THE INTELLIGENT ENTERPRISE IN THE EXPERIENCE ECONOMY FOR METALS COMPANIES

Melting together knowledge and technology for a sustainable business with your customers
Dear Customers,

For more than a century, metals companies have been innovating to improve material composition and production methods. This continuous optimization process is aimed at making metal material lighter and stronger to reduce the weight of cars and aircraft and increasing material flexibility that supports the use of metals in construction, furniture, cans, cutlery, and many other areas. In parallel, metals companies have been constantly applying the latest technology in the production process to reduce material consumption, energy use, and processing effort.

Increased technology use and innovative cross-company business processes will create dramatic new opportunities for metals companies. The level of digitally enabled and connected equipment will further improve product quality and will become the connection point for processes that connect with other partners in the industry ecosystem. Greater collaboration enables circular-economy concepts to become a reality, further extending the existing high recycling rate and use of scrap in metals. In addition, many other global trends are impacting metals businesses, including increasingly empowered customers, disrupters from adjacent industries, availability and prices of raw materials, and application of the latest digital technologies.

By 2025, metals companies will move away from a pure production focus to a more collaborative model and use their know-how to steer an industry network and offer services. These services will be delivered around highly customized products, enriched by digital information.

To get there, metals companies will focus on five strategic priorities:
- Achieving customer centricity
- Connecting and automating the enterprise
- Running smart factories and digital networks
- Supporting value-added services and new business models
- Building a responsible and sustainable business

Companies have to shift their mind-set and work to achieve the 2025 vision. They must increase the digital representation of their own end-to-end processes to become a player in multicompany business processes and combine this with real-world awareness that includes customers and environment. Additionally, winning and keeping business will be based on providing great experiences across all interactions.

With the SAP® Intelligent Enterprise Framework methodology, SAP provides the integrated suite of applications, the intelligent technologies, and the digital platform that companies need to make this shift. We have the vision, the solutions, and the commitment to go with you all the way from defining your transformation strategy and delivering the right solutions to running your digital backbone in the cloud.

Stefan Koch
Global Lead for Metals
SAP SE
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The move from a linear to a “circular economy” will allow metals companies to take a double role. First, their products can be made of recycled material. Remelting of scrap is common, but technology will extend the range of achievable high-quality products. Second, companies will think about the circularity of their own products: many can be designed to be first reused and then recycled with less effort.

Industry borders are blurring, with partners and competitors arising at the same time. Focus will shift from corporate-owned assets to successfully managing a multioperator global supply chain. This will help access raw materials at reasonable prices and allow for geographical access to consumer markets.

Where and how work is done will change as production automation increases. It will become less necessary to have physical assets and people in the same location, as remote operations enable companies to monitor, maintain, and manage from afar.

Cost and availability of energy and the related global imperative to reduce CO₂ emissions will force producers to innovate processes and reduce energy consumption.

Customers expect outcomes, and the feedback they provide can be used to create products that really matter. The world is shifting into the experience economy, and metals companies can benefit from better understanding their customers.
In 2025 metals companies will derive a large part of their business from collaborative business models.

Traditional borders and processes between the companies in the metals value chain will blur, and the supplier-customer relationship will evolve into deeper cooperation models. Digital technologies will foster business models that do not rely on pure ownership and operation of production assets but rather on managing the value chain, starting with the customer’s wish and following through to fulfillment and afterlife.

Metals companies will deliver individualized products and services that will address very specific requirements and serve the “segment of one” on a global basis. Some will be based on new business models specifically around the capability to effectively share data on products shipped or advice on the best use of a complex product.

Companies will be more flexible and efficient in responding to uncertain and changing conditions profitably while meeting governmental regulations and societal expectations. This is achieved through elimination of data silos, higher automation of processes, and close collaboration through business networks. Much of the value chain will be further automated and optimized through the use of innovation technologies such as machine learning, artificial intelligence, and blockchain.

