The intelligent supply chain

How industry and logistics are merging in the digital realm

Executive summary

Customer demands are increasing. Today's consumers demand healthy, sustainable, and personalized products. They will quickly seek a substitute product if they believe a company is not meeting their needs. Accurate data including information on the raw materials and manufacturing equipment employed is therefore critically important for consumer products and retail companies to learn more about product performance, react quickly in case of product recalls and manage their complex supply chains. Gaining visibility and intelligence through the use of the internet of things (IoT) can help companies to predict problems before they occur and offer insights into product performance to understand trends and offer the products consumers really want.

As part of the Siemens Xcelerator open digital business platform, Siemens Digital Logistics developed an incremental approach to smart, integrated supply chain and logistics management. Companies can drive processes up and downstream by merging industry and logistics through a cloud-based IT platform. With logistics and production equipment connected, the whole supply chain is intelligent. Siemens enables the system itself to plan, organize and predict needs in real-time across locations and enterprises from end-to-end, offering insights that drive sound business decisions and improve efficiency.

This white paper is intended to help you take the right step on your journey to the digital value chain.

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Consumer Products and Retail (CP&R) companies must adapt to an ever-changing market. Consumer demand drives the need for more environmentally friendly products, variety, and bespoke goods. But not only that, today's savvy customers want to know where their products come from, and they also want to be aware of the journey from raw materials to finished products.

CP&R companies must adapt to a constantly shifting market. Consumer demand drives the need for more eco-friendly, diverse, and customized products. In addition, today's savvy customers want to know where their products originate from and the journey by which raw materials become finished goods.

Trusted traceability is key. For that, companies need data. By using IoT technologies, companies can provide visibility and intelligence throughout the production and the supply chain to boost customer confidence and increase brand loyalty. It shows them that products are made safely throughout the whole product lifecycle.

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When logistics knows what the machines know, the supply chain becomes intelligent"

The power of the cloud
Smart supply chains solutions provide the customizable components needed to control production and logistics. They offer a quick and easy way to integrate the involved parties on a cloud-based platform with all the necessary information and documents.

The latest trends in today's digital revolution go further still, integrating machines through the IoT into a process that streamlines production and makes results more predictable. Making logistics part of this process means integrating it into the IoT. This yields an intelligent supply chain by bundling data across the entire value chain. It also makes it possible to plan each step in the logistics process chain based on current production flows.

Next-gen industry meets next-gen logistics
Say goodbye to guesswork! Now it's possible to nail down precise delivery times based on production status. Data generated from production and logistics enable simulations that help avoid risk and optimize capacities.

The digital integration of industry and logistics yields virtually endless opportunities for added value. New business models emerge, processes are automated from start to finish, resources are optimized, and the quality of service to customers is enhanced. As always, when it comes to new terrain, the hard part is getting started. This white paper is intended to help you take the first step on your journey to the digital value chain.

IoT as the engine of automated digital logistics in the Consumer Products and Retail industry

IoT helps every "thing"- gripper arms and conveyor belts become a data source. Machines and their components learn to share even the most minor details. Their sensors report whenever anything is amiss, such as the threat of downtime or an approaching maintenance interval. In this intelligent world, costly outages and unavailable replacement parts become a thing of the past. Machines used to toil away mindlessly. Now, factory floors are integrated from one end to another, which makes it easier to control, monitor and improve production lines. In addition, having access to all that information makes it possible to leverage the power of big data to drive processes up or downstream from the initial customer request to the final delivery. The result is improved agility and flexibility, enabling the production of lot size x at speed and scale without compromising on quality and cost.

The next big thing

That's why the fusion of industry and logistics is the next big thing. In the IoT, machine data becomes the driving force behind logistics processes. This turns logistics into a highly flexible component of a larger mechanism that yields not only products but an optimized supply chain.

The machine says to the logistics: "We're running at full capacity right now. Please adapt your transport and storage capacities to the current production volume." This type of communication, in binary code at the speed of light, can eventually make deadheading a thing of the past. Resources can be planned with precision down to the last loading centimeter. Costly special transports – inbound and outbound alike – become superfluous.

Logistics professionals that operate like this achieve greater efficiency per kilometer. They need fewer drivers and vehicles. They are responsible for less congestion and carbon emissions to meet consumer demand to reduce the carbon footprint of products. They become an indispensable element of a production process that produces more added value in the chain of events while driving down transport costs.

