Empower the Intelligent Chemical Enterprise with SAP and its Ecosystem

Operate with visibility, focus and agility to drive game-changing outcomes faster, more effectively, and with less risk

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THE BEST RUN **SAP**

Imprint

Dear customers,

The COVID-19 pandemic is causing huge impact and economic disruptions for consumers, manufacturing industries and communities around the globe. As industries re-examine their supply chain ecosystem partners and processes in a search for effectiveness & efficiency, chemical businesses are feeling increasing cost and margin pressure. The outlook for 2020 and respective growth opportunities continue to disappoint, and chemical makers are bracing for softer financial conditions.

By adapting to how customers want to acquire, use and pay for their products and services, chemical companies can empower digital transformation throughout the supply chain – and drive their own profitable growth. Chemical companies must undergo a significant cultural change, attract and retain new talent, and must earn the trust of their customers to co-create custom processes and products. Those companies that can make this cultural shift will be positioned to focus on further process optimization (e.g. 'lights out manufacturing" or "touchless order fulfillment") and will deliver entirely new customer experiences.

We expect in 2025, as much as a third of chemical companies' revenue will come from business models that are based on real-time data sharing and co-innovation with customers.

The companies that lead the way will be those that utilize intelligent technologies that process data, and those that develop the skill sets to fully leverage that data across company boundaries acting within a flexible industry business network. They will be the most responsive to the demands of individual customers and to the challenges posed by environmental health and safety concerns. Those that cannot adapt will continue to be hampered by commoditization and margin erosion. In this brochure, we propose a set of business priorities that will drive transformation and the tools that will make it possible. The new SAP value map for chemicals reflects all these new aspects and the most prominent business priorities we see as follows:

- Customer Engagement and Co-Innovation
- Planning and Sourcing
- Integrated Operations Management
- Delivery and Service

The pressures on our industry can seem relentless. The challenges are real. But the biggest risk we face is to stand still as our ecosystem partners remake themselves without us. Do not be left behind. SAP is here to help!

Sincerely yours,
Thorsten Wenzel (PhD)
Global Vice President | Chemical Industry | SAP SE

Content

SAP Partner Profiles

Value Map – SAP for Chemicals 2020 and Beyond

By 2025, chemical company revenue will depend on innovative products and services that derive from new business models.

These new models range from straight forward after-sales service offerings to complex outcome-as-a-service models. They will also include programs to monetize corporate knowledge, intellectual property, and data assets. Increasingly, these new ways of doing business will rely on real-time data sharing and collaboration with customers on new platforms, supported by extended partner ecosystems.

Customer-centric R&D will anticipate customer and consumer demand, collaborate with extended ecosystems, simulate product and formulation performance, and design products that minimize environmental impact and support a circular economy.

Applying digital technologies in operations will help chemical companies analyse production process variables and asset performance in real time and to simulate their impact on product quality, costs, and yield. Predictive analysis will enable chemical companies to anticipate downstream supply chain disruptions and take corrective actions in real time.

Enabling digital twins and IoT connectivity of assets will allow chemical companies to continuously monitor asset health, process quality, through-put, waste and emissions. By combining asset information with predictive analytics, companies can predict the likelihood of asset failures, plan maintenance, and adjust production plans accordingly.

Digital technologies such as blockchain, the Internet of Things, 3D printing, and machine learning provide opportunities to optimize, extend, and even disrupt supply chain processes and models. Digitalization benefits supply chain processes - from authentication of raw materials and fair labour practices to automated tank replenishment and fleet management. It helps optimize trading and shipping, additive manufacturing, and product integrity management while minimizing supply chain risk.

The Vision

By 2025, most chemical companies will move from B2B push models to business-to-business-to-consumer (B2B2C) models. Digital technology and concepts like the "segment of one" will be leveraged to deliver sustainable, co-developed applications, services, and business outcomes. Companies that have identified an experience gap will gain competitive advantage by engaging more closely with their customers and ecosystem partners. This engagement will enable them to deliver outcome driven services and address customer expectations proactively. This new experience along with developing customer relationships based on trust, shared values and risks will be the new paradigm.

The Journey

Chemical companies will start toward this goal with personalization of the customer experience, marrying customer sentiment analysis with buying behavior analysis across channels to understand each cus-

tomer's needs and generate tailored customer interactions.

They will establish searchable intellectual-property databases to access relevant scientific information to create co-innovated products and solutions. Having established this foundation, they will extend into properties prediction and performance of new formulations to significantly shorten the development process and time to market while monitoring product and formulation compliance along the entire lifecycle. Furthermore, they will extend into their customers' value chain, monitor process parameters, and allow in situ quality control in real time through sensors at customer operations. In terms of logistics, they will track and trace material flow and product integrity along the entire value chain.

Finally, they will collaborate on open innovation platforms, turn data into value-based services, and establish transformative business outcome-driven and customer-centric revenue models to improve quality and reduce costs and risks for customers. We have identified four strategic priorities necessary for chemical companies to transform their business.

In order to drive growth and agility in the chemical industry and to tackle these strategic priorities within the SAP for Chemicals portfolio, we have grouped our industry strategy and overall portfolio approach around the following "Core Industry Priorities" and "Cross Enterprise Supporting Priorities".
https://solutionportfolio.net.sap/industry/CHEM

Core Industry Priorities:

Customer Engagement and Co-Innovation

■ Achieve positive returns on innovative products and services

Anticipate customer and end-consumer demands in Research and Development. With solutions from SAP, you can collaborate with customers and prospects to develop focused solutions and services that enable your intelligent enterprise with a shorter time to market. Commercialize solutions and services successfully addressing the right target groups with

To Transform Chemical Companies Prioritize New Business Models and Processes

Deliver customer outcomes, not just products
Rethinking the value chain from the customer perspective

Compete as an ecosystem
Integrating with both customer and supplier supply chains to unlock superior value

Simplify to shrink cycle time
Using the IoT to streamline operations and maximize asset performance

Increase market-driven strategic agility
Adjusting strategy and portfolio dynamically in response to market opportunities and needs

appropriate messaging and improve customer retention by providing excellent customer experiences.

Planning and Sourcing

■ Transform your supply chain into a demand-driven network with demand-driven digital business planning and sourcing

Align strategic, financial, commercial, and operational goals with demand-driven digital business planning software from SAP. Plan inventory and supply through cross-functional collaboration, analysis, and optimization of demand signals, supply constraints, and financial considerations. The plan can then be translated into actionable targets for execution systems. Identify raw material sources and align them in order to manage global supply risks while protecting profitability.

Integrated Operations Management

■ Optimize asset performance and use by synchronizing processes, enabling data-driven decisions, and proactively managing risk and safety

Maximize manufacturing performance by synchronizing plant functions with business functions and deliver real-time insights at the point of need. SAP solutions help optimize production processes, improve the reliability of assets, and enable remote monitoring. Enable faster corrective actions by using SAP solutions to analyze the impact of events on the complete supply chain and present possible solutions.

Delivery and Service

■ Balance customer service and delivery costs through efficient digital logistics, order fulfillment, and customer service operations

Optimize freight, shipping, and warehouse operations by gaining the visibility needed to make efficient logistics and order fulfillment decisions. With SAP solutions, you can improve speed, efficiency, and sustainability by aligning distribution and fulfillment processes and collaborating with logistics participants. This includes the consideration of regulatory requirements such as the management of chemical risks. Provide support services that add value to products, helping ensure positive customer outcomes.

Cross Enterprise Supporting Priorities:

Human Resources

■ The new world of work

Enable growth and sustainability by providing choice in the delivery of HR processes and services. Increase value, employee satisfaction, and business performance. SAP solutions can help align goals and objectives from the top down to ensure the organization is moving in the right direction.

Finance

■ Despite sustained market volatility and greater demand for regulatory compliance, financial organizations are excelling through best practices

Chemicals Value Map 2020

Customer Engagement and Co-Innovation
- Single Customer View
- Consent-Based Marketing
- Optimized Marketing
- Portfolio and Project Management
- Product Formulation and Recipe Development
- Sales Force Automation
- Sales Performance Management
- Quote to Cash
- Omnichannel Commerce Management
- Commerce Personalization

Planning & Sourcing
- Sales, Inventory, and Operations Planning
- Demand Management and Insights
- Response and Supply Management
- Manufacturing Planning and Operations
- Sourcing and Contract Management
- Supplier and Risk Management
- Buy and Deliver Direct Goods
- Procurement Analytics
- Trading Partner Collaboration
- Central Procurement

Integrated Operations Management
- Buy and Deliver Indirect Goods
- Manufacturing Execution
- Manufacturing Networks
- Industrial Insights
- Environment, Health, and Safety
- Asset Operations and Maintenance
- Asset Performance Management
- Buy and Deliver Services
- Invoice and Pay

Delivery & Service
- Product Compliance
- Order Promising
- Warehouse Management
- Transportation Management
- Track & Trace and Logistics Network
- Yard Logistics
- Omnichannel Customer Service
- Customer Experience Management

Human Resources
- Core Human Resources and Service Delivery
- Payroll & Time and Attendance Management
- Talent Management and Learning
- Talent Acquisition
- People Analytics

Finance
- Invoice-to-Pay
- Invoice-to-Cash
- Real Estate Management
- Financial Performance Management
- Record-to Report
- Treasury Management
- Travel-to-Reimburse

Analytics

Platform and Technology
- Application Platform and Infrastructure
- Database and Data Management
- IT Management
- Security Software
- IoT Business and Technology Services

Legend:
- Core industry priorities
- Cross-enterprise supporting priorities
- Technology and platform

The following customer references outline and describe recent customer successes that support the four core industry priorities.

Organizations that have a 360-degree view of finance processes enable their people to collaborate more efficiently and use business insight more effectively driving better overall business decisions. By focusing on best practices and utilizing machine learning, finance organizations can reduce the amount of non-value added work and focus those resources on more value add services.

Business Technology Platform:

Analytics

■ Leverage modern analytics to ensure the success of the digital enterprise

Revolutionize decision making by giving everyone the analytic capabilities they need to discover, plan, and predict better business outcomes. Help ensure trusted data discovery by combining on-premise and cloud data – without moving or replicating data. Use a fast, scalable analytics platform that leverages your existing SAP investments.

Application Platform and Infrastructure

■ Build, run, and extend your applications on a consistent application platform and infrastructure

Rely on your network of business applications to support every aspect of your business. With the SAP application platform and infrastructure, you can:
■ Help ensure common standards, robust interoperability, and flexible extensibility.
■ Access a solid set of underlying technology platforms and related infrastructure services such as integration, collaboration, and interface management.

# Customer Engagement & Co-Innovation – Customer Cases

Working Faster with Partners and Customers to Bring New Ideas to Market

Winning the Race for the Best Taste

Ongoing commoditization and margin erosion require chemical companies to focus on co-innovation, and the selling of business value and outcomes instead of just products, with the ultimate goal to deliver entirely new customer and consumer experiences. This requires connecting and collaborating with manufacturers using chemical products, understanding and becoming part of their value chains, and leveraging digital technology to deliver business outcomes, and unprecedented customer experiences. This trend is increasingly true for specialty chemicals but already an imperative specifically for flavor & fragrance manufacturers. In this business companies are in a race to be the first who offers a tailored solution for a customer problem.