Metals companies will spend significantly more time and effort making products and servicing customers in a sustainable way and purposefully making a positive contribution to society. Companies will offer an increasing number of products containing more sustainable materials. They will support recycling, establish lower energy requirements, and reduce material consumption. They will strive for fair labor conditions and will continue to use technology to improve worker health and safety.

Successful business model innovation, process optimization, and workforce productivity are directly linked to deliver great customer and employee experiences. In fact, research indicates that the best-performing companies are pulling away from the rest, widening the performance gap. They are doing this by delivering great experiences. And they are the most profitable because they adopt new technologies and deliver winning products and services more efficiently.
FIVE PRIORITIES FOR SUCCESS

We have identified five strategic priorities necessary for metal companies to transform their business.

ACHIEVING CUSTOMER CENTRICITY

CONNECTING AND AUTOMATING THE ENTERPRISE

RUNNING SMART FACTORIES AND DIGITAL NETWORKS

SUPPORTING VALUE-ADDED SERVICES AND NEW BUSINESS MODELS

BUILDING A RESPONSIBLE AND SUSTAINABLE BUSINESS
ACHIEVING CUSTOMER CENTRICITY

Evolving customer buying behavior on the consumer side also impacts business-to-business (B2B) sales models.

All B2B operations today must understand how their customers are making buying decisions and using products to deliver value for their customers – all the way to the end consumer. If the expectations of that end customer are changing, it will drive ripple effects all the way back up to your business. True customer centricity means understanding the ultimate end consumer, how their behaviors are changing, and then making every business decision based on this insight through experience management. Today’s dilemma for metals companies is that they are disconnected from the customer, as these relationships are typically owned by metal traders or fabricators, who apply services such as material cutting, forming, or coating before it is used by the final manufacturing customer.

The Vision
In 2025 metals companies will work even more collaboratively with their customers (see Figure 1) – and increasingly with their customer’s customer of today. There will be interchanges of data and joint approaches to improve the delivery, implementation, and use of metals materials and products. Collaboration with new partners, such as logistics providers, will evolve, as the physical metal product is only one part of the delivered or perceived value for the customer. Additional value will come from enabling better product use. For example, a metals tube producer will be able to provide technical details and instructions for how to correctly and safely install and service the tube on an oil rig. In addition, data from the use of the tubes on the oil rig will be sent back to the manufacturer to improve production and inform future customers on best-practice use.

The Journey
Metals manufacturers will start toward this goal by evolving their current routes to the customer into a true digital data exchange to ensure seamless information flow. This will be extended by real-time capabilities and by offering additional but connected communication channels. This means customers can be served seamlessly, even if they change the channels by which they interact with your company. By adding engineering, production, and logistics partners in the same manner, the customer relationship will transform into a network collaboration, offering a competitive advantage by combining each individual strength into a unique product and service offering for the final customer.

Figure 1: Working Collaboratively with Your Customers

Today – Transactional

Future – Customer for Life

By 2020, human-digital interfaces will diversify, as 25% of field-service technicians and over 25% of information workers use augmented reality. 

Customer experience including customer satisfaction surveys is important for food packaging giant Tetra Pak’s success. With support from Qualtrics, an SAP company, Tetra Pak went to a mobile-friendly interface and cut its customer surveys from 48 to 8 questions, which went from an average of seven minutes down to two minutes to complete. Now, teams at every level and in every function have role-based dashboards so they see the feedback that matters most to them, allowing them to react faster to customer insights. Previously, it took up to 15 days to follow up with customers. Tetra Pak now aims to follow up with 100% of detractors and 25% of promoters within 48 hours.
Putting the end customer’s point of view at the center of every decision is a key prerequisite for success in the digital age, and experience management helps in capturing these prerequisites. This does not stop in the sales department but also applies to which products are produced and which services are offered. Metals companies will become customer-centric enterprises, and the ability to focus on their most valuable customers will be one of their key priorities. Since short and reliable delivery times are important for their customers, metals companies will prioritize the production of their products based on the individual importance and individual product configuration of each customer.

