



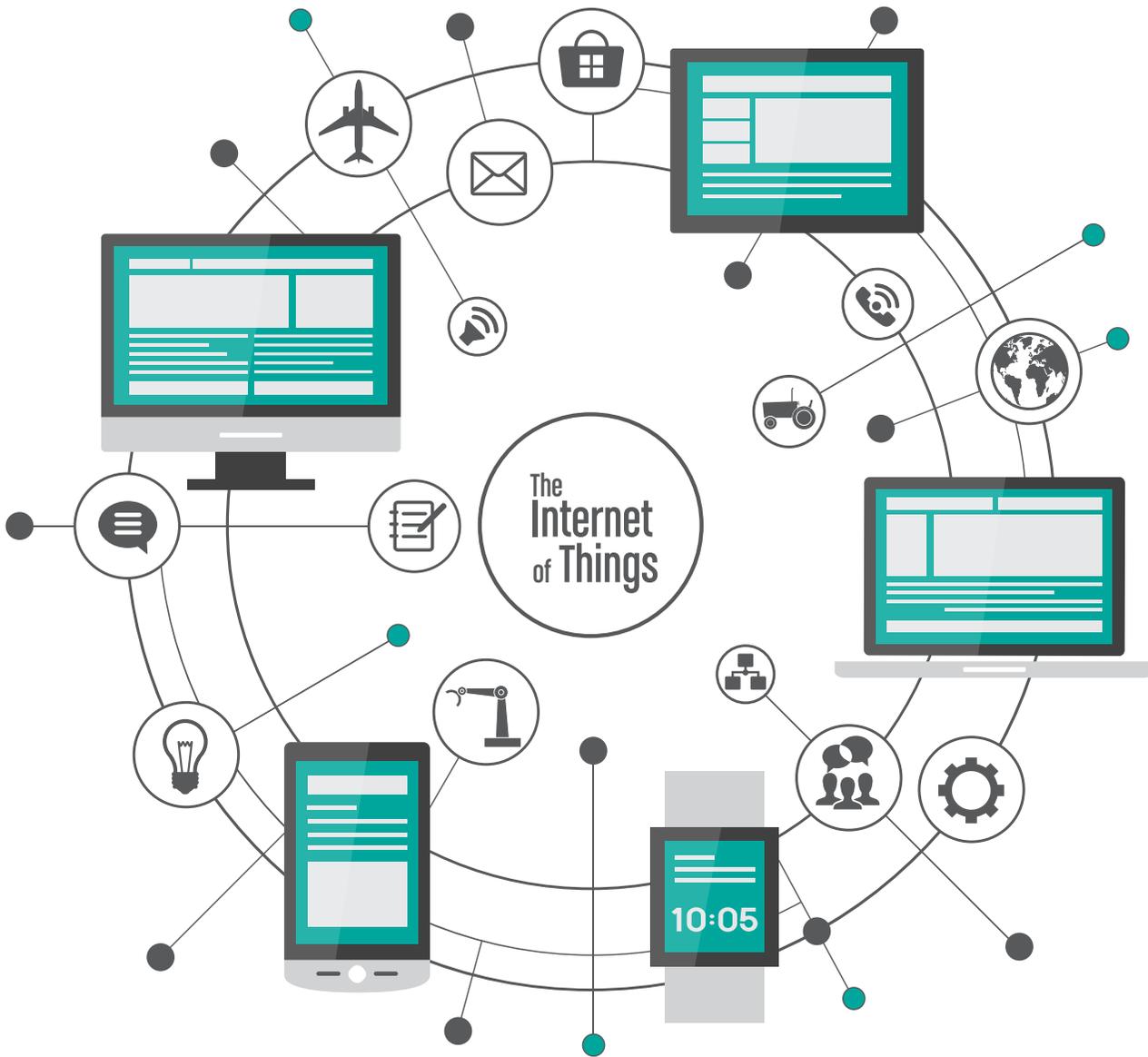
Digital Humanists vs Machinists

TECH TRENDS

WEARABLES AND ARTIFICIAL INTELLIGENCE

The Internet of Things

Cold Chain Execution &
Consumer Packaged Goods



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From DSI®

Rise of the Machines: How the Industrial Internet of Things Is Driving the Next Wave of Supply Chain Transformation



The intersection of people, machines and processes has been at the core of supply chain execution from the beginning. Whether it's goods being manufactured, materials and finished goods being stored and transported, or products being serviced, the three are inextricably linked. What has changed—and is rapidly changing as we speak—is how they are linked. And what is enabled as a result.

The first wave of supply chain automation focused on collecting data in a more efficient, less error-prone way, through the likes of bar codes and RFID tags. The result was improved efficiency and accuracy. The second wave centers on the power of mobility—ensuring that individuals have the real-time information that they need, when and where they need it. The result is radically enhanced visibility and control throughout the extended supply chain. The third wave—on which we are all now embarking—builds upon the previous two by sensing the physical world and applying analytics to determine how to adapt execution in the face of risks and opportunities. And the impact on supply chain execution will be profound.

