In collaboration with
Boston Consulting Group

The Data-Driven Journey Towards Manufacturing Excellence

WHITE PAPER

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Contents

Foreword

The goal of this initiative is to support manufacturing and supply chain companies in their journey towards globally connected data ecosystems.

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One of the great strategic opportunities for industry today is manufacturing data excellence: the use of data and advanced analytics to drive productivity, new customer experiences and a positive societal and environmental impact. The movement towards hyperconnected value networks is already under way: manufacturing and supply system organizations now collaborate on data applications across company boundaries to manage the production and distribution of goods. And with uncertainty – brought on by megatrends such as the climate imperative and ongoing supply chain disruptions – likely to continue in the economy and the world at large, the innovative use of data in manufacturing may turn out to be a stabilizing force for global industry.

This report describes the work to date of a multiyear initiative on Unlocking Value in Manufacturing through Data Sharing, launched in 2019 by the World Economic Forum's Platform for Shaping the Future of Advanced Manufacturing and Value Chains, in collaboration with Boston Consulting Group (BCG). The goal of this initiative is to support manufacturers and supply chain companies on their journey towards globally connected manufacturing data ecosystems.

Back in January 2021, the organizations engaged in the initiative launched the Manufacturing Data Excellence Framework.[1] The framework helps companies develop new capabilities, build new partnerships and evaluate their progress with regard to the maturity of data-driven applications, as well as the organizational and technological enablers required to extract value from data at a company, supply chain and ecosystem level.

This white paper describes what leading manufacturers have learned by applying this framework and engaging in this initiative. It provides an overview of tangible use cases and the critical success factors they have in common. As a growing number of companies are progressing towards data excellence and the effective use of analytics in manufacturing, we trust the white paper will be useful for their efforts to develop globally connected manufacturing data ecosystems.

Executive summary

This report covers critical trends in the path towards data excellence and sheds light on leading practices and use cases.

Global disruptions, such as the COVID-19 pandemic and climate change, are fundamentally affecting manufacturing operations around the world. As a result, supply chain resilience and environmental sustainability are increasingly becoming important drivers of competitiveness. Manufacturers also need to make ongoing step-change improvements in productivity, cost reduction and quality.

As outlined in our previous white paper, Data Excellence: Transforming Manufacturing and Supply Systems, data is key to overcoming these challenges successfully, improving existing operating models and enabling new value creation. A BCG survey conducted with more than 1,300 manufacturing executives cited in that paper found that 72% of manufacturing executives considered advanced analytics to be more important than they had been three years earlier. But only 17% said they had captured satisfactory value from data and analytics.[2] This gap still exists, mainly because many companies do not yet have the requisite technical and organizational foundations in place.

To help capitalize on the power of data, members of the Unlocking Value in Manufacturing through Data Sharing initiative co-developed the Manufacturing Data Excellence Framework, a tool that identifies high-value opportunities for data-driven applications and the technological and organizational enablers required to build and scale those applications successfully. In 2021, several leading manufacturers applied the framework by performing a self-assessment across their facilities in order to gain a better understanding of their data maturity and which steps they can take to reach the next level, generating further value for themselves, their customers and the environment.

This white paper presents critical trends in the journey towards data excellence and sheds light on the best practices and real-life use cases implemented by the leading organizations that co-developed and successfully applied the framework across their manufacturing facilities. It also describes three stages of manufacturing data excellence identified through ongoing workshops and consultations among members of the initiative, as well as through the deployment of the framework:

- **Deriving actionable insights** by discerning patterns from data through human analysis of reports and dashboards
- **Predicting future outcomes** for business stakeholders to act upon, through the use of advanced analytics on historic data
- **Enabling self-optimizing systems** that take autonomous action through self-learning and self-steering algorithms, with input from historical and real-time data

Moving forward, the World Economic Forum will continue to support production companies in their journey towards globally connected data ecosystems by working closely with the global manufacturing community to identify the foremost practices and recognize those who are leading the way on the path towards data excellence. The World Economic Forum also invites organizations to take part in this process by incubating multistakeholder collaborations that use data for greater productivity, improved customer experiences and a better impact on society and the environment.