### ACHIEVING CUSTOMER CENTRICITY

#### FOCUS ON THE MOST VALUABLE CUSTOMERS

Putting the end customer’s point of view at the center of every decision is a key prerequisite for success in the digital age, and experience management helps in capturing these prerequisites. This does not stop in the sales department but also applies to which products are produced and which services are offered. Metals companies will become customer-centric enterprises, and the ability to focus on their most valuable customers will be one of their key priorities. Since short and reliable delivery times are important for their customers, metals companies will prioritize the production of their products based on the individual importance and individual product configuration of each customer.

#### TOP VALUE DRIVERs

<table>
<thead>
<tr>
<th>Increase in revenue from new products</th>
<th>Increase in customer satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%–20%</td>
<td>10%–20%</td>
</tr>
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</table>

Source: SAP Performance Benchmarking
CONNECTING AND AUTOMATING THE ENTERPRISE

Metals are highly flexible and can be formed and used in many different ways, so customers are interested in products and solutions that are made exactly to meet their requirements.

Often, these requirements are requested specifically to have a clear differentiator in the market. The need to meet these exact requirements forces metal manufacturers to move from large lot sizes, which can serve many customer orders at low cost, to smaller lot sizes. Also, customers expect to pay the same as they would for a standard solution, requiring manufacturers to control the cost of manufacturing and distribution to stay competitive and profitable.

The Vision
In 2025 metals companies will be able to deliver completely tailor-made products, services, and solutions that precisely fit the needs of an individual customer, captured through experience management (see Figure 2). Based on a sophisticated and collaborative technology, production, and supply chain platform, companies will be able to offer customers much more flexibility in choice and delivery — all while still ensuring appropriate levels of profit. Digital technologies will help recommend the best product configuration for a specific purpose, and the best way to fulfill each order from a production and distribution perspective. The ability to propose a specific steel grade and diameter for a wire rod that matches the required strength of the later car part at lowest weight and costs will become a differentiating service.

The Journey
Metals companies will start toward this goal by rationalizing existing product and processing options by matching previously siloed production, logistics, and customer data. In a next step, companies can apply machine learning to analyze and improve production processes to achieve higher production flexibility and shorten customer response times. This will support metals companies to promise and deliver most of the individual customer requirements. Companies eventually will be able to use product-, design-, production-, and logistics-related data to collaborate with customers, identifying the best product and production combinations. An example of a differentiator will be the ability to offer customers fast responses and delivery times for order changes.

Figure 2: Configuring Products for a Single Customer

Today – Segmentation

Future – Single Customer

10%–20%

Reduction in manual rework through better product configurations

Ordering new spare parts for the first time, such as a particular circuit breaker or drill, was often a significant effort for business users at Severstal, and the company handles more than 550 daily requests for the creation of new materials. The Russian steel and steel-related mining company saw returns on 21% of all new material requests, thanks to incorrectly chosen material classes. The company decided to use machine learning to improve the process of entering new materials into the material master data in an intelligent and automated way.
Providing solutions that precisely fit the needs of one single customer has been commonplace in traditional engineer-to-order environments. Now, manufacturers must be able to capture all customer requirements effectively, and they must be able to produce at the lowest cost exactly what was requested by customers. Experience management helps in understanding customers’ demand so that product configurations tailored to individual customer needs can be offered more quickly with less effort during the order intake process.

Critical for this transformation is the ability to manage the specifics of each order in every aspect of the industrial value chain in a consistent way at nearly the cost of a standard order. To do this, all product and process information must be kept in a single place, and all business processes must be effectively executed and closely monitored.