How the supply chain becomes intelligent

When logistics knows what the machines know, the supply chain becomes intelligent. It can plan, organize, and predict based on real-time data. Or plan and organize proactively if the dispatcher uses tools of a digitally integrated supply chain. A status update here includes not only the status of the supply chain – the precisely determined location on the telematics-supported map of events.

It also includes down-to-the-second information on the density of the production line. This data is collected and stored to ensure complete traceability of a product's journey, helping companies share more and improve communication with their customers. This generates unique consumer experiences which boost brand loyalty.

The intelligent supply chain takes the production process into account. It merges industry and logistics through a cloud-based IT platform and provides cross-location, cross-enterprise integration of the supply chain partners. It's about live collaboration: Everyone who needs to be there is there, including suppliers, OEMs, CP&R manufacturers, logistics experts, carriers, customs authorities, service partners, customers: they all have the same view of the same event at the same time. Estimated time of arrival (ETA) is yesterday's metric. The new standard in industry and logistics is the precise time of arrival (PTA). Algorithms capable of analyzing data streams from participating partners in mere fractions of a second and continuously syncing data with the current event status are able to nail down exact arrival times. This allows companies to react much quicker to disruptions when they occur even across global facilities.

Next generation customer satisfaction

This approach can accelerate and streamline many things in the other direction as well. Take a home appliance warehouse, for example: household devices no longer need to be "stockpiled," as it were. Instead, it can be produced on demand at the time it is ordered. When the customer clicks to place an order, the logistics system generates a blanket order that simultaneously triggers the manufacturer's equipment or 3D printer to make the product or a spare part in case of line or machine failure.

Without human intervention, the IT platform automatically transmits a transport order to the service partner, who then picks up the goods following the precisely defined production turnaround. This process marks a new milestone in time slot management: Loading dock times can be planned down to the minute since production flows are synced with the logistics system in real-time. Same-day production and delivery become an option for many shipments - plus a bonus that e-commerce companies following this approach will stand out from the competition. This "instant gratification" approach to production takes customer satisfaction to a new level.

In the chain of precisely timed events, nothing is left to chance. This long-range advance planning and controlling of the supply chain is known as predictive analytics. At the highest level of analytical intelligence, events are not anticipated but actually simulated in advance. The question behind prescriptive analytics is: What actions must be taken to bring about a specific result? Manufacturing intelligence not only predicts the probability of something happening, it also yields recommendations for specific situations. Business leaders gain the confidence to make grounded decisions on how to best optimize logistics and mitigate risk.

State-of-the-art industry meets next-gen logistics: What it takes for this technology fusion to work

For industry and logistics to communicate, you need a digital network. This is an environment where communication happens across multiple channels and levels: machine-to-machine, human-to-machine, and human-to-human. Only an open and neutral network can ensure that all Consumer Products and Retail companies, regardless of their system architectures, can join the new world that digital innovations make possible.

Ideally, such a network lives in the cloud. The cloud enables the cross-enterprise cooperation of products, equipment, and systems with logistics. It enables mobile collaboration in complex networks anywhere, anytime. It can even be used to benefit from real-time customer feedback that improves communication and generate unique experiences.

Not only intelligent but also integrated
With more companies recognizing the need to switch to open, cloud-based IoT operating systems to automate and monitor their processes, the possibility of collecting, analyzing manufacturing data across systems is fast becoming a reality. But to turn all this internal chatter into external communication, you need IT building blocks that channel and analyze the flow of information and ultimately translate it into an order that sets the supply chain into motion.

State-of-the-art industry meets next-gen logistics
The intelligent, cloud-based supply chain is therefore a data-driven network with a platform infrastructure offering a variety of customizable service components. These components must be optimized to the production and system requirements of industry. They also need to ensure continuous control of logistics, which enables end-to-end visibility across the entire process chain.

The cloud enables the cross-enterprise cooperation of products, equipment and systems with logistics. Consumers demands and delivery options trigger production orders as well as outbound logistics. Real-time supply chain shortages help adjust production order scheduling to optimize overall equipment effectiveness. Last but not least, historical data about production; inbound and outbound logistics, supply chain enable to continuousely improve the digital twin of production and logistics and ultimately the real processes.