In an approach to bring sales and marketing, the back-office and R&D together Döhler - a global producer, marketer, and provider of technology-driven natural ingredients, ingredient systems, and integrated solutions for the food and beverage sector – managed to reduce the time for tender management by 50%.
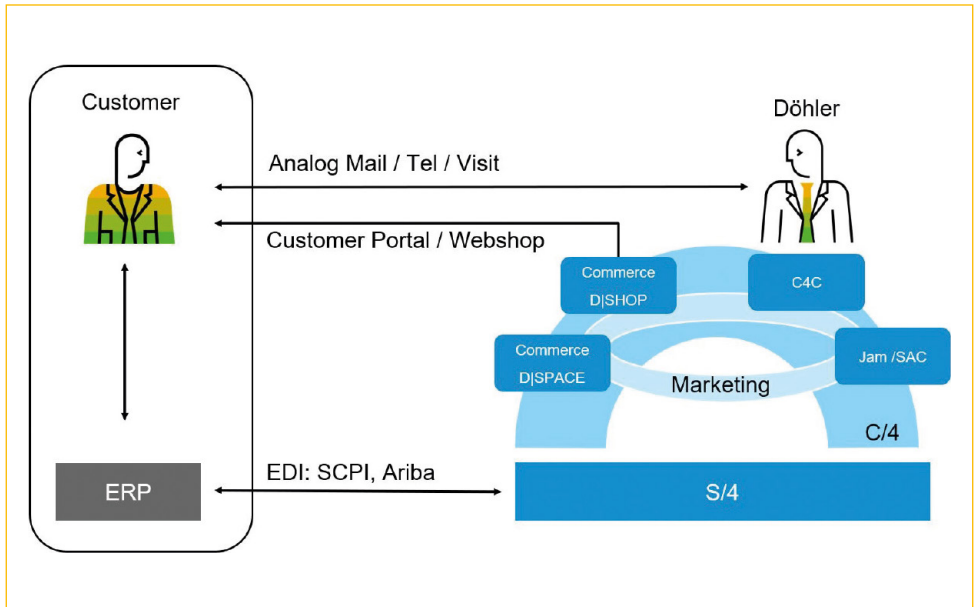
Preparing the Back-Office for Digital Transformation

Döhler had run its operations on the SAP® ERP application since 1993, which resulted in a highly customized and specialized system with more than 33,000 custom objects. To accelerate growth, Döhler needed to update this platform and automate its sales activities. Deploying SAP S/4HANA across its finance, logistics, and manufacturing lines of business, Dohler gave a special focus to price management. The tender management team can now handle larger tenders, and the company has a better overview of operations. With that, this platform enables Döhler to run new business processes and create innovative business models that deliver even more value to partners and customers.

Efficient R&D

S/4HANA is the only ERP system that can manage chemical information and allows the development of recipes based on those. Making use of the Recipe Development application, an integral part of SAP S/4, HANA Döhler is able to work with one global system for research and development to get products to market more quickly and ensure full transparency on every product developed. With a strong customer focus, thousands of innovative and personalized recipes are created or changed each year. However, all those can be successful in the market only by aligning R&D with sales and marketing.

Understanding Customers Better

To address customers better, Döhler´s digitalization strategy also incorporates closer customer interaction. This comprises an extranet for customers which consists of a content-rich solution area, customer tools for interaction and strong collaboration capabilities. On top of that, Döhler needed a sophisticated marketing solution to address individual customer needs and capture profiling data from multiple customer interactions. By integrating aggregated profiling data with a golden record for aggregated customer data, SAP Hybris marketing cloud gives Döhler the opportunity to significantly improve customer response and conversion rates from running highly targeted marketing campaigns aimed at specific customer segments.

With all that, Döhler – a company of around 1.5 billion € revenue and more than 5000 employees of which 600 are in R&D - gives an example of how digital transformation in a specialty business will look like and how R&D and sales & marketing can be better aligned while being perfectly supported by the back-office.

Customer Engagement & Co-Innovation – Customer Cases

Revamping Customer Experience – A Transparent Transformation Journey with the SAP C/4 HANA Implementation

**Aditya Birla Chemicals –
Grasim Industries Limited (Epoxy Division)
Customer Engagement Transformation
and Sales Process improvement through
SAP C4HANA**
https://www.adityabirlachemicals.com/chemicals.php

Aditya Birla Chemicals represents a flagship sector of the Aditya Birla Group. Aditya Birla Chemicals India Ltd. manufactures and markets chemicals such as chlor-alkali, epoxy, fluorine chemicals, peroxides, phosphates, and sulphites. Aditya Birla Chemicals has 20 manufacturing locations spread across India, Thailand, and Germany with more than 10,000 employees reaching out to customers in more than 80 countries.

Aditya Birla did not have a customer engagement software solution and the entire product presales process was done via e-mail. The presales process database was maintained in a Microsoft Excel spreadsheet. The Aditya Birla sales team had to manually coordinate with their backend office team, who in turn made manual entries into their SAP ERP system. The average turnaround time to create an Aditya Birla customer was 2 days due to the lag between the customer conversion and the creation of the Sales Quote in their SAP ECC ERP system. In case any data was required at a global level, the Aditya Birla teams had to manually coordinate and consolidate data which took an extended period of time. There was also no provision to track progress of the Aditya Birla Chemical products under Research and Development. Budgeting and forecasting were also difficult to achieve in the absence of a customer engagement system.

The SAP C4/HANA solution was first implemented for Aditya Birla Chemicals – Grasim Industries Limited (Epoxy Division) to revolutionize the customer engagement process across 3 countries. The SAP C4/HANA solution enabled real time integration of the Aditya Birla Chemicals product pre-sales process with their SAP ECC ERP system. The real-time integration of the two systems also allows the sales order created from the sales quotation to be triggered at the backend as soon as a prospect is converted to a customer in SAP C4/HANA. The Aditya Birla Chemicals business can now analyze consolidated data from their SAP C4HANA solution integrated with their SAP ECC ERP system at multiple levels for all 3 plants, eliminating manual coordination, and significantly reducing chances of error. Aditya Birla Chemical Products under Research and Development can now track progress of products centrally through the SAP C4HANA system as well as the standard sales cycle lead, opportunity, and prospect. The cost incurred and ROI achieved from the Aditya Birla product sample requests being ordered and tracked by customers can now be estimated accurately without losing track of the product sample ship-

ments. Features such as potential mapping, budgeting, and forecasting have also been added to facilitate inventory planning and minimize costs.

The SAP C4HANA implementation at Aditya Birla Chemicals has facilitated business improvements in the following ways: 1. Availability of a robust and scalable IT solution platform that automates several day-to-day operations thus reducing response time for client's customers, and leverages industry best practices to align with management's growth strategy. 2. Reduction in inventory carrying costs with the help of the budgeting and forecasting feature. The business can now accurately gauge the demand and procure supplies accordingly. 3. Integrated and simpler landscape – multiple applications running in silos are now replaced by the single SAP C4HANA system that maintains processes of all plants across the globe. 4. This has reduced costs by at least 40% through reduction of man hours and reduced error in data management to NIL as manual coordination is no longer required. 5. Employees spend 95% less time on administrative work, such as data entry and coordination, and can work on more productive activities directly aligned with both business and personal growth. 6. Seamlessly integrating SAP ECC ERP with SAP C4HANA, thus ensures that the business makes the best use of both SAP platform solutions for increasing profitability and enhancing customer engagement.

Quantitative Benefits:
- Customer creation time has reduced from 2 days to 1 hour.
- Data transparency has significantly increased, thus reducing errors by more than 95%.

- Man-hours spent on administrative work reduced by more than 90% due to the availability of consolidated data in the SAP C4HANA solution.

Aditya Birla Chemicals SAP C4HANA Project & Use Case Details:

Lead Management & Project Development including R&D:
- Lead and Opportunity Management is used to capture and track both external and internal leads.
- R&D product will be captured as a lead. All phases for a 7 step R&D approval process will be configured.
- A web service is provided to the Website team to generate Leads on SAP C4HANA.

Customer Creation:
- SAP C4HANA capability has been leveraged to create Customers and Prospects.
- The system has been customized to combine common customers from Thailand and India.

Product Sample Request by Customers & Prospects:
- Lead and Opportunity are used to capture and track all product sample requests by customers & prospects.
- Before sending product samples to a customer or prospect, the Opportunity is converted to Sales Quote/Order.
- Standard SAP C4HANA reports are in place to keep track of Opportunities.
- Customizations are implemented for product sampling process.

Visits & Surveys: The objects below have been created in the system to improve customer experience:

- E-Mail templates including surveys
- Target customer & prospect groups
- Visits with tasks, surveys, follow up items, pictures, and attachments
- Tour plans have been created

Potential Mapping:

- A functionality has been configured to capture the existing potential of selling to a given customer
- A competitor functionality is configured to capture the competitor scenario in the market.
- The data about the existing potential and competitors are captured in custom reports

Sales Performance and Sales History:

- Standard reports for sales in SAP C4HANA are used to track sales performance for the team
- A custom report has been created to combine sales data for Thailand and India customers.
- Sales Target Planning has been implemented to set and measure sales revenue targets for a specific time against various parameters such as sales person, territory, product, etc.

Dispatch Plan & Accounts Receivable (AR) Status:

- A custom screen has been created to enter and update the dispatch plan which is maintained manually.
- Reports have been created to view maintained dispatch plan.
- A web service has been created on the SAP ECC ERP system to be consumed on SAP C4HANA to get Accounts Receivable against customer.

Customer Profile & Pro-Active Margin Analysis:

- A customer Summary report has been created along with a customer profile view.
- A standard price list is used to arrive at margin analysis and proactive contribution.

Planning & Sourcing – Customer Cases

Introduction

It's not news that procurement in many chemical companies is undergoing transformation through cost pressures, global shift in demand, and raw material volatility. This requires great efforts to harmonize supply, sourcing and supply chain processes. What's new is HOW they are going about creating a successful digital strategy that will take them to the next level of business optimization.

Intelligent Spend Management has become the fundamental focus for companies to gain visibility into spend and integrate to planning, manufacturing and maintenance. Clearly, changes in raw material input costs can have quite a significant impact on profitability and need to be managed closely.

Obtaining the right grade of raw material at the right price, right time, complying to all safety and regulatory requirements is fundamental to the profitability of chemical companies. For many companies purchasing expenditures can be 20 – 60% of revenue for specialty chemical companies and 50 – 80% of revenue for commodity chemical companies.

The raw materials can be supplied from many different locations and in many forms and numerous grades. Minor

changes in the characteristics of the batch could have a huge cost differential to process them which makes procurement of direct materials challenging. This is more complex for specialty chemical companies. Therefore, it requires the buyers to have a deep knowledge of the product and perhaps certify every source of supply. The direct procurement solutions from SAP Ariba can help achieve the following business goals:

- Improve compliance through reduced risk in supplier selection and management
- Reduce costs by harmonizing processes
- Achieve greater process efficiency
- Increase visibility and collaboration

This offering is all part of the new SAP for Chemicals Value Map, which has been completely revised, in the section Planning and Sourcing.

Nufarm, an Australian agribusiness company, unified global procurement by deploying SAP Ariba solutions. Now, with standardized, simplified, and streamlined global procurement and enhanced supply chain efficiency Nufarm can deliver the best value products to help farmers around the world grow healthier, stronger crops.

„SAP Ariba solutions allow us to keep procurement simple, removing any roadblocks so that staff can complete tasks more quickly and more easily.“
(David Bury, CPO, Nufarm Limited)

Planning & Sourcing – Customer Cases

Driving Customer Value with End-to-End Supply Chain Planning

Industry Vision

Resource scarcity, complex supply chains, global competition, and perpetual disruption create serious challenges for the chemical industry. The inability to understand volatile demand patterns, align strategy with execution, and collaborate with complete visibility exposes significant risk. However, the ability to connect strategic & operational planning with real-time visibility & execution enables chemical companies to face these challenges. This transformation requires end to end supply chain planning capabilities to unlock new sources of value and respond profitably in a dynamic market.

Integrated Business Planning as Key Enabler

With SAP Integrated Business Planning (IBP) powered by SAP HANA, next generation supply chain planning becomes a reality, transforming organizations for sustainable growth and profitability. These capabilities help synchronize outcomes across the value chain through collaborative planning with a holistic view for improved productivity and enhanced customer value.