**TRADITIONAL SCENARIO**

- Product variants predefined by marketing and product management
- Variant product catalog with limited number of variants available
- Every variant existing independently as a product, resulting in inconsistency and errors in variant management downstream
- Unique design and engineering systems and bills of materials (BOMs) that lead to high integration effort
- Inefficient, expensive, and error-prone variant manufacturing

**NEW-WORLD SCENARIO**

- The customer requests unique product features and can be guided to appropriate choices.
- Product and production capabilities are managed with help from rules, analytics, and algorithms.
- Machine learning technologies help to guide to and identify the right configuration.
- Integrated design, engineering, and sourcing allow for quick order completion. Machine learning and image recognition help with ordering the right spare parts in case machinery fails.
- Production planning and execution are integrated for flexible and efficient operations. Manufacturing dashboards provide total insight, and management by exception helps keep focus on critical orders.
- High customer satisfaction results when customized products are delivered as quickly as standardized products.

**TOP VALUE DRIVERS**

- **10%–12%** Reduction in total logistics costs
- **10%–20%** Increase in on-time deliveries
- **Up to 10%** Reduction in total manufacturing costs
RUNNING SMART FACTORIES
AND DIGITAL NETWORKS

Supply chains and manufacturing networks must be solid to execute the core function of a metals business; but at the same time, they need to be completely modular and flexible to react to short-term changes (see Figure 3).

Spikes in demand or changing customer orders need to be handled more or less automatically. So customer expectations on the perfect delivery at low cost will require increased automation and communication throughout all processes – not only on the shop floor – and will include deeper collaboration across the partner and supplier network. Real-time insights into data, such as asset status, enable agile and intelligent responses to last-minute changes, which are often urgent customer requests or caused by machine failures.

The Vision
In 2025 metals companies will have digital twins of the metals value chain. As a result, interactions and deep collaboration between companies will make use of digital networks and automate many process steps. The plants themselves will be part of these activities, and production and maintenance tasks will be highly automated. The workforce will focus primarily on exceptions, working as strategic technical guides on equipment with which they have previous experience. This will make processes more efficient and will change the way employees work – even leading, for example, to workerless smelters in aluminum, where no worker will need to be present for routine work anymore.

The Journey
Metals companies will continue optimizing supply chain transparency across the enterprise, as well as connectivity from shop floor to top floor for real-time visibility. Subsequent steps will increase machine-to-machine connectivity and collaboration, allowing autonomous decisions based on sensor data and machine learning algorithms. Intelligently connecting manufacturing, logistics, and supply chains – including deeper cross-company collaboration – allows companies to quickly address short-term demand impulses, supply fluctuations, and changes to customer orders. Intelligent machines will be part of the network and will order material for restock or spare parts for maintenance automatically.

Figure 3: Enabling Flexible Production

Predictive maintenance that assesses machine usage and failure patterns when applied to critical equipment such as compressors, pumps, and motors can cut downtime by 40%, major revisions by 5%–10%, and operational costs by 2%–10%.8

ArcelorMittal S.A. wanted to improve sales and operations planning for the more than 60,000 products that can be made from a steel coil. It wanted to optimize inventory levels, reduce the need for working capital, reduce unproductive lead time, and serve customers in the best way possible. The company implemented supply chain solutions from SAP, including the SAP Integrated Business Planning for Supply Chain solution, and can now manage situations such as canceled or changed orders in a much faster and more practical way, because it has visibility into the whole picture and can decide promptly on the best action to take.
RUNNING SMART FACTORIES AND DIGITAL NETWORKS
BUILD SMART FACTORIES AND DIGITAL NETWORKS

Manufacturing and operations are becoming more connected and autonomous. Siloed, incomplete, and outdated information on assets, products, and customers means that processes cannot be optimized. Companies need a virtual, real-time representation of their business – a digital twin – not only of assets but of any element within the company. This allows all partners to collaborate in real time and provides remote monitoring of internal assets as well as the entire supply chain across company boundaries. This will result in optimization of material throughput, reduced downtime, and better outcomes for customers – at a lower cost.

TRADITIONAL SCENARIO
Disconnected departments and limited access to the business network prohibit responsive business.

Plans are not consistently created and shared, so information cannot flow quickly. R&D, sourcing, sales, manufacturing, and planning are not aligned, wasting time and money.

