Supply chain excellence in the chemical industry

Decrease operational costs with superior supply chain optimization solutions
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The chemical industry today

We live in an age where competitive advantage is comprised of speed and adaptability. The chemical industry is no different, with companies fundamentally transforming their internal workings to maintain market position. This ensuing disruption also creates opportunities to get ahead: the field is ripe for innovation everywhere from commodity to specialty chemicals and intermediates, all rippling into, as well as collectively serving, other industries—such as consumer products, pharmaceuticals, agriculture and automotive. In short, it’s not enough to embrace change. Staying ahead is also about causing change.

But keeping up in an industry that had a total revenue of some $5.2 trillion in 2016 and has continued growing ever since is challenging at best.1 For current evolutions to be sustainable and profitable at the rate set by the market, it’s clear that organizations must adapt and at once reinvent their business models. Some are doing just that, but they’re not the majority. This change in perspective is driven by global forces, among which technological advances, feedstock and product supply, demand volatility, and sustainability factors. While these all bring their own unique strategic imperatives, it’s vital for chemical enterprises to understand and take action. These companies must:

- quickly adapt by investing in operational resilience and flexibility.
- improve customer and employee experience.
- manage costs by increasing asset reliability and optimizing supply chains.

While innovation is front and center in the evolutionary model, experience shows how other factors also play important roles, and that they cannot be ignored:

- **Selectivity in Research and Development (R&D) investments** can enhance time to market and enable seamless transition to operations.
- **Collaboration and long-term partnerships** with strategic suppliers and customers can ensure sustainable prices and continual sources of demand.
- **Resilient, optimized and dynamic operations** must accurately address market variations and enhance safety standards.
- **Risk management strategies** are needed to ensure diligent compliance to regulatory and safety norms, creating an indirect competitive advantage.
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02 What to look for and what to look out for

New standards have already emerged. Innovation has helped organizations reap benefits in multiple areas of the chemical industry. For example, advanced analytics is now used in researching and designing new materials—and modern testing environments have led to the development of improved products.

But that’s not all analytics can do: data mining and modelling have since been used to optimize processes in procurement. In fact, current day industry-standard digital procurement tools can save up to 24 percent in supplier costs. Innovation isn’t just about software: sensors that link to analytics systems are nowadays used to monitor equipment by means of what’s called predictive asset management. Innovation is also a matter of making sure your organization changes to fit new software and tech capabilities.

This maximizes the utilization and availability of running assets by predicting (and preventing) equipment failure. Novel approaches such as these help enterprises minimize downtimes (be them planned or not), and new technologies such as augmented reality, cognitive intelligence and 3D visualizations now allow personnel to approach maintenance and repair in ways unimaginable just a few years ago. The opportunities aren’t yet fully comprehended—right now we’re seeing how AI can be used for production simulation, operator training, manufacturing planning, even plant commissioning—but new use cases are developed at an exponentially increasing rate. Recent leaps forward in technology have also improved more commercial areas of the industry—such as sales and marketing—with customer insights solutions helping companies gain better understanding of their customers.

All of these new technologies generate an abundance of data that can be utilized to better understand current situations, predict the future, and drive action with improved insights. Data from public or private sources, be it structured or unstructured, needs to be stored in an accessible and uniform way. A foundation that allows ingestion of information from disparate sources into a data lake and allows add-on layers of analytics, cognitive, and user experience will help enterprises better unveil their dark data.

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03 Tomorrow’s supply chain

For all the possibilities, innovative technologies also bring about certain issues that didn’t exist before. The continuous expansion of business environments (enabled and empowered by innovation) has made supply chain systems much longer, and much more complex than they were before. Reduced volumes per order, higher numbers of customers and tighter specifications add more and more complexity.

This new status quo creates fresh challenges for companies’ sustainability plans, their operational flexibility, their cost management practices and no less safety standards. In an industry as cyclical as chemicals, where strong competition drives rapid change, we can be certain that next generation supply chain models will be ever more flexible, agile and responsive if they’re to support ever growing operations.