In this issue, we explore this third wave of supply chain transformation as enabled by machine-to-machine communication (M2M) and the emerging Industrial Internet of Things (IIoT). We'll show you how the broad scale use of sensors and smart machines is transforming supply chain execution and optimization in a number of industries, including Agribusiness and CPG. And, you'll see an in-depth example of how a leading breakfast cereal brand is employing machine communication to create an automated, robotic warehouse. We'll discuss some of the nuts and bolts of IoT technologies, as well as the role and impact of wearables and advanced analytics. And we'll have a look at the evolving human-machine relationship, as machines and systems continue to become more intelligent.

We'd love to hear your thoughts on entering this next wave, and to discuss ideas for how applying sensors, smart machines and analytics can help optimize your supply chain execution. Reach out to us anytime at info@dsiglobal.com.

Gordon Van Huizen
Chief Technology Officer

EXPLORING THE DIFFERENCE

BETWEEN

Machine to Machine & The Internet of Things

Amid all the buzz around the Internet of Things (IoT), there can be a lot of confusion about how the vision of IoT relates to the more established and proven concept of machine-to-machine (M2M) communication. Given that M2M is all about connecting devices, it's easy to think the distinction is all hype—or, conversely, that the grand vision for IoT is simply too “blue sky.” Either way, those steeped in M2M implementation may conclude that IoT is the latest “emperor’s new clothes” of the technology world. The reality is that while the aspirations for IoT are sweeping, there are identifiable advancements inherent in IoT that already provide tangible value. And, fortunately, businesses already leveraging M2M are well positioned to benefit from IoT’s additional capabilities.

In a DSI Labs post, we quoted Jacob Morgan writing for *Forbes* with the definition of IoT simply as “...the concept of connecting any device with an on and off switch to the

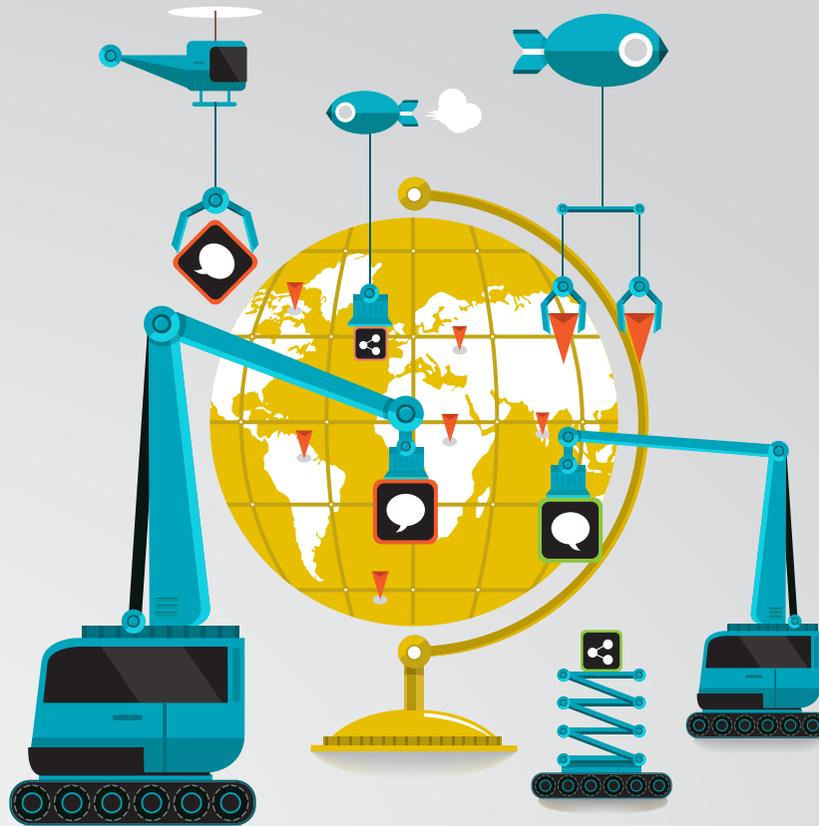
Internet (and/or to each other).” M2M, on the surface, would appear to be a fundamentally required capability—and it is. But a world of connected sensors and smart machines requires a lot more. Most M2M deployments involve either a small, fixed number of devices or a small number of device types. Device communication is often performed over proprietary hardware and software through custom integration efforts. And M2M applications are often purpose-built, with a great deal of awareness of the devices they leverage baked into the application code itself. The vision for IoT is much broader and interconnected,

striving toward a future where large numbers of heterogeneous devices communicate in a much more dynamic—and potentially intelligent—way. Making this vision a reality requires a different way of thinking about the problem and a different architecture to support it.

M2M Integration: Purpose-Built for Success

For decades, though, M2M integrations have automated processes in many industries. Perhaps more than those in any other segment, manufacturing and distribution companies have long used M2M to automate and





optimize processes—connecting machines to streamline production on the shop floor, to monitor and control warehouse operations and to automatically sense when fuel must be replenished, among other uses. In these scenarios, M2M connections facilitate communication between a small number of devices (e.g., weight scales or conveyor systems) and are purpose-built to automate specific tasks or processes.

DSI's extensive background in M2M implementation includes a vast array of integrations to optimize business processes on the shop floor, in the warehouse and in the field. Our latest M2M case study, detailed on page 5, provides a manufacturing and distribution example in which a major food manufacturer deployed DSI's platform to integrate multiple enterprise software systems. The company also enabled machine connectivity among several disparate pieces of equipment to eliminate user intervention for a truly automated process and uninterrupted flow of materials.

The Best of Both Worlds: IoT and M2M

Industrial IoT builds upon this foundation. Supporting a large, potentially dynamic number of individual devices—thermal sensors and GPS devices mounted on truck fleets, for example—requires device management: the ability to add and remove devices in the field and associate them with supply chain data. Connectivity across an increasing array of device types requires standards-based protocols. And developing software solutions that can be leveraged across multiple IoT implementations requires a more horizontal, generalized software platform, one that implements the core requirements and design patterns of Industrial IoT, while supporting new types of devices and new use cases.

These additional IoT capabilities provide significant, tangible value within the supply chain. For a large brand like the one mentioned in our earlier example, IoT might connect not only the machines and software

in the warehouse, but also other sensors and devices upstream and downstream in the supply chain. In an IoT-enabled supply chain, users would have a 360-degree view of the value network, with data collected from a broad network of connected sensors and machines presented as actionable information in real time. For instance, in the manufacturing plant or in the field, connected machines can relay information to enable predictive asset management and service delivery. Downstream in the supply chain, advancements in IoT could provide in-transit visibility into the precise location of deliveries as well as monitor and ensure their temperature stability.

While M2M integrations demonstrate proven benefits, the broader functionality of IoT promises greater flexibility and capability in an increasingly competitive market. Continue to explore DSI Labs at www.dsiglobal.com/labs to see other DSI M2M implementations in action, and for more updates on IoT.

Harvesting the Benefits of IoT in Agribusiness

As the global population grows and international supply chains increase in complexity, the agribusiness industry faces some critical challenges—namely, to achieve accuracy and efficiency and maximize yield in an industry subject to unpredictable forces. However, the adoption of Internet of Things (IoT) and machine-to-machine (M2M) technologies in agribusiness provides the potential to improve the quality and quantity of crops while adding visibility and efficiency to the entire process.

As it does with other industries, IoT opens the door to innovation through the real-time availability of meaningful data. In agribusiness, IoT-connected sensors expand the applications for practices like precision agriculture, a farming approach that leverages technologies like sensors, aerial imagery, GPS-guided equipment and electromagnetic soil mapping to perform site-specific management based on data about soil, pests, yield and more. Precision agriculture bolstered by the IoT has a wide array of applications including regulating the amount of water and nutrients (like nitrogen) and the times at which they're used based on information captured by sensors.

With soil monitoring systems in the fields, farmers can better predict yield. The accessibility of this information, combined with the farmer's first-hand experience, can lead to better decision-making and a more efficient use of resources—with the overall benefit of better margins with less risk. Some companies are even promoting drone technology as a means of showing farmers an aerial view of their crop to allow them to apply targeted treatments to problem areas. The overall goal is the same: to use the right amount of resources at the optimal time to improve yields and reduce waste.

While increasing production is an ever-present goal in agribusiness, it's also an asset-intensive industry, and maintaining equipment from irrigation systems to tractors is crucial. In the IoT, farm workers receive real-time notifications from farm machinery equipped with wireless sensors as issues arise. The ability to perform preventative maintenance and repair issues immediately could lead to tremendous cost savings in decreasing down time and protecting valuable assets.

Of course wireless technology doesn't just connect sensors in the soil or mounted on farm machinery; it also connects people working in the fields through mobile solutions. A wine maker in Australia, for example, chose DSI to enable their team to record crop information from between the vines with a mobile app that lets them input data into the system of record whether connected or, as is more likely the case in an agribusiness environment, disconnected.

The level of information made available through the IoT and mobility not only optimizes real-time decision making and high-tech agricultural practices—it also enables supply chain visibility from farm to fork. Innovation in agribusiness isn't just about yield; it's about food traceability for the health and safety of consumers. In the IoT, people from farmers to distributors to families at the dining table will have confidence in the origin, safety and nutrition in their product as a result of a complete pathway of information that tracks a product's lifecycle back to the point of origin.



MAJOR FOODS MANUFACTURER AUTOMATES SUPPLY CHAIN WITH M2M INTEGRATION

Enterprises have been automating processes through machine-to-machine (M2M) integrations for decades. It's not uncommon for a large enterprise to employ several software systems to manage the complex processes up and down the supply chain. That's where M2M integrations come in: to open the lines of communication between devices, machines and software systems for business process optimization.