Reliance on a few external partners and manual communication means visibility is limited, collaboration is difficult, delays are inevitable, and the risk of error is high.

NEW-WORLD SCENARIO
One plan can be shared with all critical resources and partners to achieve visibility, agility, and responsiveness. You gain:

• Collaborative product design with customers
• Insight into future demand for manufacturing and procurement, optimizing inventory
• Alignment of sales, manufacturing, and delivery, improving customer satisfaction through in-time orders
• Linear supply chains transforming into digital supply networks through simultaneous collaboration of all relevant stakeholders
• Your company at the center

TOP VALUE DRIVERS

Reduction in asset service and maintenance cost

Reduction in asset master-data creation and maintenance effort

Source: SAP Performance Benchmarking
SUPPORTING VALUE-ADDED SERVICES AND NEW BUSINESS MODELS

Metals production will still be part of the metals business in the future.

But the power of differentiation will move to additional services that can even become offerings on their own, sometimes as a separate business model. It will be difficult for one company alone to meet all new customer expectations. Thus, solutions will not be restricted to the companies’ own products but, rather, evolve into services that can be served only by a network of partners within the metals ecosystem. This will occur even before production but be especially relevant as soon as the product leaves the plant. Logistics providers and metals converters will be the source to contribute important data such as dates or material properties for the user experience journey of the final customer.

The Vision
In 2025 metals companies will offer more than metals production; they will also offer logistics, engineering, and processing services (see Figure 4). Metals producers will become metals service providers that offer services along with material shipments. So a tube producer of today could, in the future, offer to take over the engineering of tubes, helping, for example, to decide which material and wall thickness is best for a pipeline, leveraging usage experiences from multiple customers for a better engineering result. They could also offer services on the construction end of the project, for example, renting trucks and cranes or managing the project. A company could even offer to build and operate an entire pipeline and charge per cubic meter transported. In this scenario, the value and associated payment comes from “outcomes” that a customer achieves with a product, including its use and achieved results, rather than just from the product itself.

The Journey
Metals companies will start on this journey by offering services such as tracking and financing or by providing detailed data about the products shipped. Subsequent steps will include offering detailed product profiles in combination with, for example, best practices for how to weld a metal sheet, which will help the customer process the material at the highest speed – flawlessly. Finally, companies can really transform with the advent of new IoT platforms and collaboration networks, and additional new offerings will be created as all of this data is shared across the supply chain and different companies become proficient in various areas of expertise. 3D printing is an obvious front-runner to succeed in this model, as engineering, material, machine, data, and finance cannot run in isolation but need to be connected beyond company borders, which is not possible for today’s classical metals producer.

Figure 4: Creating New Products and Services with the IoT

Today – Selling Products

Future – Selling Outcomes

Germany-based Hörmann is the most famous manufacturer of gates, doors, frames, and operators. With the hundreds of thousands of products it sells every year, a certain number of complaints can be expected. Working with the SAP Customer Relationship Management application, Hörmann is offering excellent service in this area, improving its complaint management – and gaining many satisfied customers.
Traditionally, metals products are individually configured products, but they are nevertheless seen as a commodity. Thus, differentiation is difficult, and metals companies are shifting from selling physical products only to providing complete solutions. This can include collaborative development, advice on correct product configuration, advice on best product use, and even more sophisticated scenarios. Companies will use experience management to validate the effectiveness of their investments, in areas such as service or product recommendations, to increase their differentiation from the competition.

Metals products are often converted or processed further at the customer site. Innovative metals companies are offering additional business models to differentiate in the marketplace. They provide their goods bundled with services, which can lead to better outcomes for customers. With that transformation, they generate new business, increase market share, deliver more product insights, and, finally, create a more sustainable revenue stream.

**SUPPORTING VALUE-ADDED SERVICES AND NEW BUSINESS MODELS**

**SELL OUTCOMES AND SERVICES**

Traditionally, metals products are individually configured products, but they are nevertheless seen as a commodity. Thus, differentiation is difficult, and metals companies are shifting from selling physical products only to providing complete solutions. This can include collaborative development, advice on correct product configuration, advice on best product use, and even more sophisticated scenarios. Companies will use experience management to validate the effectiveness of their investments, in areas such as service or product recommendations, to increase their differentiation from the competition.

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**TOP VALUE DRIVERS**

<table>
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<th>Improvement in service profit margin</th>
<th>Improvement in subscription invoice processing time</th>
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<tr>
<td>3%–10%</td>
<td>25%–30%</td>
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</tbody>
</table>

Source: SAP Performance Benchmarking
A mind shift is happening across consumers, employees, suppliers, and investors that is incentivizing companies to more strongly define and deliver on their purpose. To succeed in the future, metals companies will of course still need to deliver financial performance, but they must also show how they make a positive contribution to society and to solving some of the world’s greatest challenges. With natural resources being limited on this planet, there is increased awareness of the ecological footprint a product has. To attract the right talent, metal companies need to make sure their company is a place where young people want to work. While worker safety is commonly taken care of, the consumption of ore, water, and energy needs to be as low as possible. Companies are moving away from creating products that get discarded at end of life to planning and supporting a circular economy in which products are recycled and reused indefinitely (see Figure 5). An example is the reuse of metal goods and increased use of scrap. This approach will also drive business strategy, as margins and business profitability will benefit due to a shift of pricing power toward green in the long run.

The Vision
In 2025 metals companies will run their business in a manner that includes focus on metal product reuse, recycling, and a low energy and material footprint in general. Together with having fair labor conditions, metals companies will be able to do business with partners and secure talent.

The Journey
Manufacturers will start toward this goal by improving production processes, so they have lower energy consumption and improved labor conditions and worker safety. This will be achieved through process insight based on sensor data, real-time analytics, and IoT concepts. As a next step, they can collaborate with business partners to lower transportation effort, consider producing locally to lower transportation volumes, and improve product use to produce less waste. Additional transformational steps can include collaborating with other industries or even competitors to establish more sustainable resource consumption and considering additional uses for by-products to continue the drive to zero waste. For example, a company running steel production could provide the emitting gas as input material to a chemicals plant instead of using it for electricity production only.

Figure 5: Managing the Product Lifecycle with Purpose

"Young people are very motivated to join a company that addresses some of the key challenges of the world and offers them a deep sense of purpose in their work."
– Mark Dolfyn, HR Development Director, Umicore NV/SA

"In a letter to our clients today, BlackRock announced a number of initiatives to place sustainability at the center of our investment approach, including making sustainability integral to portfolio construction and risk management; exiting investments that present a high sustainability-related risk, such as thermal coal producers; launching new investment products that screen fossil fuels; and strengthening our commitment to sustainability and transparency in our investment stewardship activities." Laurence Fink, Chairman and CEO, BlackRock Inc.

Typical integrated mills’ CO₂ emissions are 3.8 times higher than an EAF mini-mill’s.
Metals production is an energy- and resource-intensive business, which makes the industry one that society is keeping an increasingly close eye on in terms of how goods are manufactured. There is an increasing number of technologies and processes being implemented to significantly reduce energy consumption and emissions. This helps the environment but also makes the metals producers a differentiator in the market. Additionally, while metals are already some of the most recycled materials on the planet (steel in particular), there is still a need for sourcing new raw materials. Digital capabilities allow for testifying and tracking the origin of metals, so even reuse can be proven and help drive change for preference of, for example, low-carbon-emission aluminium.

Modern technology, coupled with the collection of worker experiences – for example, in work environments or around the usage of tools – also helps organizations keep employees safer and mitigate environment, health, and safety (EHS) risks by providing the functionality to perform risk assessments, efficiently measure and report emissions, manage incidents, and communicate safe work practices to all employees.

Novolipetsk Steel (NLMK) has developed a 3D positioning system that tracks shop-floor employee location as well as asset and machine condition. Workers carry a wearable sensor tag that tracks locations, unusual behavior, immobility, falls, and abrupt changes in body position. The worker can call for help using a button on the tag, and a sensor can vibrate to alert all workers in a dangerous zone.

Five Priorities for Success
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Key Technologies

Each of these priorities will be enabled by emerging intelligent technologies.

**Artificial Intelligence and Machine Learning**
Machine learning enables algorithms to “learn” from existing data. Once the algorithm is trained, it can then predict future outcomes based on new data.

**The Internet of Things**
Although manufacturers have been using the Internet of Things for some time, now the entire value chain can be connected from design to production to supply chain. Data-driven insights of customer preferences can drive better designs, lower material costs, and reduce risk.

**Data Platform to Manage Experience**
Leaders are interlocking the operational performance data from companies’ business systems (what is happening) with the experience data coming from customers and employees (why it is happening) so they can get 360-degree views and actionable insights to deliver better experiences.

**Advanced Analytics**
Empowered users can get real-time visibility into their changing environment, simulate the impact of business decisions, mitigate risk, and achieve better customer outcomes.

**Blockchain**
The blockchain model of trust, through massively distributed digital consensus, could reshape supply chains and commerce across the digital economy.

**Virtual and Augmented Reality**
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**
Voice interfaces 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.

**Robotic Process Automation**
Robotic process automation streamlines repetitive, rule-based processes and tasks in an enterprise and reduces cost through the use of software robots by replicating specific tasks or keystrokes.

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**KEY TECHNOLOGIES**

48% Of metals companies consider the top three use cases for the IoT to be energy efficiency, production visibility, and quality management. Going forward, production visibility and asset reliability will gather more attention and investment.

90% Of new enterprise applications will embed artificial intelligence by 2025.

30% Of manufacturers will be utilizing blockchain and the IoT (driven by increased requirements for sustainability) to provide reliable provenance, leading to a 90% increase in audit efficiency by 2025.

60% Of G2000 manufacturers will address growing industry talent shortages by making significant investments in intelligent robotic process automation by 2023.

40% Of manufacturers will leverage IoT-connected products and artificial intelligence tools to validate warranty claims preventing claims submitted in error by 80% by 2023.

50% Of all manufacturing supply chains will have invested in supply chain resiliency and artificial intelligence, resulting in productivity improvements of 15% by the end of 2021.
GETTING THERE: A PHASED APPROACH

Companies will become intelligent enterprises on three distinct tracks as they evolve their strategic priorities to match their company’s vision.

1. **Optimize** what they already do by implementing a stable and scalable digital core to make processes more transparent and integrated

2. **Extend** their current processes by connecting them to the real world using IoT technologies

3. **Transform** their business using a constant stream of data enabling new service-driven business models (see Figure 6)

**Figure 6: Strategic Priorities Across the Maturity Framework**

<table>
<thead>
<tr>
<th>Achieving customer centrality</th>
<th>Connect and automating the enterprise</th>
<th>Running smart factories and digital networks</th>
<th>Supporting value-added services and new business models</th>
<th>Building a responsible and sustainable business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchange information seamlessly with customers</td>
<td>Collaborate in real time with customers using multiple channels</td>
<td>Use smart sensors to improve insights into physical reality, and apply autonomous processes in production</td>
<td>Collaborate on product design and delivery in an open manner</td>
<td>Optimize production for lower energy consumption, and improve labor conditions</td>
</tr>
<tr>
<td>Collaborate with external parties to automate beyond the company</td>
<td>Improve production flexibility and response time to customers</td>
<td>Connect with external parties to automate beyond the company</td>
<td>Gain a unified data model of supplier and customer that will allow analysis of product performance along the entire value chain</td>
<td>Collaborate with partners to lower transportation effort and reduce waste</td>
</tr>
<tr>
<td>Manage a collaborative interdisciplinary network</td>
<td>Enable machine learning—recommend best product configuration and the best way to fulfill its production</td>
<td>Enable machine learning—recommend best product configuration and the best way to fulfill its production</td>
<td>Running the business profitably, while focusing on product recyclability and fair labor conditions, engaging with the local community, minimizing waste, and fostering material reuse</td>
<td>Collaborate for sustainable resource consumption</td>
</tr>
</tbody>
</table>

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How do you achieve these strategic priorities?

Start with reimagining your business together with your customers. Then build a path for even more optimization and intelligent automation to simplify your business and free up resources to invest in even more digital transformation programs and find new business models and revenue streams.

According to a July 2018 study by Forrester Consulting that was commissioned by SAP, innovative companies focus on digital priorities to help them achieve digital transformation more than other manufacturing companies (see Figure 7).

**Figure 7: Expectations Concerning the European Iron and Steel Sector in 2030**

Industry 4.0 will enable the following:

- **Parameters become part of the product**
  - Strongly agree: 13
  - Agree: 26
  - Disagree: 9

- **Customers order directly at plants**
  - Strongly agree: 9
  - Agree: 22
  - Disagree: 13
  - Strongly disagree: 1

- **(Near)-lot-size-of-one production becomes possible**
  - Strongly agree: 7
  - Agree: 29
  - Disagree: 11
  - Strongly disagree: 1

- **(Near)-zero-defect production becomes possible**
  - Strongly agree: 7
  - Agree: 28
  - Disagree: 11
  - Strongly disagree: 2

- **Plants become service providers**
  - Strongly agree: 5
  - Agree: 16
  - Disagree: 24
  - Strongly disagree: 2

- **(Nearly) dark shop floors become possible**
  - Strongly agree: 2
  - Agree: 32
  - Disagree: 13
Most organizations understand what is happening in their business, but they 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 people have with their products and their business. Experience data (X-data) captures beliefs, emotions, opinions, and perceptions – “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 insights 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 8).

Only SAP has the strategy, expertise, and solutions to deliver on this vision, enabling intelligent enterprises to turn insight into action.

Figure 8: SAP® Intelligent Enterprise Framework

*Note: This representation is a general visualization of the Intelligent Enterprise and may include functions not covered in every industry.
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.

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

To move forward with speed and agility, it helps to 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.
COMPREHENSIVE SAP ECOSYSTEM: ORCHESTRATING THE PARTNER ECOSYSTEM TO DELIVER VALUE FASTER

Our comprehensive ecosystem for metals companies offers:

- The Intelligent Enterprise as the overarching strategy to meet future requirements, offering:
  - 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 third-party solutions to provide leading-edge and state-of-the-art technology

Our partner ecosystem includes, among others:

- accenture
- Microsoft Azure
- Capgemini
- Deloitte
- EY
- IBM
- Illumiti
- Celonis
- .msg
- itelligence
- OPENTEXT
- OSIsoft
- pwc
- Rizing
- utopia
- wipro
- ARTERIA
SAP IS COMMITTED 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 metals value chain across the enterprise. With its clear industry road map, SAP is the partner of choice for metals companies.

- 23 of the 25 top steel-producing companies in the world run SAP solutions
- 95% of iron, steel, and aluminum producers in the Forbes Global 2000 are SAP customers
- More than 3,400 fabricated metal products companies in 78 countries innovate with SAP solutions
- More than 4,400 primary metals companies in 90 countries innovate with SAP solutions
- 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 metals companies develop innovations that deliver impact at scale.

- Proven methodologies to drive innovation, from reimagining customer experiences to enhancing operations
- Innovation fueled through a managed innovation ecosystem from SAP
- Ability to build your own innovation capability and culture

SAP supports metals 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.

Learn more
- SAP for Mill Products
- SAP Services and Support
Outlined below is external research that was used as supporting material for this paper.

7. SAP Performance Benchmarking.

Note: All sources cited as “SAP” or “SAP Performance Benchmarking” are based on our research with customers through our benchmarking program and other direct interactions with customers.