Imperatives are common across the world, it’s just a matter of finding the right balance between:
- Finding new growth markets.
- Introducing new products.
- Reaching a diverse customer base.

It’s becoming clearer by the day that companies in the chemical industry must craft demand-driven supply chains—and that means (at the very least) deploying predictive supply chain analytics systems and dynamic pricing systems.

With new markets maturing and novel material formulations becoming prevalent, organizations in the chemical industry are finding themselves in need of technology that is agile and can meet ever growing performance standards.

Next generation supply chain solutions will include automated optimization and decision-making capabilities that will assist companies in just that, and early signs are already in market.

Considering these new and still unexplored opportunities, corporate strategies around things like productivity improvement, cost reduction, process control, cost control, and partner ecosystem collaboration, have already started shifting in anticipation of future scenarios.

All this goes to say that tomorrow’s supply chain model will most certainly be used to reduce risks by ensuring complete supply chain visibility and control. Early warning mechanisms and integrated business planning processes are already emerging across the chemical industry, and business models are shifting ever more from legacy paradigms to a model of tomorrow that we’re only just starting to see.
Despite all the room for optimism, current operations show significant opportunity in not simply weathering the storm, but in reinventing their approach to navigating waves of industry growth. However, yesterday’s linear processes and approach will become inadequate as the speed, complexity and trade-off dimensions of superior performance escalate exponentially.

This in turn will ripple through, creating further obstacles to growth that can be divided into 5 different categories:

- **Planning**, which already suffers from low usage of predictive analytics.
- **Operations**, which often require manual intervention from staff.
- **Procurement**, which is severely limited by poor supply visibility.
- **Traceability**, which has historically been proven to be an obstacle for transparency in distribution and will be an even greater problem as things progress.
- **Sales**, which suffer from poor and untimely data—and in an ever more interconnected world this problem will become greater by the day.

These industry-wide shifts stem from both internal and external factors. As chemicals and related industries push for a faster transition from the commoditized market model, organizations face unanticipated and unwelcome price volatility. In this environment, innovation and speed to market prove not just strategic, but critical.

Further urgencies such as the need for product traceability (particularly in cross-border movement regulations) put even more strain on legacy supply chains. Increasingly stringent regulations on operational traceability and regulatory compliance only add to the already increased scrutiny chemicals’ companies are facing.

This is causing disruption of the basic elements of the market: supply and demand. And it’s prompting changes across the industry. Vendors are struggling to keep up with rapid market shifts—as do internal R&D departments of established organizations. Add to this geopolitical and economic volatility, and a pattern of perils starts emerging.

Product traceability is another urgency in the industry, particularly for cross-border movement regulations.
04 Supply chain imperatives

Responses to these perils vary, but **internal incentives for transformation across the chemical industry can be summarized under four major categories:**

- **Demand variations,** which are the direct result of consumer industry changes and play a direct role in the adoption of different engagement models.
- **Operational challenges,** whereby upstream innovation and shifts in geographic supplies and raw materials demand cost optimization.
- **R&D processes,** which must be made flexible enough to address market volatility.
- **Supply chain resilience,** to understand visibility of the network (in particular, over transit inventory).

To face market challenges and internal process shifts, chemicals’ companies must prepare for immediate transformation and adoption of new digital technology. This is the only way they will not simply survive, but excel in the industry of tomorrow.
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05 Value realization

Linear supply chain models that the chemicals industry has been using so far can be generalized as follows:

- **Sourcing of raw materials**
- **Transportation to manufacturing**
- **Production**
- **Distribution**
- **Storage**

And while this straightforward architecture has served the industry in days past, with supply chains now spanning the entire planet this model leaves companies vulnerable to an array of disruptors that cannot be foreseen, let alone controlled. Building on this model and transforming solutions to fit within current day requirements necessarily involves advanced technologies that are built on a backbone of cloud-ready analytics, enterprise platforms and make use of big data and connected machines (all the way from mobile devices to industrial products).