Interfaces are key here. They make it possible to easily connect existing customer systems such as ERP, warehouse management, or transport management systems to the intelligent supply chain. Accessing the platform should be simple, relying on common standards such as EDI or web accounts.

The digital marketplace for innovative analysis and management tools in the Consumer Products and Retail supply chain

Not so long ago, developing new IT solutions was one of the biggest challenges that companies faced. But recent years have seen a sea change in the technological possibilities available. And that's not all. Today's decision-makers are no longer willing to accept huge investments and protracted implementation phases: They expect on-demand solutions. Customers also expect the service they receive to adapt to any situation and fit their unique needs. And as processes and business models go digital, the system requirements may evolve faster than the systems themselves can.

Consumer Products and Retail companies that wish to benefit from the explosive development of digital technology can turn to established IoT platforms. These IoT platforms feature open operating systems as a foundation for monitoring and integrating the machinery of today's cutting-edge industry. They also make it possible to develop and run apps and digital services that optimize every step of the value chain – from procurement to production to logistics. This type of platform as a service (PaaS) engenders a digital marketplace, a space where services and solutions come together to add value to industry.

What else do you need for a digital revolution?
The advantage of the open IoT system is that it can also accommodate other services that have proven successful or innovative as specialized solutions in other domains, such as as a logistics platform for supply chain management, for example, or as an analysis or simulation tool.

This kind of combination lets you manage the entire value chain: IT components for end-to-end digital supply chain management make it possible to integrate all partners involved in the logistics process, ensure end-to-end (and even intermodal) supply chain visibility, and offer ideal conditions for smooth collaboration in value chains.

Components for data-driven analysis, planning, and simulation enable an iterative optimization of all logistics processes, merging various data sources so that a digital twin can analyze and simulate every link in the logistics chain. The possible becomes tangible, and logistics processes reach their full potential.

Using data from simulations and analyses can help companies to predict problems and even solve them before they occur. Such tools are vital to reduce manufacturing downtime and keep the business up and running smoothly.
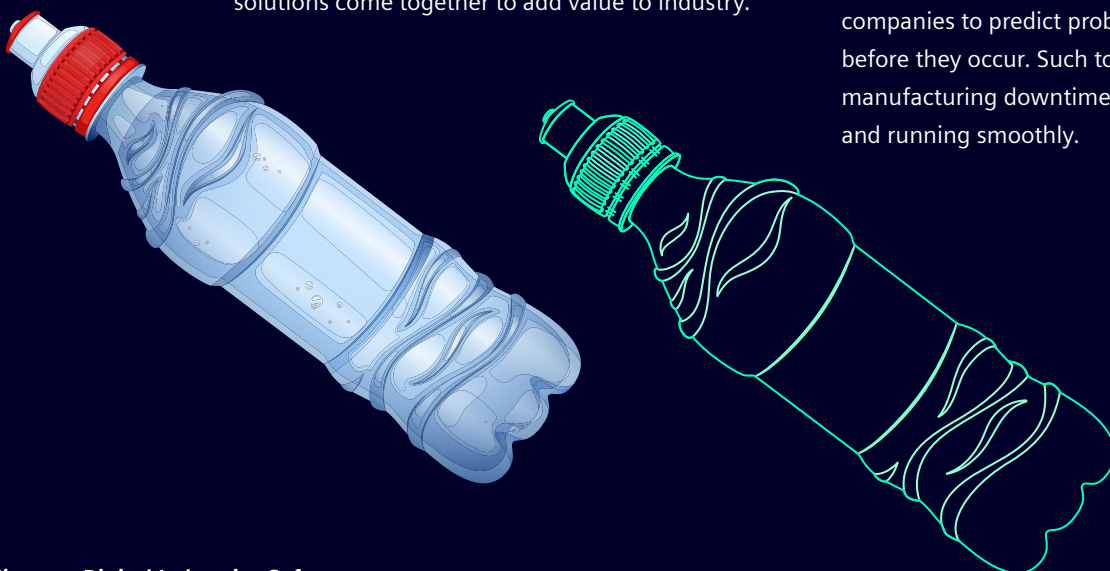
From control tower to artificial intelligence

In practice, this kind of state-of-the-art IT platform yields extensive control tower solutions. Large Consumer Products and Retail and logistics enterprises tap into this functionality to enable just-in-time control of processes and yield the greatest possible supply chain visibility. These solutions automate all shipping-related sub-processes, from blanket orders to real-time shipment tracking to invoicing. The next logical step is for machines to use the IoT to connect with warehouses, carriers, and trucks to report data such as precise storage requirements based on production volumes to keep the business running smoothly.

IoT platforms can really optimize the value chain through additional analytical tools that help you learn the right lessons from the enormous volumes of production and transport data. Because data alone won't suffice, it needs an environment to become intelligent. Where it can follow rules to help make CP&R businesses lean and mean. Where it can ultimately grow into an added value that pays dividends to all who own, share, and contribute to it. That's why artificial intelligence (AI) is key to the digital supply chain. AI can discern recurring or deviating patterns in data. It can use algorithms to calculate the ideal line for a supply chain. And that makes it possible to determine precise delivery dates.

Consumer Products and Retail enterprises can integrate these analytical components in various ways to make their processes more intelligent and efficient. For instance, to offer their consumers a higher quality of service. To synchronize production and logistics processes flawlessly and optimize existing resources. The intelligent integration of production and logistics beckons with a new level of plannability and transparency that can permeate the entire process chain.

Five steps to an intelligent supply chain

Digital Logistics, part of Siemens Xcelerator open digital business platform, developed an incremental approach to smart, integrated supply chain and logistics management based on Gartner's 5-Stage Maturity Model. Businesses move from one stage up to the next as they develop.

1. Siloed
In the initial phase, logistics and supply chain management are largely autonomous processes in an ERP system, for example.

2. Efficient
The logistics processes become more efficient when the functional reach of the system environment is extended.
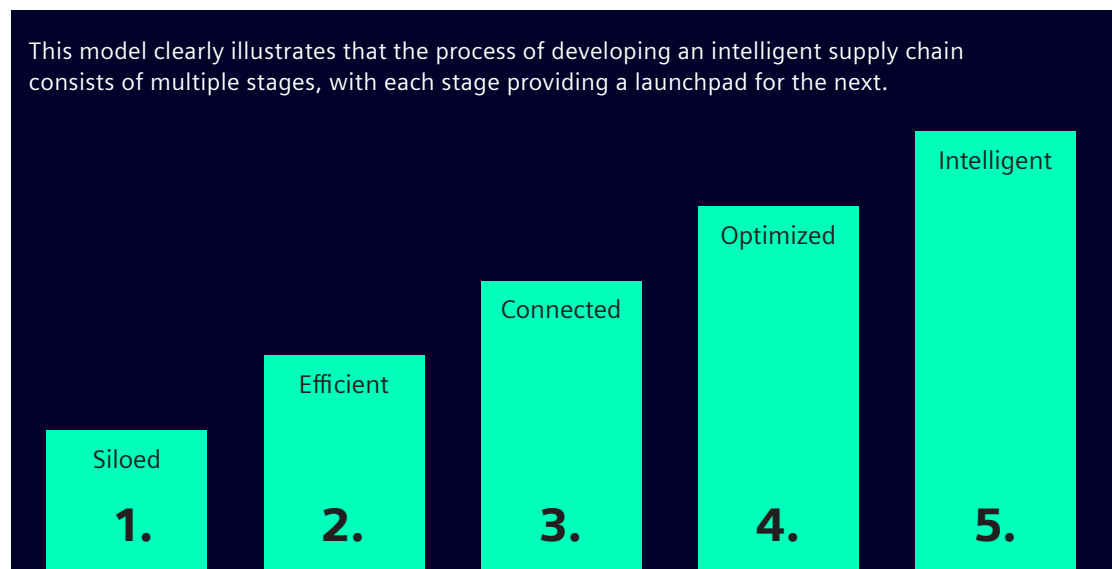
3. Connected
All supply chain partners are integrated through collaboration platforms, for example, ensuring digital communication and information-sharing within the network.n.

4. Optimized
Optimization evolves beyond selective logistics processes to become a strategic, iterative process driven by the appropriate IT tools for the purpose of redesigning the network, streamlining operational workflows, etc.

5. Intelligent
IoT apps, analytics, and eventually AI are deployed to deliver a better decision-making basis and engineer superior solutions for logistics challenges.

This model clearly illustrates that the process of developing an intelligent supply chain consists of multiple stages, with each stage providing a launchpad for the next.

Intelligent

Optimized

Connected

Efficient

Siloed

1.   2.   3.   4.   5.