Supply Chain Transformation

Kemira Oyj, a € 2.6 billion chemical company based in Helsinki, Finland, serves
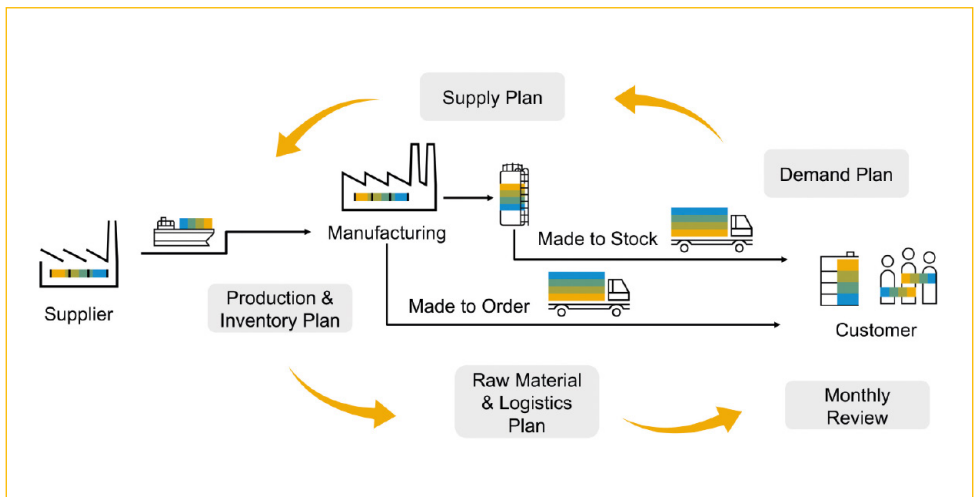
Through SAP Integrated Business Planning, Kemira drives customer value with transparent data and a single source of truth across the value chain.

businesses in water-intensive sectors such as pulp and paper manufacturing. Kemira provides chemicals expertise to enhance its customers' product quality, processes, and resource efficiency. Chemicals are fundamental to how we all live, and Kemira innovates with chemistry to create value and improve everyday life. Kemira recognized the need to transform their supply chain planning processes to better align demand with supply and eliminate manual processes to respond faster to customer demand.

Seeking to improve supply chain reliability and efficiency, Kemira looked to streamline its global planning process to better support its team of 500 sales managers across all sales regions. They needed to build end-to-end planning capabilities, enable demand-supply balancing across product lines, and eliminate manual balancing. To transform their supply chain planning capabilities, Kemira implemented SAP Integrated Business Planning, taking advantage of one common platform to unify planning across 60 manufacturing sites and 200 products.

Why SAP?

Kemira Oyj chose SAP because of their proven cloud solution enabling end-to-end supply chain visibility and real-time supply chain management. The opportunity to reduce complexity by replacing multiple legacy systems with a simplified software landscape was extremely important. Additionally, SAP was a key part to the overall digitalization strategy supported by multiple solutions.

The Kemira journey focused on value and better serving their customers through a more integrated planning process. They were able to boost efficiency and reliability and increase forecast accuracy to more effectively respond to market expectations. Enhanced customer service has resulted in record-high on-time delivery performance and customer rating. One common platform empowers the Kemira team to create value with a powerful tool and simplified planning processes.
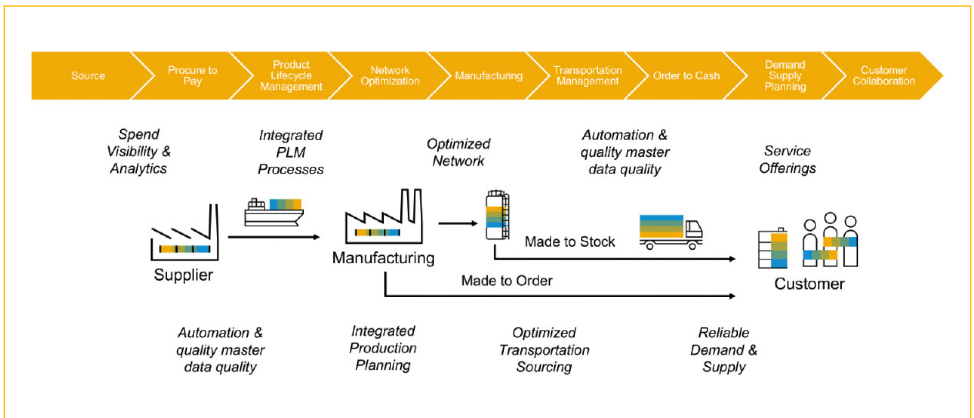
Kemira drives optimization and integrated planning processes across the value chain for enhanced customer value.

Outcomes Achieved Through SAP Integrated Business Planning

- Gain end-to-end supply chain visibility to help globally align and optimize the sales need and manage supply and capacity
- Execute and automate demand planning and better match it with accurate forecasts across a network of 60 manufacturing sites spanning 200 products
- Allocate scarce manufacturing capacity to the highest margin-contributing business and optimize procurement decisions
- Enhance supply chain performance and meet short-term needs, using real-time planning based on monthly and weekly forecasts
- Unify planning processes, helping meet profitability, cash-flow, and business targets

"SAP Integrated Business Planning for Supply Chain improves forecast accuracy, supports on-time delivery, and allows us to build profit-optimized plans."

Simo Nuutinen, Head of Global Planning, Supply Chain, Kemira Oyj

"We now have 600 users empowered by SAP Integrated Business Planning for Supply Chain, helping us make data-driven decisions across our operations, improving forecast accuracy, supporting on-time delivery, and allowing us to build profit-optimized plans."

Simo Nuutinen, Head of Global Planning, Supply Chain, Kemira Oyj

Planning & Sourcing – Customer Cases

Feeding the World with World Class Demand Planning

Industry Vision

In the experience economy, customers expect more than just a product, they expect outcome and values requiring chemical companies to rethink traditional business models. The complexity behind bringing chemicals to market requires synchronizing these outcomes across the value chain to deliver sustainable, safe, and innovative products & services. Thriving in a digital world requires connecting huge amounts of data, integrating planning processes, and optimizing across the enterprise to deliver the ultimate customer experience.

Integrated Business Planning as Key Enabler

With SAP Integrated Business Planning (IBP) powered by SAP HANA, world class demand planning is achieved by leveraging intelligent technologies and collaborative processes to improve visibility and forecast accuracy in even the most volatile markets. The SAP Integrated Business Planning solution enables fast responses to new market expectations and fulfillment of future demand based on real-time information from your extended value chain.

Supply Chain Transformation

One of the world's largest crop protection and seed producers, headquartered in Basel, Switzerland, Syngenta helps humanity face one of its toughest challenges – how to sustainably feed a growing population. The enterprise provides products that help farmers achieve global food security for more people while enabling
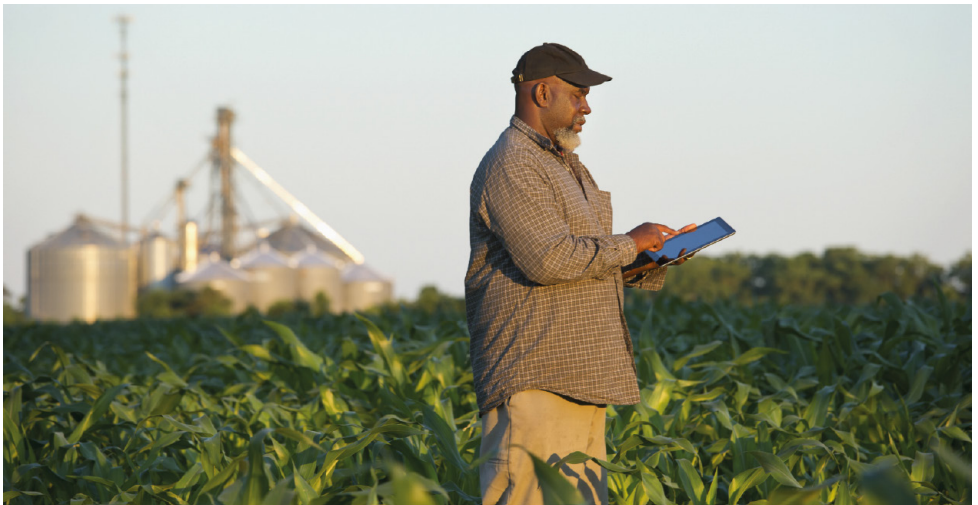
SAP Integrated Business Planning for Demand
Overview

Demand Management

Develop an accurate forecast on any aggregation level for any horizon

Exception Management

Focus planners on problems and identify opportunities for improving the forecast and the overall process

Statistical Models

Time-series, regression and machine learning based forecasting methods

Embedded Analytics

Create Dashboards and ad-hoc analytics for any key figure or KPI

Demand Sensing

Create short-term forecast to drive better fulfillment and inventory reduction

What-if Analysis

Fast and simple scenario simulation with complete view on overall supply chain impact

those farmers to produce healthy, premium crops and minimize their use of precious natural resources. To better support farmers and customers worldwide, Syngenta needed consistent planning processes and faster planning cycles. They recognized that their organization was not leveraging data to its fullest extent and turned to SAP Integrated Business Planning with machine learning to better predict customer demand. By Improving overall forecast accuracy and reducing forecast bias across > 90 countries, Syngenta was able to make profitable decisions with improved visibility and data clarity.

Full Value – SAP Streamlined Approach to Demand Planning
Cluster and Organize Your Demand Planning Process

Monitoring & Controlling of the Planning Process*

Process Step 1 Process Step 2 · · · Process Step n

Segmentation

Quarterly/Yearly

Consensus Demand Planning

Statistical Forecasting

Weekly/Monthly

Management by Exception*

Manual Input by Planners

Daily/Weekly

Time Series Analysis

Quarterly

Forecast Accuracy Calculation

Monthly
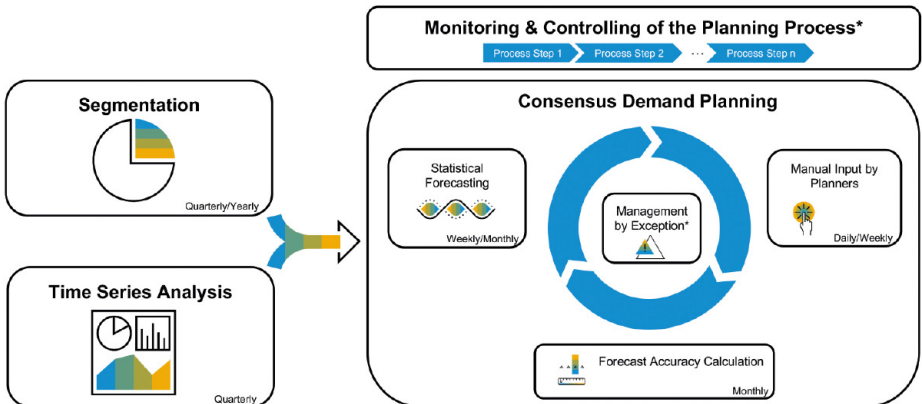
*Additional licensing may apply

SAP Consensus Demand Planning Process
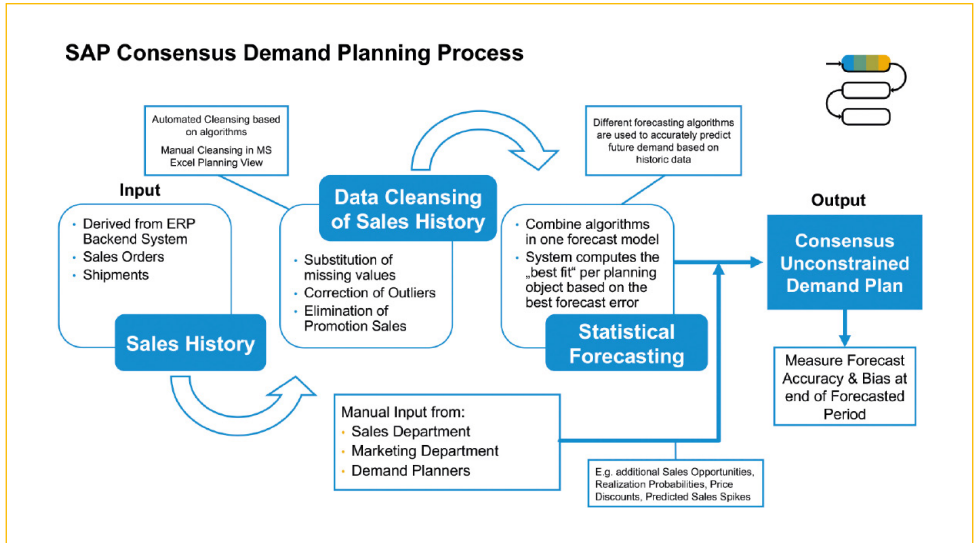
Why SAP?

Syngenta relies on SAP Integrated Business Planning to improve their demand planning processes. With machine learning, they can take sales data and combine with other variables, including weather or economic indicators, to more effectively understand the market and predict customer demand. The results are dramatic including increased forecast accuracy, reduction in lost sales, and reduced time and effort during forecasting. With SAP, the data and processes between sales, operations, finance, and demand planning are in sync, enabling end to end collaborative planning. Better decision-making results in better experiences for growers around the world.

Outcomes Achieved Through SAP Integrated Business Planning
- Harmonize sales, operations, and demand planning processes to increase efficiency with a flexible data model and preconfigured templates and integration
- Reduce inventory by improving overall forecast accuracy by 10% through statistical forecasting
- Reduce lost sales related to forecast error by nearly 20%
- Identify the best forecasting technique for each product, based on demand variability and business importance
- Use diagnostic analytics in flexible dashboards to strategically direct the business
- Enhance business performance KPIs
- Shift internal functions such as sales, marketing, planning, finance, and production from just communicating to collaborating, so the business can make better, more-timely decisions
- Achieve real-time insights and monitoring on aggregated and detailed levels, as well as operational and financial planning enabled by simulations

Integrated Operations Management – Customer Cases

Sika – Tank Management and Monitoring Solution

Sika is a specialty chemicals company with a leading position in the development and production of systems and products for bonding, sealing, damping, reinforcing, and protecting in the building sector and motor vehicle industry. With subsidiaries in 100 countries around the world, over 300 factories, and more than 25,000 employees, Sika generated sales of CHF 8.1 billion in fiscal 2019. (https://www.sika.com/)

Sika's concrete business produces water-based bulk chemicals (admixtures) that are stored in Sika-owned tanks at either fixed or mobile customer locations. Sika aimed to ascertain consumption, plan replenishment & optimize truck scheduling by monitoring stock of admixtures in tanks at customer locations. Along with tank level monitoring, Sika also wanted to monitor ambient temperature because these water-based products are frost sensitive.

Sika's main challenge was that the sales personnel were required to perform on-site visits at customer locations where Sika-owned tanks were deployed in order to check stock / tank level & order replenishment. However, for mobile tanks, there was no stock / tank level visibility. Such deficiencies in monitoring stock levels were leading to lost opportunities and deficient customer service.

Sika wanted to implement a bulk chemicals (admixtures) tank management and
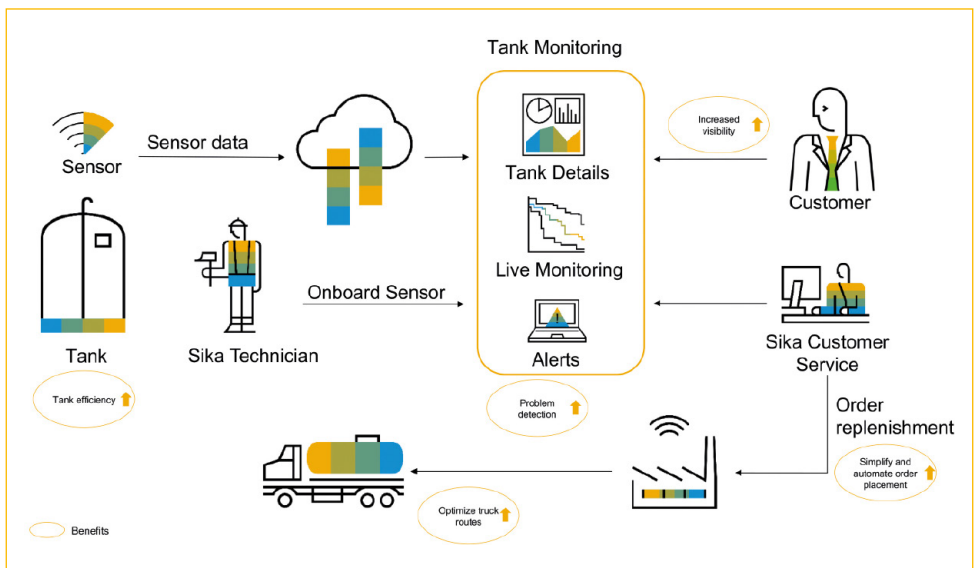
monitoring solution to monitor stock / level and trigger a reordering process when tank content / level reaches a threshold level. The system would also alert technicians / sales personnel to various key KPIs (i.e. temperature, offline device, stock level etc.)

For their bulk chemical tanks located at customer locations, Sika automated level monitoring by equipping them with sensors that measured content level, ambient temperature and collected geolocation coordinates. These sensors continuously monitor various tank specific values (e.g. fill level, temperature), which are then uploaded after a period to SAP Leonardo IoT platform.

Sika also developed a (Tank Management & Monitoring) Fiori Application, deployed on SAP Cloud Platform, using sensor data to monitor bulk chemical tanks and onboard Sensors. This application is built for technicians who install sensors on tanks, sales personnel who track current inventory levels at any customer location, as well as customer service staff who are responsible for stock replenishment and logistics.

The business context for data as collected by sensors installed on tanks at customer locations was organized through SAP Cloud Platform Cloud Connector to pass required master data and configuration data from on-premise SAP ERP system to the (Tank Management & Monitoring) Fiori Application. This connection service also ensured the creation of sales documents back to on-premise SAP ERP system enabling to order replenishments.

While using the Tank Management & Monitoring Fiori Application, Sika customer service staff can see automatically generated alerts on a dashboard and drill down to specific customer sites and tanks. In addition, Sika sales personnel can track inventory levels and order replenishments within the Fiori application when tank level reaches a threshold level.

The Tank Management and Monitoring Solution, as setup by Sika, helped automate the re-ordering process, reduced travel expenses by eliminating sales personnel travel to multiple customer sites, ensured remote monitoring of tanks, reduced rush orders, improved demand overview for production planning and minimized delivery costs by aggregating replenishment orders as well as optimizing delivery routes.

Integrated Operations Management – Customer Cases

URALCHEM - Fertilizer Granulation Drum Productivity Improvement with Machine Learning

URALCHEM is a global producer and supplier of nitrogen and complex fertilizers. It is the largest ammonium nitrate producer in Russia and the second largest ammonia and nitrogen fertilizer producer in Russia. URALCHEM's main competitive advantage is the development and production of innovative fertilizers tailored to countries, markets and segments. (https://www.uralchem.com/)

In fertilizer plants, granulation is the final process step to obtain the finished fertilizer product. However, this last step often places constraints on the production as it is a bottleneck to consistently manufacture fertilizer granules with size and shape that are aligned with defined quality requirements. Multiple factors such as

the optimal rotation speed of the drum, the temperature, moisture or the physical and chemical properties of the individual components being granulated together can affect the fertilizer granulation process, and determine the shape and size of the finished fertilizer.

Fertilizer manufacturers across the world have been trying to increase productivity of granulators without compromising quality either by technical means or by managing material flows. For instance, URALCHEM attempted traditional ways to increase granulation efficiency through technical re-equipment, by setting up an automated process control system, enhanced operator training, etc... without achieving the targeted benefit.
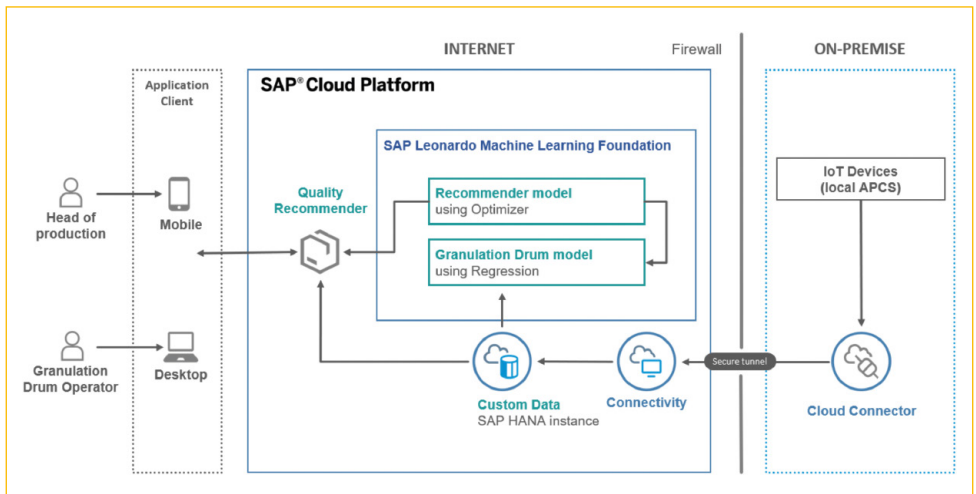
Hence, URALCHEM decided to use and deploy intelligent technologies like Machine Learning to generate productivity improvements in the granulation process.

URALCHEM created a cross-functional team of representatives from URALCHEM management, specialists from SAP, SAP partner BDO and technical specialists working in the plant (KCKK Branch of URALCHEM, JSC in Kirovo-Chepetsk). The team's goal was to maximize the product yield of fertilizer granules while maintaining a stable quality using the existing granulation drum. The second goal was to ensure that both productivity and quality were not dependent on the operator's skill level.

In order to reach these objectives, the team wanted to determine and analyze the „implicit" correlations between the operating parameters of the granulation process and the fertilizer yield. SAP and cross-functional team successfully developed a digital twin for the drying and granulation process performed in a drum type granulator-dryer (DGD). This digital twin was enriched with process parameters by connecting it to live DGD operations data utilizing SAP Edge services. The historical operating process parameters associated with the granules yield formed the basis to structure a custom database using SAP HANA service in SAP Cloud Platform (check Granulation Drum productivity Improvement Solution Architecture). SAP Leonardo Machine Learning (ML) running on SAP Cloud Platform explored the custom database of historical values to ascertain the relationship between the process parameters and the granules yield and built a granulation drum model. This ML drum model was further trained with historical data to create a quality recommender "The operator's assistant" system. The ML assistant reads and analyzes the live process parameters and provides the recommendations of optimal process parameters values to the drum operator to complete the required production.

This ML based granulation drum productivity improvement project will enable URALCHEM to achieve an estimated increase in output of finished products by 2-10%. The implementation of the quality recommender "The operator's assistant" enables constant production of fertilizer granules fulfilling the quality requirements without compromising the productivity regardless of the skill level of the operator thus leading to a better customer experience.

Delivery & Service – Customer Cases

The Value of Standardizing and Automating Warehouse Operations

The Delivery Imperative

As raw material suppliers to the companies that make everything from car tires, to mattresses, to tablets, to animal feeds, chemical companies have unique delivery challenges. Their products must be delivered on time so their customers' production lines don't stop, no matter where their plants and warehouses are or where their customers are located. This makes logistics a critical business priority in the chemical industry.

Fulfilling Customer Delivery Requirements

To address logistics challenges, Evonik Industries AG, a world leader in specialty chemicals headquartered in Germany, implemented a single solution to standardize and automate fulfillment processes at all

of their warehouses. Now they manage global warehouse and delivery processes more efficiently, saving time, lowering costs and providing value to both their customers and their shareholders.

Like many chemical companies, Evonik is growing by acquisition. When it acquired J.M. Huber's silica business in the US, Evonik found itself running six warehouses in multiple regions on legacy systems. They needed to harmonize warehouse processes worldwide, at the same time as integrating the new silica business.

Evonik standardized on SAP S/4HANA Supply Chain for extended warehouse management (EWM), moving all the acquired warehouses onto a single platform in a nine-month project. Warehouse operations were stable from day one of the project, which went live without any business disruptions. Efficiency of warehouse
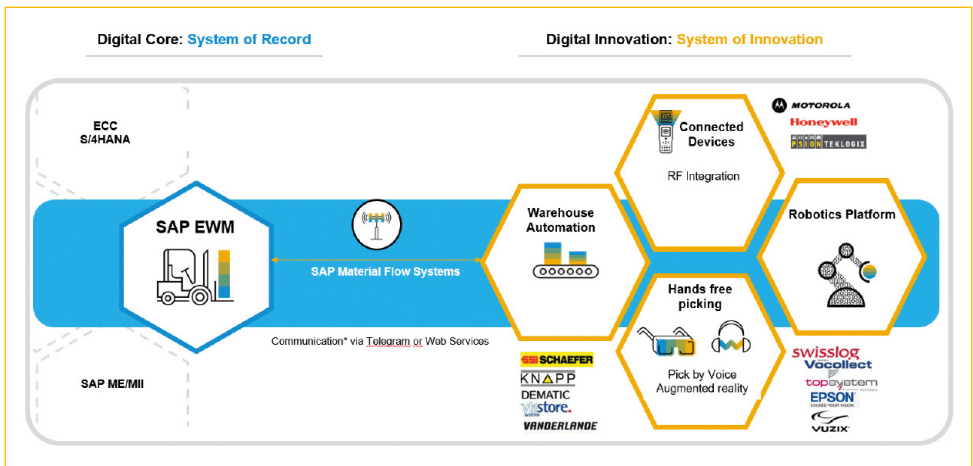
operations improved due to integration of EWM with the SAP ERP core, as well as with mobile solutions.