The next generation supply chain:

- **It’s digitized.** It can offer near real time information on assets (including in-transit inventory), it can contextualize information and deliver it through mobile devices, and simplify the management process. For teams, it makes it easier to collaborate and share insights across silos.

- **It uses predictive analytics in decision making.** It can thoroughly analyze inventory management, supply/demand forecasting, distribution and manufacturing costs, and return primed decisions. Advanced analytics eliminate legacy supply chain models and make modern ones much more productive. Tomorrow will only see improvements on this.

- **It optimizes operations.** Tomorrow’s supply chain model establishes cost-improved metrics and easily configurable logic to achieve operational agility.
What’s more, digitalization is already used by chemicals companies to gain competitive advantages in supply chain planning, and this trend shows no sign of slowing down. Security, availability, optimized asset utilization, product allocation, sales, reduced inventory buffers and minimal obsolescence—all these areas are already experiencing significant improvements from new technology implementation, yielding significant cost savings and reduction of working capital.

We believe that, as linear supply chains continue to be reimagined, they will quickly get replaced by a circular architecture that increases visibility and flexibility on decision-making by promoting continuous dynamic interactions. As opposed to what we saw in the past, circular supply chains include the entire logistics process, and adapt well to ever growing concerns around the need for environmental protection, recycling, sustainable development, and safety regulations.

The top three beneficiaries of supply chain optimization for chemical industry are:

1. **Distribution and logistics:** benefit from a logistics advisor and from inventory management and optimization, enabling visibility and logistics improvement, responsiveness and surety of supply.

2. **Manufacturing and engineering:** automating business processes and orchestrating relationships providing electronic workflows.

3. **Planning and procurement:** supporting financial, supply and demand planning by using internal and external data and insights and offering buyer assistance, logistics improvement and visibility—and no less responsiveness and surety of supply that weren’t possible before.
Transforming chemical supply chain networks
Digitization is the driving force behind much of today’s development and has created agility in multiple world-wide industries including chemicals. The rise of new technologies such as machine learning, AI, IoT and of course blockchain has spawned a wave of innovation that provides organizations with new tools that they can use to access, process and analyze vast amounts of data in real time.

As things stand in today’s chemical supply chain model, all suppliers across a supply chain necessarily require their own databases. An extension of this fact is that records, once updated, must be reconciled among other participants in the network that do not share databases, making transaction logging inefficient, expensive, and vulnerable.

Enter blockchain: it’s based on a general ledger that instantly distributes and proves information validity to all nodes within its network. What this technology is showing is that there are ways of enabling faster, permissioned, immutable, transparent and auditable business-to-business transactions among participants in a given network.

Chemical manufacturers around the world are already looking for ways of integrating blockchain technology into supply chain systems, and they’re doing this in the hope that blockchain will get rid of the problems plaguing current record-systems. In fact, blockchain applications have already shown reducing cost of payment transactions by about 30 percent.4
06 Our commitment

As one of the world’s leading innovation companies, IBM provides solutions that address some of the most prominent issues the chemical industry faces. Organizations can boost their growth and can maximize asset productivity using IoT, while implementing artificial intelligence and cognitive solutions that sift through unstructured information to provide previously unattainable value. In all, the way forward in transforming the supply chain reunites the right processes, assets, facilities and technologies to achieve performance, availability and decision-making excellence:

- Watson IoT
- Cognitive Equipment Advisor
- Cognitive Plant Advisor
- Cognitive Solutions such Product Finder
- Supply Chain Optimization (using tools such as ILOG, CPLEX)
- Process Templates and Accelerators
- System Integration Capabilities
- RFID, Barcode based solutions
- IBM Blockchain
- Digital Insights Platform

With its global presence, IBM is uniquely positioned to further innovate within the chemical industry, and is set to drive the next generation of business improvements—thanks in large part to deep expertise built from R&D and years of project execution and strategic partnerships with other leading technology providers.

IBM has the tools and the experience to collaborate with anyone to create a distinct advantage that keeps business ahead of the curve in today’s rapidly changing environment.

Do you want to drive new growth and operational efficiency with advanced technologies and reshape supply chain in your organization? Find out how
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References: