capacity constraints, and achieve maximum utilization of their facilities by managing inbound and scheduling appointments.

In view of all the developments that are going on, the future of TMS looks very promising. In fact, many experts firmly believe that the future of shipping and 3PL lies in TMS. As such, shippers and 3PL companies that adopt TMS early will get a clear advantage over those that don't. Therefore, they should adopt TMS as soon as they can.

If you'd like a demo of the Cerasis TMS, we call the Cerasis Rater, <u>simply fill out a request on</u> <u>our website here</u>.



CONCLUSION





We hope you enjoyed this educational e-Book on the changes we expect to see due to the use of emerging technologies and the applications within the manufacturing, supply chain, logistics, and transportation industries.

Cerasis, a transportation management company founded in 1997, has always believed in the use of technology to improve process to not only reduce cost but to stay strategic, competitive, and have the ability to use data from technology to continually improve. In fact, one of our core values is just that: continuous improvement of our people process and technology.

We built our Cerasis Rater TMS in 1998, launching it as web-based before Google was even a business. Our (now Army, as our Development Manager, Jerel Byrd calls them) development team are always continually improving the Cerasis TMS, as we know it is vital to have a system that is not only innovative, but sound, secure, and enables those in transportation to do their job all while doing it cost effectively.

Are you using a TMS to help manage your transportation department as a shipper? What are you seeing in the space?

In addition to our transportation management system (TMS), the Cerasis Rater, when you are a Cerasis shipper, you gain access to the following managed services:

- Transportation Accounting to include: Invoice auditing, one weekly invoice no matter how many shipments, and freight payment services
- Comprehensive end to end freight claims management: if your freight is damaged or lost, we will handle the freight claim on your behalf
- Carrier Relations: We will negotiate rates on your behalf and you get better rates thanks to our buying power
- Inbound Freight Management
- Reverse Logistics
- Robust Analytics and Reports

Want to learn more? Visit http://cerasis.com





Get a Demo of our TMS or Inquire About Our Services

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