Full integration and optimization of production and delivery processes now enables Evonik to meet the needs of their customers at the same time as they achieve profitable growth.

Creating an Intelligent Warehouse

On the other side of the world, Kingfa Science and Technology Ltd, an advanced materials company headquartered in China, wanted to move to one logistics platform driven by service best practices for the chemicals industry in order to improve customer service levels. A second but equally important goal was to lower service costs.

Kingfa chose to implement SAP EWM because it met their industry needs, provided excellent support and extensibility for production and sales logistics, and integrated closely with SAP's ERP core. The implementation included bar code scanning and handling-unit-based management of the entire fulfillment process, enabling end-to-end traceability of product. They also extended warehouse management to include process visualization that enables scientific management of vehicles, docks, and warehouse process.

Post implementation benefits reported at their Kunshan warehouses include:

- 20% increase in efficiency of raw material delivery
- >80% increase in efficiency of production preparation for sales delivery (per employee)

Thanks to their intelligent warehouse and logistics platform, Kingfa has achieved operational excellence and enhanced core enterprise competitiveness.

Key Technologies

The current pace of technological advancements has the most profound impact on enabling how chemical manufacturers transform themselves to respond to market trends and deliver an entirely new customer experience.

Intelligent technologies promise to bring great benefits such as productivity and efficiency gains, enabling innovative new business models and new revenue streams. The following intelligent technologies are instrumental in helping chemical companies respond to market trends.

Artificial Intelligence and Machine Learning

Machine learning enables algorithms to "learn" from existing data and achieve the best possible outcomes without being explicitly programmed. Once the algorithm is trained, it can then predict future outcomes based on new data. Businesses can use these capabilities, for example, in cash management to boost automatic matching rates and free up finance professionals to focus on strategy and service quality or in HR to automate the talent screening process and identify the candidates with the best skills and education match for a specific job description.

The Internet of Things

Advances in ubiquitous connectivity and edge computing are driving a step change in business productivity. This connectivity, coupled with artificial intelligence and machine learning, can analyze petabytes of data and affect business outcomes. Although manufacturers have been using the Internet of Things for some time, now the entire value chain can be connected from development to production to supply chain. Data-driven insights can drive customer-centric innovation, lower material costs, and reduce risk. Remote condition monitoring of assets provides real-time data from machines to predict maintenance needs and identify potential quality problems in manufacturing processes before they occur. Assets can be jointly managed as digital twins by manufacturers, customers, and partners, thereby improving asset data and modeling.

Advanced Analytics

The integration of advanced analytics capabilities, including situational awareness, into applications enables business users to analyze data on the fly and drives better decision-making. Empowered users, benefiting from embedded analytics in business processes, can get real-time visibility into their changing environment, simulate the impact of business decisions, mitigate risk, and achieve better customer outcomes.

Blockchain

A relatively recent breakthrough technology, blockchain is revolutionizing the movement and storage of value by creating a chain of unaltered transactional data. The blockchain model of trust, through massively distributed digital consensus, could reshape supply chains and commerce across the entire digital economy, for example, by digitalizing the bill

of lading document as part of the international ocean shipping process.

Virtual and Augmented Reality

Virtual reality – the use of digital technology to create immersive simulations – was once the stuff of science fiction. So was augmented reality, which lets users interact with digital content that's overlaid on the real world. Already in use to help workers with difficult or infrequent maintenance activities, this will become even more critical to attract and retain new talent.

Conversational AI

Advances in machine learning are enabling algorithms to become highly accurate in natural-language understanding and in image and speech recognition, especially useful in after-service and call-center activities. Voice interface will be the go-to technology for the next generation of applications, allowing for greater simplicity, mobility, and efficiency while increasing worker productivity and reducing the need for training.

Data Platform to Manage Experience

Leaders are connecting operational data from companies' business systems (what is happening) with the experience data coming from customers and employees (why it is happening) to get 360 views, actionable insights and to deliver better experiences.

~50%

Of new mobile apps use voice as a primary interface, and 50% of the consumer-facing G2000 will use biometric sensors to personalize experiences by 2020[13]

30%

Of manufacturers will use blockchain services as a foundation for digital trust at scale[14]

50%

Of new industrial robots will leverage AI by 2019[15]

57%

Increase, on average, of the contribution of machines and algorithms to specific tasks by 2022[16]

US$1.2 trillion

Internet-of-Things spending in 2022[17]

75%

Of manufacturers will provide their service teams with access to searchable video content through mobility and wearables by 2021[18]

40%

Of digital transformation initiatives will use AI services[19]

SAP's Framework for the Intelligent Enterprise in the Experience Economy

Most organizations understand what is happening in their business but may not always know why.

They know what's happening because they have systems that capture operational data (O-data) – about their customer transactions, supply chain, manufacturing, spending, and the activities of their workforce. They can see that data through reports and dashboards. They can see trends and predict what will happen next.

But to influence what happens next, companies need data about the interactions that people have with their products and their business. Experience data (X-data) captures beliefs, emotions, opinions, and perceptions – the "why" something is happening. And when companies know why something is happening, they can make an informed decision about the best way to respond.

To win in this experience economy, intelligent enterprises connect experiences with operations. They use both X-data and O-data to guide their business decisions. Intelligent enterprises collect in-

sights from customers, employees, products, and brands at every touch point. They use powerful technologies to automate and integrate their data, processes, and applications, enabling them to sense risks, trends, and opportunities. And they act on this intelligence across every part of their business. (see figure)

Only SAP has the strategy, expertise, and solutions to deliver on this vision, enabling intelligent enterprises to turn insight into action.
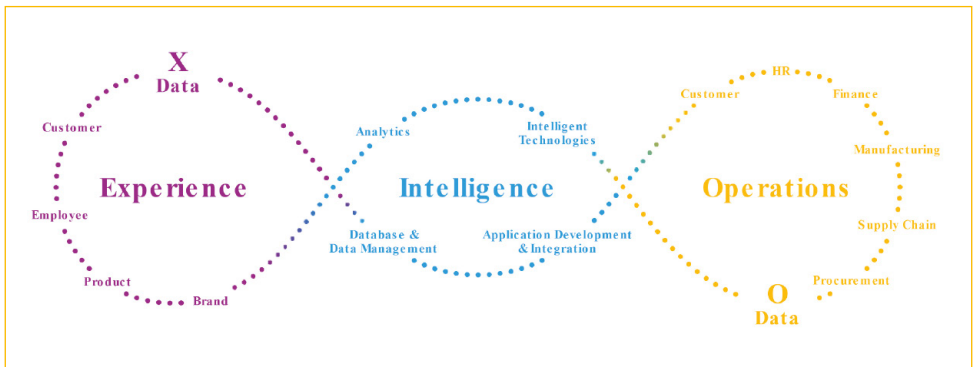
How to Plan Your Path to the Intelligent Enterprise

In the Digital Economy, Intelligent Technologies and Integrated Business Processes are now Driving Digital Transformation

To do this effectively requires an end-to-end plan for becoming an intelligent enterprise. This includes creating an intelligent enterprise road map and implementation plan with proven best practices and deployment options that optimize for continuous innovation with a focus on intelligent outcomes.

To move forward with speed and agility, companies focus on live digital data and combine solution know-how and industry-specific process expertise with data analytics so that the right digital reference architecture is defined and delivered. In that context, a model-company approach is aimed at simplifying and increasing the speed of the digital transformation journey. Model companies represent the ideal form of standardization for a specific line of business or industry. They are built on preconfigured SAP solutions based on best practices supported by SAP, along with the business content that encompasses our experience and expertise relevant for the industry. They provide a comprehensive baseline and come with the accelerators to jump-start digital transformation projects.

The End-to-End Journey to Becoming an Intelligent Enterprise

Plan
well to manage expectations

Simplify and innovate
- Reimagined business models, business processes, and work
- SAP Intelligent Enterprise Framework methodology as a guide for digital transformation
- Value-based innovation road maps

Build and launch
with proven best practices

Standardize and innovate
- Model-company approach to accelerate adoption with model industry solutions
- Design thinking and rapid, tangible prototypes
- Coengineered industry innovations delivered with agility

Run
all deployment models

Run with one global support
- One global, consistent experience
- End-to-end support – on premise, in the cloud, or with a hybrid approach

Optimize
for continuous innovation

Optimize to realize value
Continuously captured and realized benefits of digital transformation

SAP's Comprehensive Ecosystem Orchestrating the World to Deliver Value Faster

Our comprehensive ecosystem for the chemical industry offers:

- The Intelligent Enterprise as the overarching strategy to meet future requirements, providing:
- SAP S/4HANA co-development programs for customers and partners
- Industry co-innovation programs for industry-specific use cases
- Delivery of "enterprise-to-enterprise industry clouds"

- Thought leadership, evangelism, and enablement by industry through events, councils, and regular customer exchange
- Integration into a wide range of business services (OEMs, suppliers, key vendors, and more)
- Open architecture, with a choice of hardware and software specifically designed to meet requirements
- Complementary and innovative 3rd-party solutions to provide leading-edge and state-of-the-art technology

Our partner ecosystem includes, among others:

SAP is Commited to Innovation

10-Year Innovation Vision
SAP delivers fully intelligent business solutions and networks that span across company boundaries and promote purpose-driven businesses. These solutions will be the most empathic symbiosis between machine intelligence and human ingenuity.
- Self-running enterprise systems
- Self-organizing business ecosystems
- New markets and business models

Comprehensive Industry Coverage
SAP enables comprehensive coverage of the complete chemical value chain across the enterprise. With its clear industry road map, SAP is the partner of choice for chemical companies.
- More than 7.000 chemical manufacturers in 97 countries innovate with SAP solutions
- 95% of the chemical companies in the Forbes Global 2000 are SAP customers
- All lines of business are supported on a single platform

Proven Services Offering
By bringing together world-class innovators, industry and emerging technology expertise, proven use cases, and design thinking methods, we help chemical companies develop innovations that deliver impact at scale.
- Proven methodologies to drive innovation, from reimagining customer experiences to enhancing operations
- Innovation that is fueled through a managed innovation ecosystem from SAP
- Ability to build your own innovation capability and culture

SAP supports chemical companies in becoming intelligent enterprises – providing integrated business applications that use intelligent technologies and can be extended on SAP Cloud Platform to deliver breakthrough business value.

Circular Economy – Just Another Hype or a Truly Disruptive Force with the Potential to Transform Business and Society?

David Dunn

Monica Gassmann

Over the last years Circular Economy advanced to a "mega topic" being now top of mind of almost any CEO in the chemical industry. CHEManager editor Stefan Guertzgen sat down with David Dunn, Senior Director – Global Industry Marketing Chemicals and Monica Gassmann - Solution Manager for Chemicals at SAP in Walldorf, Germany, to discuss current and future developments

SG: What do you consider as the key drivers for Circular Economy?

David Dunn: As the chemical industry strives to reduce waste, create more effective processes and achieve a more sustainable environment they are looking to the concepts of Circular Economy to drive those processes and drive profitability through better utilization of side streams and waste recall. Many factors drive this focus.

Scarcity and volatile pricing of raw materials:

- The end of the "oil-economy" is foreseeable. Moreover, critical raw materials are not only limited in availability, but have hard-to-predict cost structures creating profitability pressures. Companies are looking at new ways to support waste management and to re-use waste as a resource for other areas of production. This can help ease the demand on oil based raw materials. A similar case is with sustainable water management which uses improved filtration and recycling.

Pressure from end consumers and downstream customers:

■ Consumers are becoming more environmentally conscious and demanding, and purchasing, more ecologically developed and produced food and goods. Large global players have started certification programs for their suppliers to ensure environmental compliance of their raw materials. This is potentially a play for Blockchain in the chemical industry to validate supply chain paths.

New regulatory demands:

■ Pressure from end consumers and environmentalist groups has resulted in new regulations that ban or restrict plastics around the world. We can see an increased ban on single use plastics and plastic bags in stores as well as consumers increasingly shunning plastic straws and single use coffee cups. Fines have been implemented to enforce compliance. This does not have to mean a death sentence for plastics producers: Reusing plastics could be-

come a vital profit driver for chemical companies if they move quickly to counteract new regulations and adapt to new processes.

Change in shareholder expectations as sustainability gains mainstream sentiment:

■ As companies across all industries increasingly embrace Sustainability and Purpose, we will see shareholders becoming more aware and demanding the same from chemical companies. This will add additional pressure on companies to avoid bad press or failing benchmarks within the industry.

SG: What major initiatives do you see in support of a Circular Economy?

Monica Gassmann: There are global initiatives that are starting to take action towards sustainability and the Circular Economy. These organizations are focused on working with companies to create technologies that reduce waste, maxi-

Traditional Supply Chain View

Design → Source → Produce → Store & Ship → Sell & Use → End of Life

New Supply Chain View

Customers & Consumers · Recycle · Design · Suppliers

Economic Performance

Public · Sell & Use · Source · Employees

Environmental Performance · Social Performance

NGOs · Partners

Shareholders · Store & Ship · Produce · Regulators
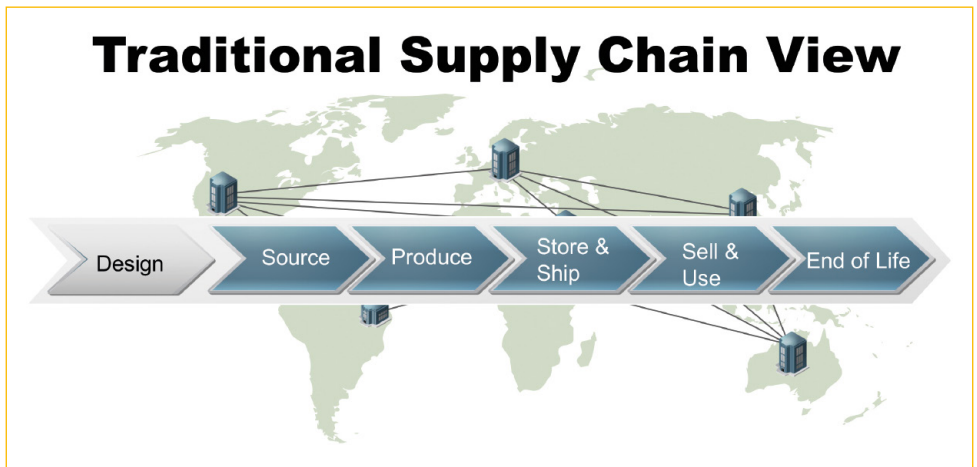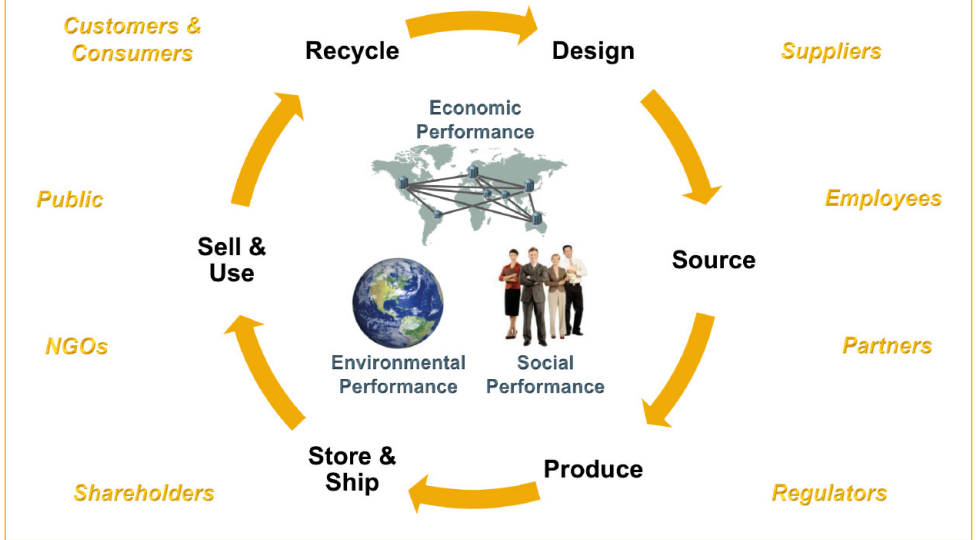
mize the usage of resources and create a more sustainable environment:

- The United Nations initiative is focused on sustainable consumption and production to do more and better with less, increasing net welfare gains from economic activities by reducing resource use, degradation and pollution along the whole lifecycle, while increasing quality of life.
- The European Commission has recently launched an ambitious Circular Economy Package, along with an action plan to transform Europe's economy into a more sustainable one.
- The Ellen MacArthur Foundation works with business, government and academia to build a framework for an economy that is restorative and regenerative by design. Its mission is to accelerate the transition to a circular economy.

- The Alliance to End Plastic Waste formed with >30 companies, including four of the five biggest global chemical players. They are committed to developing solutions that will reuse, recover and recycle plastics and keep it out of the ocean.

SAP is supporting these initiatives and is working closely with EMF and has recently, in Davos, joined the EM100 as well as the CEO Carbon Neutral Challenge.

SG: How can business and society benefit from circular initiatives?

David Dunn: There are an ever-growing number of use cases as companies focus on the issue, but here are a few for thought:

- Secondary materials marketplaces to manage, expand and smooth the trade of recycled plastics and plastic alternatives in a more effective way.
- Extended producer responsibility which focuses on the producer of plastics and packaging materials to work with customers and consumers to design more sustainable packaging.
- Waste insights which brings investors, waste managers, consumer industries, and startups together to invest in and build physical infrastructure where it is needed the most.
- Citizen engagement to educate and engage consumers to get materials in the right place for reintroduction into the value stream instead of the leakage stream.

SG: What roles could innovative technologies and business networks play?

Monica Gassmann: Technology can help customers redesign processes to achieve more circular business models. By tracking and tracing products and usage, companies can recall waste and byproducts to utilize in new production. Employing concepts such as The Internet of Things, Machine Learning, Blockchain and Artificial Intelligence, companies can redesign processes for more effective production and utilization of assets, raw materials and waste streams ultimately reducing emissions.

Utilizing networks to buy and sell rework and side streams can reduce overall waste and produce profits out of what was potentially a previous waste stream. Technology has a key role in supporting and managing these interactions between organizations to buy, sell and trade these streams.

SG: What's your vision of a "Platform of the Future"?

David Dunn: The platform of the future is based on the digital and intelligent enterprise. A digital core to help drive the management of raw materials, products and waste streams but then extended solutions to manage downstream processes. Several keys to this are the creation of marketplaces to manage recycle and reuse of products and streams such as plastics; drive best practices in responsible and sustainable product development and production; demand insights to start-up, investor and waste sectors and engage consumers around more sustainable solutions.

The use of data and analytics will also be key as companies start to lean on KPI's that measure sustainability in more dynamic ways such as carbon footprint, emissions, renewable energy, even down to a plant and product level. You cannot manage what you can't measure so there will be an increased need for this data in a measurable format not only within the company but also across the industry and beyond for benchmarking purposes and financial measurement.

SAP Partner Profiles

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THE BEST RUN **SAP**

Reaching the Next Level of Excellence in Manufacturing Operations

As part of an asset-intensive industry, chemical companies have focused their performance improvement initiatives in recent years on manufacturing and supply chain, which typically account for 60 to 70 percent of their overall cost structure. Many companies have therefore put in place manufacturing excellence teams that deployed Lean Six Sigma approaches, often with successful results.

However, as the maturity level of manufacturing operations is increasing, the marginal benefit of such approaches is diminishing. As such, chemical companies need to reinvent their excellence initiatives to improve the bottom line and finance investments in innovation. Digital technologies are creating new opportunities to do so, allowing companies to get a deeper understanding of operational performance and augmenting operators and engineers to make better decisions.
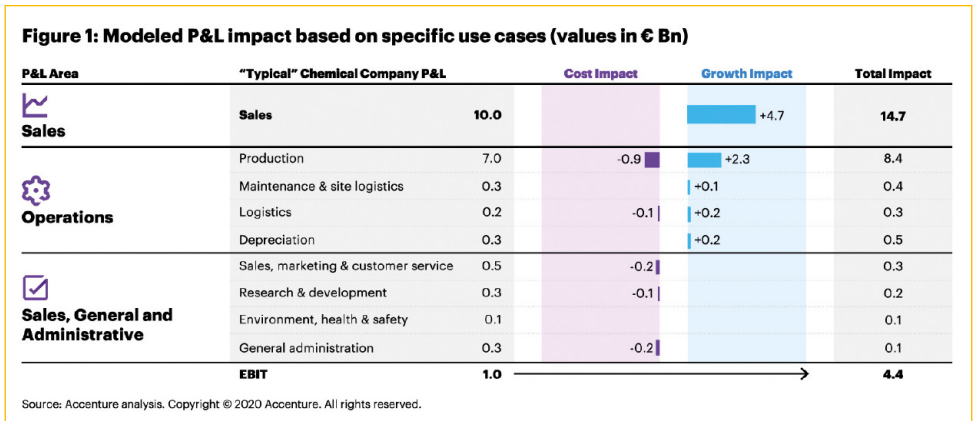
Accenture research reveals that a large share of EBITDA improvement for chemical companies can be released by adopting new approaches to manufacturing excellence, as well as customer experience and pricing (see Figure 1).

Furthermore, utilizing the large amount of data generated in the chemical industry (see Figure 2) — data related to production, maintenance and quality from ERP, MES and LIMS systems — will unlock significant value in relation to yield improvement, better energy management and maintenance cost optimization.

Next generation advanced process controls

Basic process controls are designed and built within the manufacturing process itself to facilitate essential operational, control and automation requirements. Advanced process controls are typically added subsequently, often over the course of many years, to address specific performance or economic improvement opportunities.

Figure 1: Modeled P&L impact based on specific use cases (values in € Bn)

P&L Area	"Typical" Chemical Company P&L		Cost Impact	Growth Impact	Total Impact
Sales	Sales	10.0		+4.7	14.7
Operations	Production	7.0	-0.9	+2.3	8.4
	Maintenance & site logistics	0.3		+0.1	0.4
	Logistics	0.2	-0.1	+0.2	0.3
	Depreciation	0.3		+0.2	0.5
Sales, General and Administrative	Sales, marketing & customer service	0.5	-0.2		0.3
	Research & development	0.3	-0.1		0.2
	Environment, health & safety	0.1			0.1
	General administration	0.3	-0.2		0.1
	EBIT	1.0			4.4

The process variance of each production unit gradually rises as plant equipment ages and/or when production volumes are increased. Production and quality start fluctuating as the individual variances of different production stages interact constructively or destructively at random. At this point, basic process controls become insufficient to harmonize production. However, artificial intelligence (AI) and machine learning (ML) algorithms can assess the dynamic operational conditions, analyze them and suggest enhanced parameters that lead to the optimization of costs, production and safety.

The use of AI, ML and deep learning techniques can be considered the "next generation advanced process control" approach in which intelligence is used to further improve operational parameters. When used alongside basic process controls, AI and ML can optimize scenarios and guide the relative basic set-points in a way that is complementary and constructive.

Batching and time-series shifts help to focus these set-points on a product batch as it passes through the plant, further increasing the impact of the optimization. AI and ML usually make suggestions that are relevant over hours and days rather than seconds, which is the job of basic process controls. Solving this challenge requires new approaches and the end-to-end optimization of a plant.