A leading manufacturer of breakfast cereal brands with multiple manufacturing plants and thousands of employees implemented high-tech solutions to move products efficiently from the shop floor to retailers worldwide. Among those solutions is the automated material handling system that includes unitizers, automated guided vehicles and a seven-level, high-density racking system with a 20,000-pallet capacity. The problem? Without M2M integration, the automated flow of materials through these systems was interrupted by manual data entry.

For a truly automated process, this manufacturing giant needed a digital platform to integrate disparate software systems throughout the supply chain, enabling real-time data capture, communication and visibility. The company chose DSI to implement M2M-enabled processes to eliminate user intervention. Through a DSI app that runs on vehicle-mounted devices as well as handheld wireless units, DSI's platform sends information, including inventory inquiries and transfers,



directly to the back-end system to increase inventory visibility and allow for traceability of finished goods.

How is it done? The company implemented DSI applications leveraging M2M integration to communicate inbound and outbound messages to the high-density racking system to enable complete automation. With simple barcode scans, product is tracked from the unitizer, to the automated guided vehicles, to induction points in the high-density racking system, and onto the staging lanes to be picked up by forklifts—with multiple ERP systems simultaneously updated with real-time transactions along the way.

With DSI's platform facilitating communication between software systems through M2M integration, the

company is able to remove manual data entry from its manufacturing processes, thereby reducing associated delays and errors. DSI's M2M integration helps make possible an automated, robotic warehouse through real-time, seamless data integration between back-end systems and an interface between the ERP and high-density pallet storage and retrieval system software.

This project's success serves as just one example of how M2M integration can empower the enterprise with efficiency and process automation across the supply chain. Stay up-to-date with DSI Labs to learn how other companies are using M2M integration today at www.dsiglobal.com/labs.

TECH TRENDS

How Wearables and Artificial Intelligence Are Impacting the Supply Chain



One of the common barriers to new technology is making the business case for the implementation. When those technologies are still emerging, it can be even more difficult. Technology like wearables and artificial intelligence aren't necessarily new, but many of the current applications are, especially in the Industrial Internet of Things era. And although these concepts seem overwhelmingly consumer-focused—or, in the case of artificial intelligence, too experimental—the fact is that both types of technology are poised to have a big impact on the enterprise, especially in supply chain management and execution.

Wearables: Operational Efficiency in a Portable Package

When it comes to wearables, the immediate associations are with consumer-focused health-monitoring devices—fitness bands and trackers, for

example. Yet in the enterprise, wearable devices can enable a hands-free, multimodal user experience that enables functionality through several interfaces, including visual, voice and haptic. As a result, employees can work smarter, faster and safer with technology that's tailored to their tasks and environment.

Recent Forrester research supports increasing enterprise interest in wearables.

“Forrester says that 68% of technology and business decision-makers characterize wearable devices as a priority, with 51% describing their interest as moderate, high, or critical, compared to 2010, when 43% of businesses described their mobile device concerns as high or critical,” writes Thomas Claburn for InformationWeek. At DSI's Kansas City headquarters, members of our development team

have been exploring an implementation that combines smart glasses with our digital platform, creating a powerful hands-free technology solution that offers a number of use cases in warehouses, manufacturing facilities and distribution centers.

Consider a common process like inventory management in an application that's been specifically designed for the smart glasses form factor. A warehouse worker could use a variety of voice commands to input, locate and collect a particular inventory item without needing to manually control a mobile device or handle cumbersome paper lists and logs.

Wearable technology does come with its share of barriers to implementation (battery life and a relatively immature developer ecosystem, for example), but

it also offers compelling device-specific benefits. Thanks to the variety of user interfaces in wearable technology, a multimodal experience is more easily enabled, which could be especially useful in an industrial environment. On a construction site or on the manufacturing shop floor, high noise levels might drown out task-specific audio notifications. Yet by adding in visual or haptic cues like a flashing light or vibration, workers have devices that are specifically tailored to their environments without sacrificing device functionality or worker efficiency, which speaks to the overall appeal of wearables in the enterprise and throughout the supply chain.

The key to a successful wearables implementation is to not only identify the business processes that you want to improve with wearables, but also consider a solid UX foundation so that employee performance is enhanced—rather than hindered—by the device. Wearables may not be appropriate for every industrial use case, but they're certainly worth exploring—and testing—to see what sort of operational efficiencies you could enable as a result.

Artificial Intelligence: Using Machines to Do What We Can't

Artificial intelligence has been in use for decades, but thanks to new technology and connection capabilities, individuals and companies alike are reconsidering potential AI applications.

The government is one such organization—or, more specifically, Defense Advanced Research Projects Agency (DARPA)—which is so focused on AI that Dan Kaufman, director of DARPA's Information Innovation Office, calls that particular area DARPA's "next big push. Why do we need a computer to act like a human? Instead, it's about partnering with a computer to do things I can't do on my own."

As we enter what many are calling "the second machine age," AI is increasingly viewed as a way to refine machines, introducing and enabling sophisticated capabilities that could bring automatic control to machines like robots and cars.

Yet AI also introduces an element of pragmatism that can refine and optimize business operations. Consider two early examples of real-world AI—Big Data analytics and machine-to-machine communication—both of which are computer-based capabilities that provide answers and information that humans might not otherwise know. As a result, you can create an intelligent system that senses the real world and knows what humans can't, thereby filling a critical knowledge gap that can help companies be more secure, reliable and efficient in their operations. Augmenting M2M integration with real-time analytics creates a cognitive computing system in which machines can detect—or even predict—potential failures, production and distribution issues, or exception conditions in real time, something humans couldn't otherwise do (or at least not that quickly or thoroughly). M2M integration is already used to sense and control physical processes, but adding intelligence—even the artificial kind—is the key to truly unlocking the potential of automation. That intelligence enables a better understanding of how we do business and informs strategic improvements. The insight also boosts the efficiency and integrity of the supply chain—and the products produced within it.

The current technology ecosystem is a rapidly shifting target. The key is to identify the business processes that can be optimized for your advantage by being augmented or automated, then look for the technology that

will best fit that specific use case. It is also important to consider future implementations so that the company isn't funneling excessive resources into a mixed bag of one-off solutions, but that you are creating an expanding technology ecosystem that is building upon the prior step and creating increasing value. To stay up-to-date on new technology use cases and innovation, especially as they relate to supply chain management, visit and subscribe to DSI Labs at www.dsiglobal.com/labs.

“Why do we need a computer to act like a human? Instead, it's about partnering with a computer to do things I can't do on my own.”

-Dan Kaufman



Why the Internet of Things Is a GAME CHANGER for COLD CHAIN EXECUTION





In the cold chain, information is more than power—it's the very lifeblood of the carefully controlled processes designed to keep the cold chain intact. When you're working with products that must be kept in a certain temperature range, even the slightest change can spell disaster not just for that particular product, but also for the companies manufacturing and shipping it. And when it comes to gathering the information that verifies the documented quality of delivery, there's no tool more powerful than the Internet of Things.

IoT and the Cold Chain in Action

The Internet of Things (IoT) has already sparked widespread disruption in a number of industries, introducing pervasive connectivity that drastically improves real-time data collection while

As a result, cold chain companies have the technological tools that give them an instant, 360-degree view not only of a product, but also that product's integrity and safety, which protects customer confidence in the product and the overall brand.

enabling visibility into the supply chain processes that are critical to business operations, including manufacturing, distribution, field sales and field service. Those two IoT hallmarks—connectivity and real time—are what makes IoT a particularly compelling opportunity for the cold chain.

Consider, for example, a common IoT device: an Internet-connected sensor. Installed throughout the cold chain, these sensors can continually monitor temperature, automatically logging the resulting data. Beyond real-time data capture, however, these sensors could also be easily programmed to generate an alert if a product moves outside a

specified temperature range, whether it's removed from a refrigerated environment and isn't promptly placed into a shipping container or if there's a refrigeration malfunction that causes a temperature spike. As a result, cold chain companies have the technological tools that give them an instant, 360-degree view not only of a product, but also that product's integrity and safety, which protects customer confidence in the product and the overall brand.

Why IoT?

It's easy to fall into the mindset that new technology is overly complex and not worth the trouble to implement. An advantage of IoT-connected devices, however, is that they can work with your existing business processes. Think of them as an enhancement. And with the

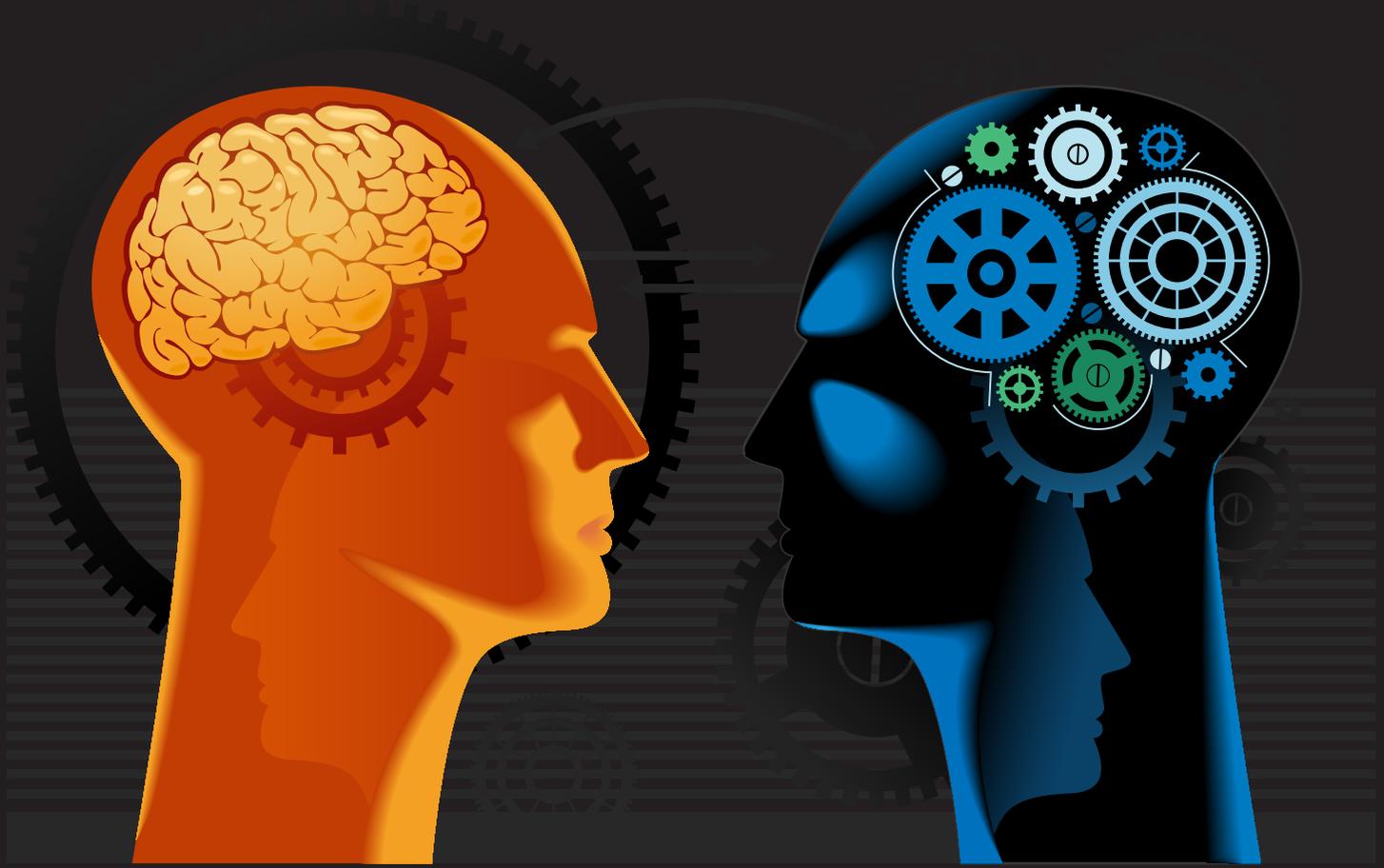
cost of devices like sensors becoming more inexpensive by the day, it's much less cost-prohibitive to implement IoT connectivity on a larger scale. But why bother with IoT at all? In today's increasingly global and regulated marketplace, real-time data and visibility have become business imperatives—and IoT makes those a reality.

"With the supply chain becoming part of the Internet of Things, we'll see a profound impact on global trade and how humankind is connected," writes Dr. Karen Reddington, president of the Asia Pacific Division of FedEx Express, for ColdChainIQ. "We'll live in a world that is more intelligent, finely tuned,

accessible, reliable and sustainable than ever. Right now, the superhighway of the world economy has never been more advanced."

Manufacturers and logistics providers now have the tools—and, more importantly, the data—to meet the increasing demand for proof that regulatory requirements are met and product integrity remains intact. There's no denying that the cold chain is becoming more complex in size and scope. When your business spans the world, it can be even more difficult to confidently track and monitor the processes and products that are continually on the move. Think of the Internet of Things—and its connected devices—as your eyes and ears wherever your business is happening. In this hyper-connected day and age when you can get information anytime, anywhere, shouldn't you have those same capabilities to safeguard the efficiency and integrity of your cold chain?





DIGITAL HUMANISTS vs MACHINISTS

WHICH APPROACH IS MORE EFFECTIVE?

The Internet of Things (IoT) is a popular discussion topic from blogs to boardrooms. Many business leaders know that technology investments that help automate business processes could be relevant to them in a big way in the near future. Automated demand sensing, notifications of problems, in-flight adjustments to equipment for efficiency—the business uses of IoT are potentially endless. The art of the possible can easily capture the imagination. The challenge for many business leaders is to ensure that there is value in the end product and to answer this critical question: When we're approaching the automation of connected things for our businesses, where do we start?

Since this is such a vast topic, it helps to distill it down into an approach that's more impactful and relevant. Gartner® did just that, breaking IoT—and related technology investments—into two different approaches that often emerge and subsequently guide how we incorporate technology into our business processes.

Focus on Technology: Digital Machinists

Sensor technology is allowing more and more possibilities for automation from store shelves, farm fields and distribution vehicles to oil pipelines and prescription bottles. It's easy to become solely focused on the

technology and how it can automate **everything**. This approach is described as the digital machinist. The focus is the technology: what machines can do and what they should do. Lending predictability, consistency and stability to processes is the end goal. As more things are connected, they should be brought online and begin funneling information into existing enterprise software systems.

The guiding principles of a digital machinist certainly do play a role in the execution of IoT. But perhaps a different point of view should also be considered.

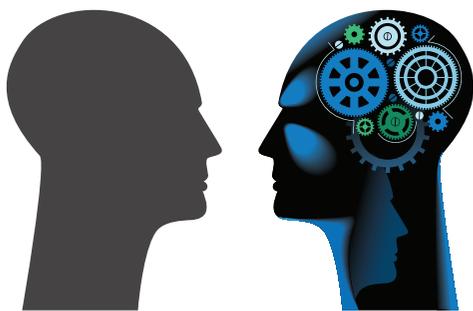
Focus on People: Digital Humanists

To fully realize the potential of what IoT can do for your business, you have to focus on the end user, not just the technology of automation. Put people at the center of your planning and layer the technology on when, where and how it can be of most assistance to them. Gartner describes this approach as being a digital humanist. By focusing on the person at the center of an IoT project your end deployment will be more useful and, as a result, have a higher chance at maximizing the benefit to the business as a whole.

A digital humanist path starts with the questions that are asked in the planning effort:

- How will the end user truly benefit?
- What portions of their everyday tasks can be automated to enhance and optimize their efforts?
- What user workflow processes could most benefit from the speed and accuracy of machine data transfer vs. the interpretation and ingenuity of a person?
- What concerns would the end user have that should be accounted for and addressed in design? Etc.

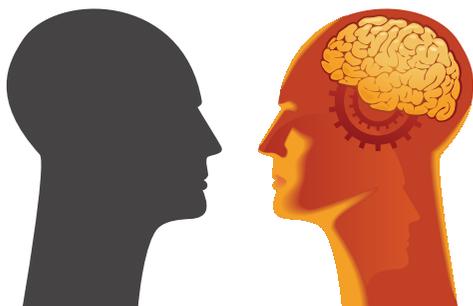
Taking a digital humanist approach certainly includes asking the right questions, but it doesn't end there. A humanist focus manifests in how the answers to those questions are gathered. Consider the following illustration, which depicts the typical, machinist-focused start to a technology project:



Hi there. Sent you some documentation to fill out on your requirements for this project.
- Thank you.

In this scenario, the reliance is on the user to think of and input what they believe is needed, information that will drive the ultimate usefulness of the technology output. This approach is really more process-centered rather than people-centered. And although this process-centric strategy can get the job done, can it fully reveal the extent to which the potential technology could help?

In contrast, a digital humanist approach to maximizing the end product would be more like this:



I am going to spend some time today watching how you go about doing your job and learn where this project can help.

This illustrates an inherently different mindset to approaching technological enhancements. The ultimate focus is a deep understanding of how the user will intersect and interact with the technology. Where would connected devices help? What could be automated to enhance those tasks? What might the user think of while in the moment that wouldn't be thought of while sitting in front of a form?

As machines and people intersect more and more, being able to invest in building technology that is centered on how the connected worker will put it to use in daily tasks will be key.

Competing in an increasingly digital business environment cannot happen without machines automating some tasks. But keep in mind the digital humanist approach and seek to leverage connected devices and machine-driven tasks to enhance and improve the work of the end user. That's how you'll ensure that technology investments are useful by design.

Internet of Things IN CONSUMER PACKAGED GOODS

Connecting Customers and Businesses With Real-Time Information

For the consumer packaged goods (CPG) industry, the digital economy presents as many challenges as it does opportunities. The home of the future is at the center of the consumer narrative in the Internet of Things (IoT). Heralded as the smart home, the sensor-equipped appliances within collect and transfer data to increase the efficiency and convenience of everyday tasks, including shopping. In such a scenario, the refrigerator talks to the coffee pot, which talks to the toaster and without human interaction, the grocery list is not only made, but also the order is submitted to the grocer to be delivered later that day. While this level of automated purchasing is still on the horizon (though advancing quickly), IoT use cases in the CPG industry continue to broaden, with immense potential for future innovation in how businesses can get their product to customers.

The smart home example above isn't far off with start-ups and technology giants alike developing new ways for customers to order goods anytime and anywhere. Amazon's recently released Dash Buttons are a prime example of how businesses are already finding new ways of connecting directly to customers in the home through IoT. Pushing one of these Wi-Fi-connected, product-specific buttons automatically submits an order to Amazon in a pre-set amount. Amazon and others are

also at work embedding sensors into household objects to measure usage and automatically prompt re-orders.

While ecommerce is rapidly growing in popularity and evolving with IoT, online transactions make up only 1% of overall product purchases in the CPG industry. Brick and mortar stores still constitute the majority of purchases made today. That's why traditional methods of in-store marketing are as important as ever—especially in light of how they can be augmented by IoT capabilities.

Product placement in the store is a primary method of getting brands in front of consumers, but with distributors sending multiple drivers to hundreds of stores and as many vendors vying for prominence, it's difficult to ensure optimal placement. CPG companies pay a premium for end caps and other product placement opportunities, but with the addition of sensors, it may be easier to ensure a return on that investment. With inexpensive sensors attached to their in-store displays, CPG companies can use geolocation sensing to ensure correct placement in a store, without distributors having to send a representative to check in person. Sensors could also be used to collect data on how products sell based on location and other factors—ultimately helping companies find the best placement for their products.

Long before products are stocked on grocery shelves, however, machine communication can enable efficiency and real-time, actionable data for CPG companies. Upstream in the supply chain, many manufacturers depend on machine-to-machine (M2M) integration to streamline processes on the shop floor. Old Dutch Foods, a leading snack food provider, uses the DSI platform for their fixed scanner M2M integration. With scanners on the production line integrated into their system of record, Old Dutch Foods has real-time access to manufacturing data for production planning and informed decision-making.

As the Old Dutch use case demonstrates, there's no shortage of opportunities to leverage the power of M2M integration—and IoT connectivity—to not only optimize business processes, but also enable a continuous, real-time stream of manufacturing and transactional data that proves product integrity throughout the product's lifecycle.



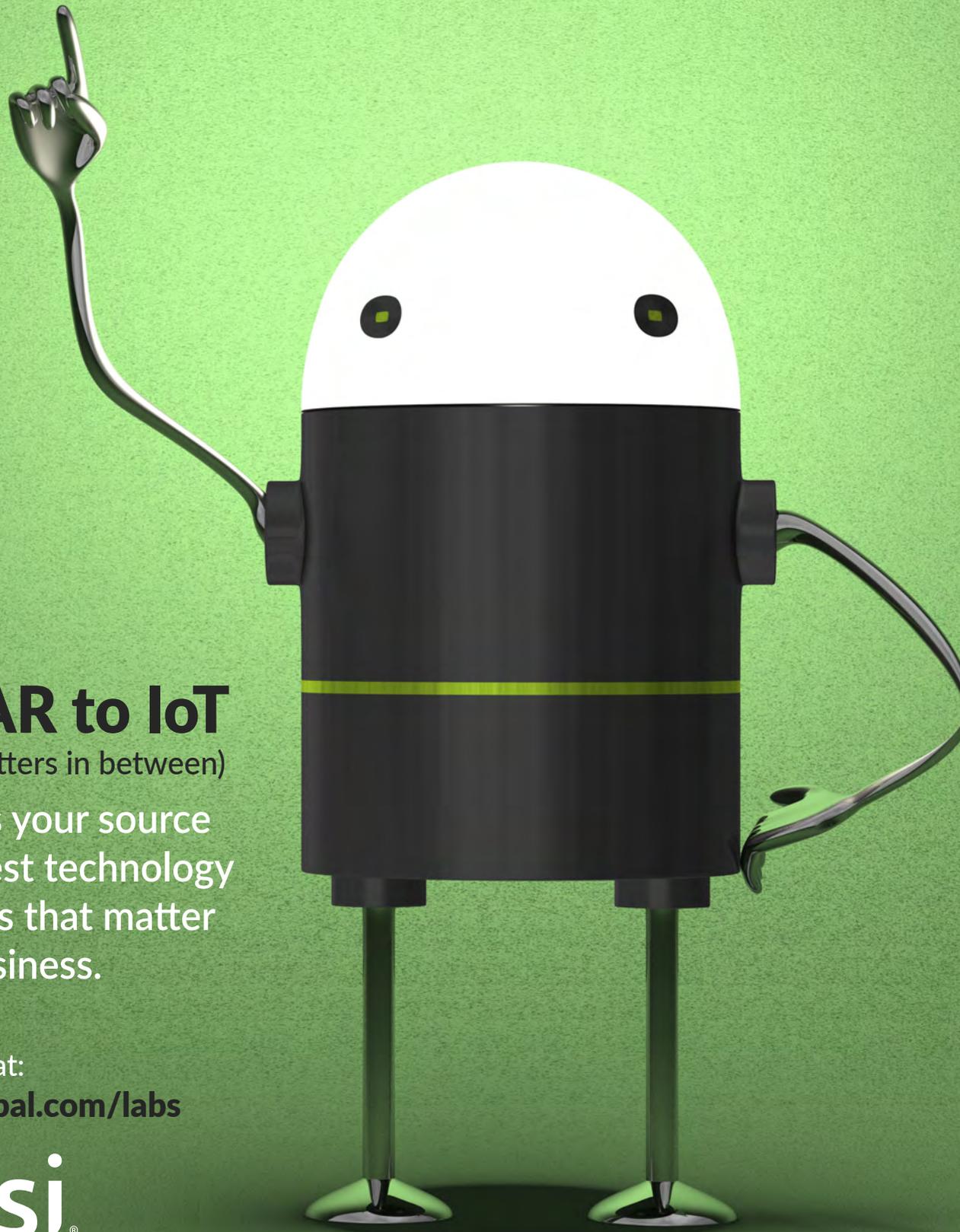
From AR to IoT

(and all the letters in between)

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