Customer success: dm-drogerie markt Generating capacities, managing growth

German drugstore giant dm-drogerie markt had a unique vision for their logistics infrastructure "Integrative. Intelligent. Automated". The company required greater flexibility in their stores that would improve sustainability in a complex retail network. What was required was an integrated use case environment that could simulate and optimize the whole dm network of stores as well as the logistics processes in a digital twin.

Siemens Digital Logistics was able to realize this vision by developing dm's logistics network architecture using Supply Chain Suite (SCS). Using the digital twin, dm was able to simulate growth scenarios, forecast capacity reserves and optimize how retail locations were supplied for maximum reliability and cost-effectiveness. Alternative strategies relating to the supply of stores were the first to be simulated. Following this, additional use cases were set up that focused on packaging, logistics cost at the product level and the ideal order to prepare items for storage.

Success
The project was so successful that it earned the company the German Award for Supply Chain Management 2020. Today, uses SCS to cover key processes and areas of tactical decision-making in order to optimize its supply chain management. The positive experiences in Germany led to some of the use cases being applied in various countries within dm's network. The joint strategy has helped dm streamline how it uses site capacities and open a third distribution center on schedule.

Learn more about this success story <u>here</u>.

Taking digital transformation to the next level for the Consumer Products and Retail industry

The fragmented world will eventually coalesce into an ecosystem where increasingly specialized, high-tech industries complement one another like they do in a natural organism. They'll no longer work alongside one another but together as connected enterprises in a transparent, fully synchronized process. The IoT will evolve into the internet of industries and fuse with the internet of logistics.

The central meeting point in this world is a digital marketplace offering everything that participants need to thrive: high-efficiency supply chain networks, proven business processes, services for whatever customers want, and data delivering insights into every conceivable use case. Ready to up your game?

At home in the digital ecosystem
Those at home in this digital ecosystem benefit from a dynamic, interactive environment offering the utmost in efficiency and performance and the data needed to make the sound decisions that drive a flawless launch. Machines use algorithms to digest all the available data, learning more with each millisecond. AI boosts their IQ.

At this ultimate phase of digital transformation, the future becomes the present. Big data doesn't just tell us what will happen, it tells us what we need to do to make something happen (or prevent it from happening). And how this decision will ultimately affect our business. Consumer Products and Retail companies can utilize this valuable insight to reveal insights about products to enable new business models and generate unique consumer experiences. As long as a natural disaster does not appear out of the blue to slow down shipments, predictive and prescriptive analytics can help the supply chain become a precision tool for the industry to carve out more and more market share.

The foundation for this development is neutral infrastructure – an open system where apps constantly evolve and can be used to build unique customer solutions, even entire value chains. With solutions small and large, 1:1 or 1:n – any relationship is possible, any business model feasible. In a growing ecosystem, the options multiply with each phase of evolution and each additional app.

Traceability and Lifecycle Intelligence for Consumer Products and Retail

Siemens' Traceability and Lifecycle Intelligence is a digital approach to produce individual products as flexibly as possible, anywhere, anytime by improving:

• **Manufacturing intelligence** to solve production downtimes
• **Product performance intelligence** to transform the consumer experience
• **Trusted traceability** for increased brand loyalty

Siemens' Traceability and Lifecycle Intelligence provides Consumer Products and Retail companies the necessary visibility and connectivity into product lifecycle and manufacturing to deliver an intelligent foundation across the entire lifecycle, enabling companies to gain and maintain a competitive advantage within the Consumer Product and Retail industry.

CP&R Traceability and Lifecycle Intelligence is part of Siemens Xcelerator, an open digital business platform which enables customers to accelerate their digital transformation easier, faster and at scale and offers cloud-based SaaS solutions, powered by Amazon Web Services (AWS).

Learn more about CP&R Traceability and Lifecycle Intelligence here.

Start accelerating your business's digital transformation with Siemens Xcelerator here.

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For additional numbers, click here.

Siemens Digital Industries Software helps organizations of all sizes digitally transform using software, hardware and services from the Siemens Xcelerator business platform. Siemens' software and the comprehensive digital twin enable companies to optimize their design, engineering and manufacturing processes to turn today's ideas into the sustainable products of the future. From chips to entire systems, from product to process, across all industries, Siemens Digital Industries Software – Accelerating transformation.

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