Consider an example: a leading plastics producer substantially improved its

Figure 2: Amount of data generated in the chemical industry

Supply chain 1-10TB per year	Offer │ Order configuration │ Contract │ Customs │ Delivery notes	**1,000-5,000** raw materials **2-5** suppliers per raw material **20-50** interactions per raw material	**50-50,000** data points per raw material (MSDS, REACH, real-time shipment status, pricing data, etc.)
Research & development 1-20TB per year	Recipes │ Experimental range │ Analysis results │ Research reports	**250-1,000** lab technicians **2-5** test series per technician per day **2-3** measurements per sample with 10-10,000 data points per test	**10-100** relevant papers and patents per day with 10-100 relevant data points per source
Production 50-500TB per year	Pressure │ Temperature │ Valves Speed │ Flowrate │ Quality	**50-100** plants **5,000-10,000** pieces of equipment per plant **5-10** data points every 10 seconds **100-5,000** measurements per plant	**1-1,000** data points every 1-10 seconds (pressure, temperature, flow rate, mixing, emissions, energy, performance, status, planning, etc.)
Product portfolio 1-10TB per year	REACH │ MSDS │ Analysis protocol Stock levels │ Batch details │ Application performance data	**10,000-20,000** stock keeping unites **100-1,000** data points per unit (documentation, stage-gate information, real-time pricing data, market information, competitor products, stock & shipment status, etc.)	
Customer interaction 1-2TB per year	**Technical support** Order history │ Data sheets **Customer service** Call recordings │ CRM reports **Sales** Customer strategy	**1,000-5,000** customers **50-150** data points per customer **4-5** interactions per month	**10-20** data points per interaction (production information, market data, product performance, prices, R&D activities, etc.)

Source: "Artificial Intelligence and Blockchain: Insights and actions for the chemical industry," Accenture in collaboration with Cefic.
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non-quality costs linked to off-specification polymers by better anticipating a variance in the polymerization step and taking corrective action in the curing step.

Another example from an industrial chemical cluster shows that substantial value can be extracted by better linking the on-site demand for utilities (steam, electricity) with the energy market environment. The development of renewable energy in several countries has increased the volatility of electricity prices, and an advanced operations approach can yield substantial benefits for the overall performance of a site where cogeneration units are used.

Making it work

Reaching the full potential of analytics in manufacturing requires the orchestration of different tasks. Technology is seldom the issue, and the maturity of data science algorithms is good.

The top priority is to identify relevant use cases that can be addressed through digital approaches. Analyzing existing variability and setting up experiments to explore new set-points is the right approach.

In parallel, making sure the required data will be available to conduct the issue analysis and develop predictive models is an important step in launching an analytics-based approach. If needed, soft sensors can be used to evaluate a process parameter that is difficult to measure directly, and low-cost sensors are available to validate the feasibility of developing a model.

Industrializing the approach is the next challenge. Three elements are key: connecting data streams to the analytics model; ensuring data quality; and finding the right balance between central processing and edge computing that is required to reduce

latency. Innovation in cloud technology beyond pure provisioning of storage and computing power makes the approach increasingly accessible, but it must be embedded in the security strategy of the company.

Finally, skills and capabilities need to be developed to sustain the effort and progressively extend it to increasingly sophisticated challenges. Following the example set by successful companies who are raising the bar in terms of data science literacy, process and operations engineers need to advance their knowledge of data science to identify opportunities and frame the work of data scientist teams. They need to accept approaches based on ML and AI. New tools also need to be rolled out to simplify data extraction and visualization. Lastly, it is important to understand how to reach scale by balancing the right mix of skills and capabilities across local sites and central locations.

Mastering this transformation involves more than the adoption of new technology. It requires chemical companies to reinvent their ways of working.

accenture

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Leveraging SAP Data Intelligence in the Chemicals Industry

The future of value chain management is all about coping with digital transformation. New information technologies, AI applications, and operational technologies are exploding around us and bringing rapid change to what is possible in the end-to-end value chain. No one should expect business as usual for much longer.

The Intelligent Enterprise is an umbrella concept defined by SAP to leverage automation and data insights, not only to boost efficiencies and achieve better results but also to support enterprises in reinventing business operating models.

The top 3 challenges for the chemicals industry are:

■ Portfolio innovation with the goal to generate new products and customers, also meeting sustainability requirements
■ Agile mangement of the complex ecosystem and the overall value chain
■ New technologies like machine learning, AI, IoT and the push towards the automation of everything

As a strategic co-development partner of SAP for bringing Demand-Driven capabilities into SAP IBP, last year, Camelot's contribution to this booklet was focusing on Next Level Supply Chain Mangement and the Demand-Driven concepts to master a complex and volatile environment. This year, we focus on the business challenge to transform data into value when investing into Big Data, which comes along with re-inventing business models. One way to drive this, is SAP Data Intelligence and automation for higher efficiencies.

IT is challenged for higher efficiencies

There is a huge opportunity hidden in the massive amounts and types of data that is constantly generated within a chemical enterprise, along with the business digitalization – and not every company is leveraging it to the full potential. The data landscape is getting more and more complex, with multiple data lakes, data warehouses, operational applications, and even the push towards E-Commerce, as well as more online interactions. Furthermore, in order to react to growing dynamic market requirements, IT finds itself under tremendous pressure to detect new applications and implement easy data sharing with business partners.

The key concerns are:

■ Data silos when only one group in an organization can access a set or source of data. Users can not access data and operate with it through the silos. It can be very difficult to connect enterprise data and business operations to gain value from data.
■ Complex data governance across various landscapes. Managing data security and privacy requirements is a critical need for an enterprise data landscape. Well-established end-to-end data governance is a must for a modern organization in order to ensure data accuracy and security.
■ Enterprise readiness for machine learning application. The life cycle of machine learning application and its

deployment within the enterprise core is difficult and often not supported by explorative tools.

■ Poor or outdated integration tools. Currently, available tools require considerable effort to produce enterprise-wide data scenarios. This makes it challenging to rapidly connect and implement desired data outcomes.

SAP Data Intelligence to enable AI empowered automation tasks
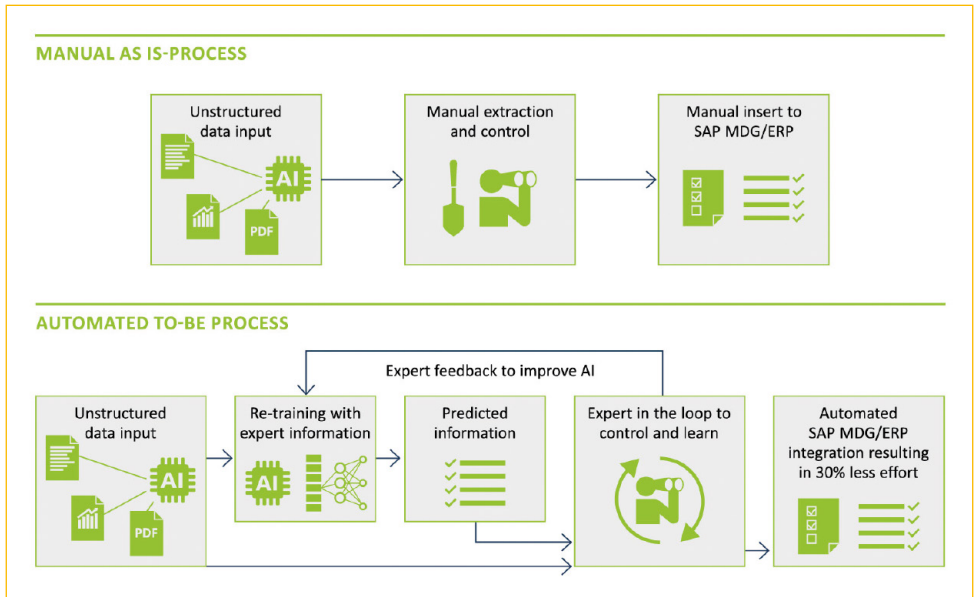
SAP announced the SAP Data Intelligence platform with the goal to offer a coherent machine learning and data science foundation that leads businesses to an Intelligent Enterprise evolution.

The vision of the Intelligent Enterprise is at the heart of the SAP strategy. To reach this goal, AI applications have to be delivered at scale. Ideally, there should be one integrated offering with one data science frontend covering full lifecycle management – all integrated with SAP systems. However, delivering these applications can be quite challenging and every stakeholder faces a different point of view:

■ The CXO would like to develop new business models that enable the creation of value out of data.
■ The Data Science team would like to have a development environment which is compatible with enterprise requirements, but still with further exploration possibilities.
■ The IT operation or DevOps team is focusing on re-usability, robust deployment and maintainability to lower the cost.

SAP is aiming exactly at these three stakeholders with the goal to manage end-to-end machine learning scenarios within one system. The integrated solution to solve the gap between development and

MANUAL AS IS-PROCESS

Unstructured data input → AI / PDF

Manual extraction and control

Manual insert to SAP MDG/ERP

AUTOMATED TO-BE PROCESS

Expert feedback to improve AI

Unstructured data input → AI / PDF

Re-training with expert information

Predicted information

Expert in the loop to control and learn

Automated SAP MDG/ERP integration resulting in 30% less effort

Client example for leveraging SAP Data Intelligence within a chemicals enterprise

Camelot ITLab is currently engaged in a lighthouse project for intelligent process automation of classification attributes.

Together with the client, we are looking for ways to streamline the daily manual work within the purchasing process of complex packaging material. As of today, the process relies on an expert going through every package description within received purchase documents: they must either read a PDF document or an image that has all the information such as size, volume, name etc. Our aim is to minimize the time and effort it takes for

the experts to store valid master data by introducing an AI-enabled extractor and an easy to use annotation tool. Thus, providing the first level of semi-automation for a valid material master data process (see figure).

The entire project is realized on SAP Data Intelligence with the advantage that the solution can seamlessly be deployed to the enterprise environment. The key benefits already seen in this project phase are:

- Reduction in time needed for system maintenance tasks by 50% and for integration with enterprise solutions by 20%
- Better data quality with significant impact for related business processes, such as fewer out-of-stock situations due to incorrect orders of packing material
- Experts with more time to focus on building stronger vendor relationships

There are many potential related use cases within the chemicals industry. Whenever specific information is extracted manually by experts from unstructured information the presented AI framework can be adapted in a flexible way. The first reference story is already published by SAP.

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Find Out How to Bring your Sales Process Forward with SAP C/4HANA Sales Cloud

The environment of the chemical industry is rapidly changing. Ecological and sustainability demands and reduced innovation cycles determine the market and compel customer industries to service their customers relative to these trends. These pressures are subsequently passed on to vendors – including those in the chemical industry.

Digitalisation in particular leads to new customer requirements and practices. New markets and business models are emerging. The digitalisation and acceleration of all business processes are being driven forward, triggered by new technologies and the possibility for the systematic collection, analysis and use of large amounts of data. For a company, thorough knowledge of its customers and the alignment of interactive customer processes on the needs of the customer will become its most important competitive advantage. Digitalisation is changing, among other things, the availability of information and access to suppliers. It results in a higher degree of transparency about product characteristics, prices and delivery conditions. Products and services are being offered on digital sales channels. All told, a shift in market power to the benefit of the customer can be seen.

enowa AG has supported important projects in the chemical industry for many years. Our consultants possess extensive expertise in the industry relating to the optimisation of processes and system landscapes, and know precisely the requirements of the market on future business models. The design of digital transformation in all business areas is both enough's mandate and the main focus of our consulting. In addition to the technical implementation of C/4HANA, we've developed procedures for raising the sales of a company to the digital level.

Implementation of SAP C/4HANA Sales Cloud as a strategic decision

Companies face the strategic decision of supporting their sales work with a high-performance CRM system. There are good reasons to choose SAP C/4HANA Sales Cloud.

From a sales organisation perspective, SAP C/4HANA Sales Cloud is the right system in more ways than one.

Continuous E2E business processes cannot be implemented without costly programming across standardised integration scenarios.

Employees can take their sales decisions in real-time on the basis of sales, supply chain, and production data or margin information, which primarily lie in different IT systems, achieving not just a 360° customer viewpoint, but a complex business perspective as well.

Taken from the IT perspective, SAP C/4HANA Sales Cloud offers the following advantages:

IT can react quickly to changing requirements. Support costs can be reduced due to lessened need for individual programming.

Because SAP's release strategy is publically communicated, new functions are made known quickly. In addition, data

protection and compliance are contractually secured via hosting at a computer centre in Germany.

Implementation of SAP C/4HANA Sales Cloud using enowa AG's agile project approach

An agile project approach means to us:
- Flexible task handling
- Definition of individual development steps as sprints
- Early error avoidance via combination with rapid prototyping
- Fast realisation of partial results
- Continuous collaboration between specialised departments, IT and key users

We divide our implementation projects into the following project phases:
Phase 0: Project preparation

- The necessary infrastructure is established. The official project kick-off is announced.

Phase 1: Development of a storyboard
- The strategic guidelines of the project are defined. These and the project requirements are then used to formulate a storyboard.

Phase 2: Agile development of stories and concepts
- The stories written in the project phase are procedurally and technically developed using agile methods in close coordination with the internal project team (scoping).
- In parallel, technical concepts for data migration, employee training and the authorisation system are drafted. For the training, enowa AG can now offer
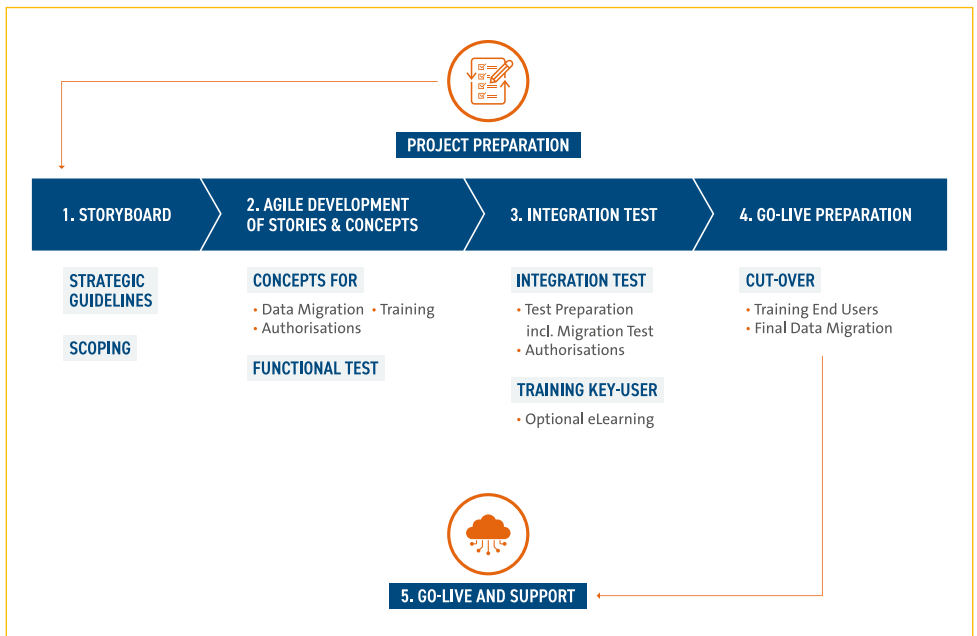
the option of an eLearning platform based on SAP Enable in addition to conventional training.

■ The implementation of stories is documented with a functions test.

Phase 3: Integrations test

■ Phase 3 is outlined using the key user training and the integrations test for all stories, with a selection of real data.

■ The end-user training is conducted by the key users and can optionally be supported via an eLearning platform.

Phase 4: Preparation of go-live

■ The preparation for the go-live includes the final data migration in addition to the SAP predetermined activities.

■ The training of end users and the User Acceptance Test (UAT) are conducted.

Phase 5: Go-live and support

■ We'll suggest a fixed date for the go-live, on which all business units will begin productive operation.

■ The support of the project team is ensured for four weeks following the go-live.

The greatest advantages of the SAP C/4HANA Sales Cloud are the standardisation and versatile integration scenarios to other IT systems. enowa AG has implemented a demo system in E2E processes and, in doing so, put communication between C/4HANA and S/4HANA at its centre. We can introduce this demo system to interested companies at any time.

In our CRM projects we work together with our customers to implement innovative, adaptable and high-performance CRM concepts in which the employees of sales and service organisations can un-lock their full potential. We offer our customers all services from a single source, from process design, to implementation, through to Change Management and ensuing systems support. The collaboration with our customers is a genuine partnership, characterised by respect and appreciation – while at the same time keeping a critical and analytical eye on achieving the best possible solutions for our customers.

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Driving Future Growth Through Transformative Innovation

Chemicals companies face many challenges in the current landscape – to increase revenue growth, agility and optimization while protecting their businesses and clients, when existing margins are tight.
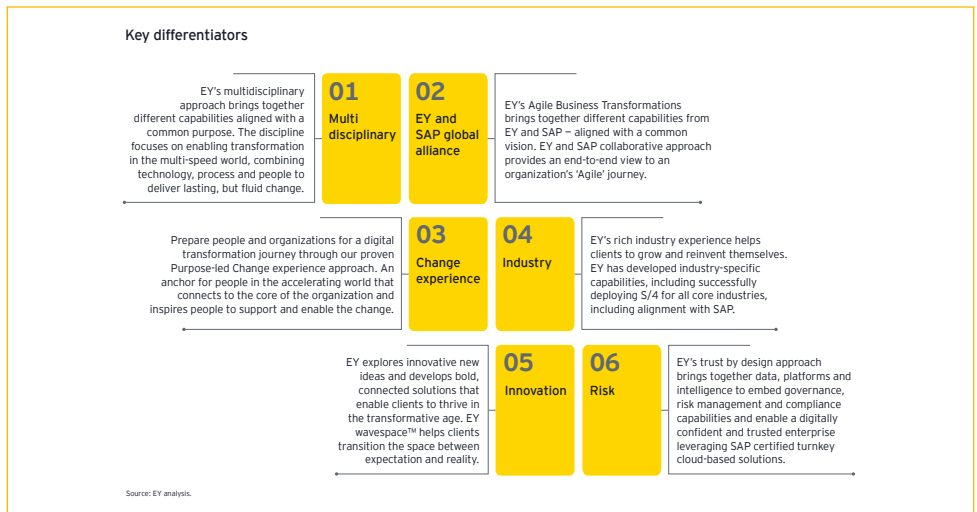
Becoming more responsive to changing market dynamics, customer and business needs, stakeholder demands and regulatory requirements is not easy to do. EY professionals have developed a methodology called Adaptive Transformation. It guides organizations with SAP S/4HANA standard processes, advanced technology, end-user experiences and a metric-driven philosophy to drive positive results.

EY thought leaders and finance consultants leverage the SAP S/4HANA technology to rapidly deliver innovative new solutions at scale. Multidisciplinary EY teams are working with leading global chemicals companies to transform their enterprise architecture based on SAP S/4HANA, to capitalize on the following benefits:

- Combines leading practices from chemicals and discrete manufacturing built on S/4HANA.
- Addresses specific chemicals sector business challenges through preconfigured processes aligned with APQC benchmark information.
- Reduces time to complete fit and gap analysis.
- Enforces global standards to reduce overall risk and maintain a "back-2-standard" mentality.
- Business users can immediately visualize how their business processes will be enabled.
- Accelerates the build and configuration phases via VRS preconfiguration.

Transformation is not just an IT project – it's the entire business response to dis-

Key differentiators

EY's multidisciplinary approach brings together different capabilities aligned with a common purpose. The discipline focuses on enabling transformation in the multi-speed world, combining technology, process and people to deliver lasting, but fluid change.	**01** Multi disciplinary	**02** EY and SAP global alliance	EY's Agile Business Transformations brings together different capabilities from EY and SAP – aligned with a common vision. EY and SAP collaborative approach provides an end-to-end view to an organization's 'Agile' journey.
Prepare people and organizations for a digital transformation journey through our proven Purpose-led Change experience approach. An anchor for people in the accelerating world that connects to the core of the organization and inspires people to support and enable the change.	**03** Change experience	**04** Industry	EY's rich industry experience helps clients to grow and reinvent themselves. EY has developed industry-specific capabilities, including successfully deploying S/4 for all core industries, including alignment with SAP.
EY explores innovative new ideas and develops bold, connected solutions that enable clients to thrive in the transformative age. EY wavespace™ helps clients transition the space between expectation and reality.	**05** Innovation	**06** Risk	EY's trust by design approach brings together data, platforms and intelligence to embed governance, risk management and compliance capabilities and enable a digitally confident and trusted enterprise leveraging SAP certified turnkey cloud-based solutions.

Source: EY analysis.

ruption and increasing volatility through a combined business effort. The Adaptive Transformation approach encompasses vital functional areas for the chemicals sector:

1. Customer engagement and co-innovation

"Chemicals companies need to place the customer at the beginning of their value chains — not the end — by aligning customer strategies and priority areas with their own," says Frank Jenner, EY Global Chemical Industry Leader.

Having regular customer input into new products leads to sales, enabling chemicals companies to keep pace with their customers' evolving demands. We focus on marketing and sales transformation, business impact analytics, organization management, cost reduction and strong business case development, based on the strengths and weaknesses of companies and total cost of ownership view.

Recently EY teams created a unified customer view for a client during an SAP S/4HANA implementation, by integrating their corporate finance functions, supply chain management, retail and wholesale operations, planning and customer en-

gagement. Enabling consumer differentiation and improved customer service, with an end-to-end global execution and rapid responsiveness in the marketplace. SAP technology and EY thought leadership supported the client's future business models and vision for growth.

2. Planning and sourcing

Chemicals companies, as suppliers to all other industries, need to be a part of the circular economy as consumer demands continually shift. "It's time to understand that customer demand is not just actual or forecast orders," said Jade Rodysill, EY Americas Advisory Chemicals Leader. "It's buyers' values matched with innovative, differentiated solutions. Orders then follow."

EY teams help companies transform their supply chain to an end-to-end digital platform to consider sustainability while enabling agility. SAP technology and EY professionals drive strategic planning, manufacturing and distribution execution; procurement sourcing, P2P and collaboration; and warehousing and transportation execution.

For one chemicals company, EY teams integrated three work streams: finance,

SAP Pinnacle Awards 2015 Winner

SAP Pinnacle Awards 2016 Winner

SAP Pinnacle Awards 2017 Winner

SAP Pinnacle Awards 2018 Winner

SAP Pinnacle Awards 2019 Winner

2015
Fastest Growing SAP Transformation Practice

2016
Quality Partner of the Year and Market Impact Partner of the Year

2017
Customers' Choice Partner of the Year

2018
Customers' Choice Partner of the Year Large Enterprises

2019
Technology Innovation and Strategic Growth

supply chain and manufacturing/plant maintenance. Each consisted of seven phases of work to produce key deliverables: a business case, cost estimate and inputs for long-range planning. This approach helped to design simple efficient processes; drove scalability to focus on inorganic growth; and improved transparency across the global organization to create leading-class operational efficiency – setting the foundation for greater focus on planning and sourcing.

3. Integrated operations management

AI and automation of front-end and back-end operations are radically impacting how services are delivered and how costs are incurred. To reduce equipment failure and minimize maintenance costs, ensure plant and employee safety, and better enhance the effectiveness of cloud and Internet of Things systems for plant management, new ways of using technology show promising developments — to bridge the gap between intentions and reality.

For one client that required integrated operations covering all aspects of their value chain, from sourcing to shipping, EY teams devised an automated system to standardize their business processes and increase efficiency. It helped the client to manage business operations and financial costs with complete visibility, resulting in actionable insights to reduce waste and increase profitability. The S/4HANA cloud platform and innovative robotic solutions designed by EY shaped how to thrive on scalable technology architecture that supports the client's current business needs and future growth plans.

4. Standing apart

SAP recognizes EY as an early-adopter partner to help deliver SAP services. In addition to our SAP Pinnacle Awards, we won Worldwide Business Consulting Services Vendor 2019 by IDC MarketScape; ALM Intelligence named EY as a top market leader in supply chain management consulting 2019 and Logistics Consulting Provider 2018, as well as the World's Best Outsourcing Advisor 2017 by IAOP. With 1,475 professionals who are certified with S/4HANA, EY teams drive the Agile Business Transformation approach by streamlining day-to-day transactional activities of CFOs and allowing talent and resources to focus on strategic priorities.

EY
**Building a better
working world**

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