Introduction

The community developed a framework outlining key applications and their enablers to capture the value of data.

Manufacturing companies today are facing highly complex challenges. They must compete on several levels at once to improve their value proposition: ever-increasing quality, reduced prices and digitally enhanced productivity. This triple goal requires continuous improvement in manufacturing efficiency. In addition, manufacturers realize that they need to take the climate imperative into account and accelerate the transition to net zero with more sustainable materials, production processes and value chains. Furthermore, there is increasing pressure to develop greater resilience against recurrent external shocks and disruptions, and manufacturers are prioritizing increased visibility and flexibility in their supply chains, as well as advanced planning capabilities to better sense shifts in supply and demand, and pivot rapidly in response.

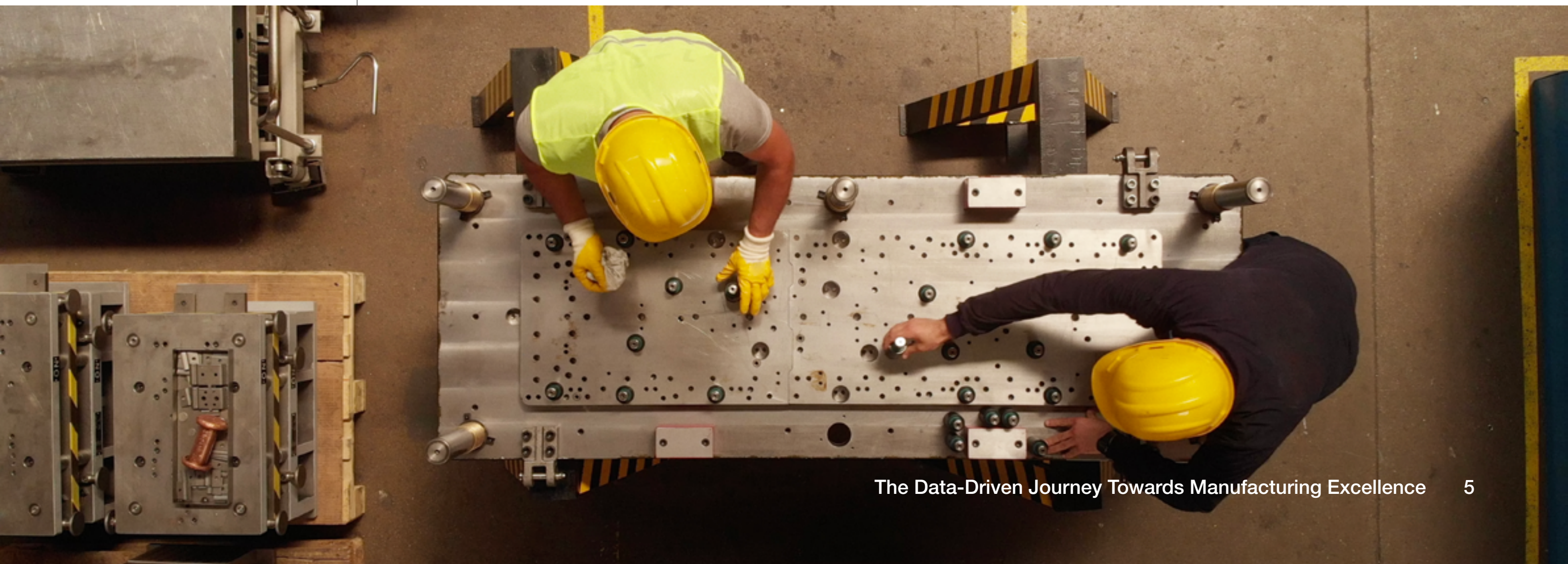
Overcoming these complex challenges requires advanced data and analytics capabilities, many of which have not yet been realized. In a previous white paper, [Data Excellence: Transforming Manufacturing and Supply Systems], a BCG survey found that 80% of manufacturing business leaders considered data and analytics important to their business. Moreover, while 72% said that the importance of data had grown during the previous three years, only 17% said they had captured satisfactory value from their efforts to date.[3]

This discrepancy can be attributed to technological and organizational hurdles, and the lack of collaboration both within and across company boundaries. To capitalize on the power of data internally and along their supply chains, successful companies can address these hurdles in three ways: 1) select and implement the data applications that are most relevant to their strategy; 2) build a solid technological foundation to scale up new digital products and services; and 3) strengthen their organizational set-up to effectively design and operate these applications.

To represent these efforts in more detail and support the community in capturing value from data, members of the Unlocking Value in Manufacturing through Data Sharing initiative co-developed the Manufacturing Data Excellence Framework (Box 1).

Over the past year, a group of leading manufacturing companies from various industries have applied this framework by self-assessing their manufacturing facilities in order to better understand their data maturity across a set of applications as well as the organizational and technological enablers. Aggregating the results of these assessments provided insights into the current level of maturity when it comes using data in manufacturing applications and the degree of implementation of associated enablers such as: data platform; data processing and visualization; strategy and roadmap; and governance and processes (Box 1). Based on the work conducted with the initiative community and the deployment of the framework, it has also been possible to determine which applications added the most value and identify three stages of data excellence in manufacturing. With real-life use cases as examples, the paper highlights leading manufacturers that have successfully captured the value of data and made significant gains in productivity, customer experience and sustainability.

Below: @tunart/ Gettyimages



BOX 1 | The Manufacturing Data Excellence Framework

The framework shown in Figure 1 was co-developed by the Unlocking Value in Manufacturing through Data Sharing initiative community. It covers the key opportunities and success factors for manufacturing data excellence, breaking them down into 20 dimensions covering three pillars:

– Application areas cover 10 functional dimensions, spanning the manufacturing value chain. These include: new product introduction; supply chain management and planning; maintenance; and quality. For each dimension, the framework maps specific applications, all relying on data and analytics to generate value.

– Technological enablers include the required digital and analytic foundations to capture data, process it and visualize it in a comprehensive way: data platform; data processing and visualization; connectivity; and privacy and security.

– Organizational enablers comprise the organizational set-up and processes to effectively design and operate data-driven applications: strategy and roadmap; governance and processes; ecosystem partnering; digital skills and capabilities; and legal compliance.

FIGURE 1 The Manufacturing Data Excellence Framework

Source: World Economic Forum in collaboration with BCG, *Data Excellence: Transforming Manufacturing and Supply Systems*, 14 January 2021

The process of moving towards manufacturing data excellence starts with an organization understanding its current level of data maturity. The framework is designed to provide these insights, enabling manufacturers to self-assess their strengths and development areas, relative to their peers. This helps them devise a path forward, planning the change strategy and the launch of new initiatives. Ultimately, the framework gives an opportunity for companies to collaborate beyond their explicit boundaries by defining a common target for data excellence and incubating new partnerships that can turn mutual pain points into tangible solutions.

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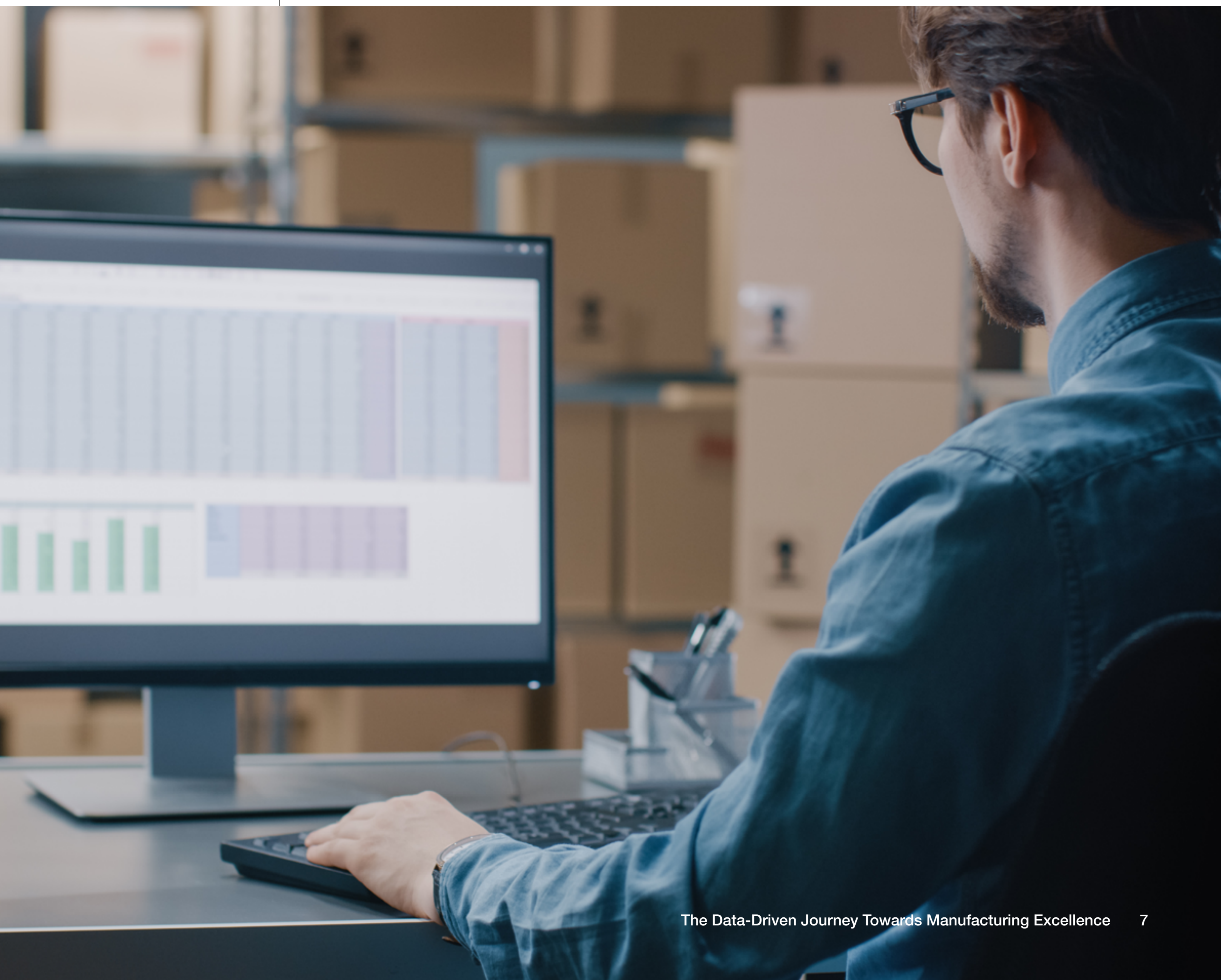
1 The data-driven path to manufacturing data excellence

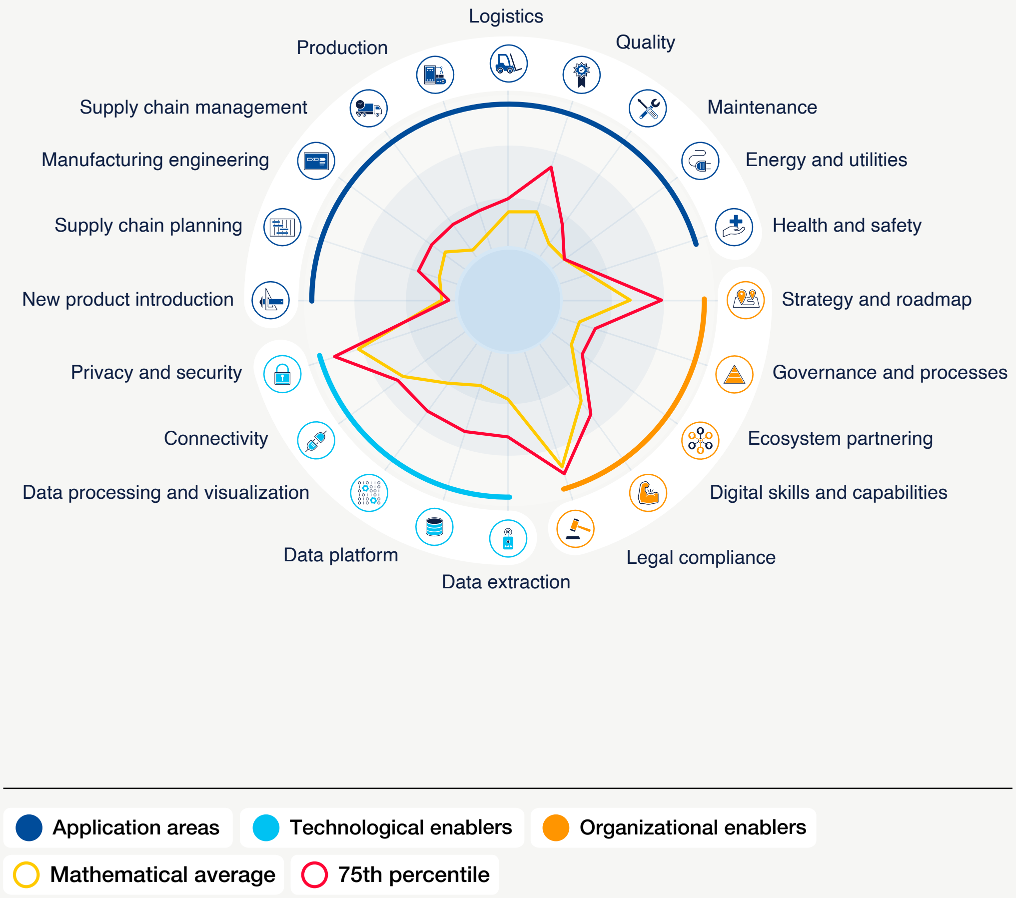
The path consists of three steps, featuring increasing degrees of collaboration and higher levels of analytical prowess.



Members of the initiative have used the Manufacturing Data Excellence Framework to embark on a journey towards manufacturing excellence powered by data-driven applications. They monitor their level of maturity in terms of adopting data and analytics applications, exchange learnings with the manufacturing community, define actions for improvement and identify opportunities for collaboration to reach data excellence, driving step-changes in productivity, customer experience and societal and environmental impact.

Figure 2 represents the average of self-assessments conducted at more than 15 plants on each of the framework's dimensions. The benchmark highlights the current trends and maturity levels in data-driven applications and their required enablers, along with the largest improvement areas.

FIGURE 2 **Average results of companies' self-assessments of manufacturing data excellence**



Source: World Economic Forum and BCG research and analysis; the average combines data points from 18 self-assessments

Ongoing consultations and workshops with the initiative community, together with the above trends, reveal that the manufacturing data excellence journey consists of three successive stages featuring increasing degrees of collaboration and data sharing across company boundaries, as well as higher levels of analytic prowess (Figure 3).

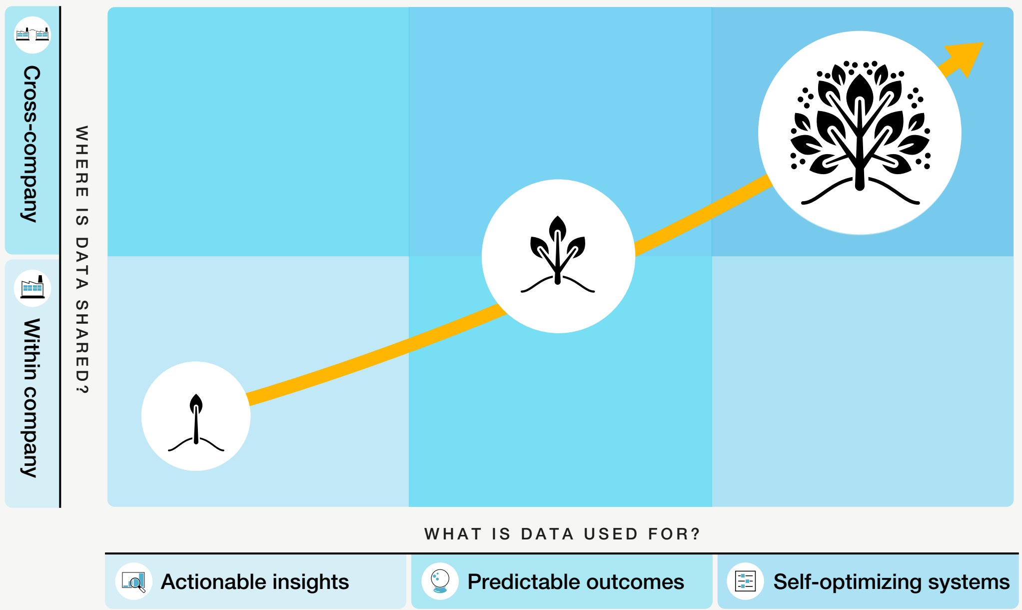
1. **Deriving actionable insights** – In the first stage, operational data is used to derive actionable insights. Managers discern patterns from the data synthesized in the form of reports and dashboards.

2. **Predicting future outcomes** – The second stage involves predicting future outcomes. Advanced analytics are applied to historic data, so that future developments and needs can be anticipated and acted upon.

3. **Enabling self-optimizing systems** – In the third stage, self-optimizing systems take autonomous action through self-learning and self-steering algorithms, with input from historical and real-time data.

The quality of predictive analytics depends upon correlating vast amounts of information; therefore, as we move through these three stages, data is gathered from a growing number of sources, within and across company boundaries. Manufacturers ultimately share data with partners in their value chain and integrate their decision-making with the broader ecosystem.

FIGURE 3 The three-step approach to manufacturing data excellence



Source: World Economic Forum and BCG analysis

As they move along this path, companies continuously improve their data and analytics capabilities and increase the degree of collaboration within their ecosystems. Using both levers at once leads to greater benefits. End-to-end tracking and tracing of materials along the supply chain and predicting machine failures or product defects leads to operational improvements and an increase in productivity. Partnerships with suppliers, empowered by data and analytics tools, also enable just-in-time delivery of critical goods, ensure improved quality and reliability, and provide transparency over provenance of goods, which can enhance customer experiences. Finally, data and analytics applications can help increase resource efficiency and environmental footprint transparency along the value chain, leading to a positive impact on the environment.

The remainder of this section describes the three stages of the Manufacturing Data Excellence Framework in more detail. Analysing these trends across the three pillars of the framework – application areas, technological enablers and organizational enablers – allows us to observe key features for each stage. The descriptions are punctuated with company success stories, drawn from the application of the framework.

1.1 Deriving actionable insights

At this stage, data applications are built to track the performance of operational processes and articulate and solve the root causes of problems. They make use of collected data from sensors in factories and logistics systems, using extraction mechanisms. Data is also gathered from enterprise resource planning (ERP) and manufacturing execution systems (MES) software and from other core business systems.

The analytic results are released through reports, or increasingly through real-time dashboards generated with data visualization and analytic software. Managers use these reports and dashboards to discern patterns and trends, informing decision-making. Compared to later stages, these applications are relatively simple to implement; yet they are important as they pave the way for more efficient and agile operations.

The most common technological enablers during this stage include self-service business reporting programs such as Tableau and Microsoft Power BI, with which managers program their own analytic tools. Privacy and security are critically important; their ubiquitous presence among framework applicants reflects the ever-present nature of cyberattacks and the strategic importance of supply chain and manufacturing data.

The main organizational enabler at this stage is strategic planning. Data is treated as a core asset worth leveraging. However, at this stage, applications are often executed at the level of the individual facility, in some cases without a corporate-level data strategy: as plants innovate individually and at their own pace, digital maturity across geographies and business units may range widely.

BOX 2 **Use case: ZF – end-to-end tracing of product data**

ZF has built an application to trace product characteristics along the supply chain. Combining production order and routing data from the ERP with measurement data from the shop floor allows a plant to collect, process and leverage data for further analysis. As a result, faulty components can be easily identified within the product structure tree. This allows ZF's plants to identify production problems early, trace them back to their origin, isolate faulty components and work with suppliers to identify root causes. This significantly increases the chance of discovering defects early before orders leave the plant.

↑ Higher efficiency and process reliability

↓ Short reaction times and high resolution in case of requests

Data processing and visualization

Dashboards providing ERP information as well as measurement data. Production orders can be traced, including relevant production information

Strategy and roadmap

Partnership with I4.0 Maturity Center from Aachen for a status-quo evaluation of a plant that shaped the individual I4.0 roadmap for the years to come

Data platform

A group-wide Industrial Internet of Things (IIoT) platform brings together data from different sources across the organization and leverages state-of-the-art graph database technology

Governance and processes

Close collaboration between business and IT supported by a central steering committee ensured the successful realization of the use case

1.2 Predicting future outcomes

During this stage, data and analytics are used to automatically recognize patterns, by feeding large datasets into machine-learning algorithms to predict future behaviour. This can reveal early signals of future outcomes and help companies prepare for the next steps.

Because the quality of predictive analytics depends on correlating vast amounts of information, there is a built-in incentive to scale up data collection throughout and across organizations. Gradually, the practice of predicting future actions migrates along the supply chain, and insights about operations, logistics and opportunities for improvement are shared among an ever-growing number of parties within the ecosystem.

Key technological enablers observed at this stage include data-processing capabilities and intelligent algorithms. The algorithms predict what will happen next by correlating massive amounts of data from past and present operations, along with public and external data. Since predictive analytics are built in, the systems continually learn from experience, and the people who manage them learn alongside them. The combination of data from multiple sources has often been achieved by building up enterprise-wide data platforms, usually enabled by cloud-based infrastructure and standardized data models, to effectively break down data siloes.

To mitigate concerns about the long lead time and significant investments required for these applications, leading manufacturers have been implementing them – along with the required platforms – in an iterative way: agile teams work towards minimum viable products (MVP). MVPs are smaller “quick-win” releases that are usually set up at the level of individual plants, requiring less upfront investment and generating tangible results in a short time. Once their early success has established credibility for the concept of predicting future actions, they have been steadily improved in an incremental, iterative way. Additionally, to develop such predictive algorithms at scale, manufacturers have been reskilling their workforce or acquiring new talent to strengthen their data science, data engineering and artificial intelligence capabilities

BOX 3

Use case: Ford Otosan – data-driven factory/layout planning

Ford Otosan digitalized its factories by creating digital twins of roughly 50% of the production lines used for car body production. Data captured from Internet of Things (IoT) sensors as well as production volumes, failure rates and operator efficiency was fed into a big data platform and used to perform bottleneck analysis and identify stress points. Intelligent algorithms were used to optimize the lines' efficiency and simulate proposed layouts for optimized production lines.

15% Operator efficiency increased

2% Asset (robot) efficiency increased

15% Of cycle time reduced

Data extraction

Production assets within the production line are equipped with IoT sensors that capture data in real time and transfer it to the big data platform for processing

Data processing and visualization

Advanced algorithms optimize resource requirements based on real-time data that is streamed from the IoT sensors. Discrete event simulation is used to capture advanced production data analytics

Strategy and roadmap

Ford Otosan worked together with its global simulation software partner company Ford to co-develop the solution. Aligning strategy, roadmap and investments across company borders was key to a successful implementation

Digital skills and capabilities

Earlier experience in implementing data applications led to the build-up of advanced data analytics capabilities in-house

Below: @ gerenme/ Gettyimages

BOX 4

Use case: ZF – occupational safety analytics

To reduce the number of accidents in distribution centres and factories, ZF implemented a solution in which a self-learning algorithm analyses continuous streams of video from cameras. The safety system detects abnormalities and highlights these in a visual overlay to the video stream. The tool automatically notifies plant managers when an anomaly suggests precautions or special measures are needed, thereby preventing potentially unsafe conditions.

↑ Safer work environment

€65,000 Cost savings per plant per year

Data processing and visualization

Visual overlays are automatically generated and placed in the real-time video feed

Data processing and visualization

Machine learning-based algorithms recognize patterns, distil evidence of shifts in behaviour and generate warnings

Ecosystem partnering

ZF has worked with a start-up incubator to jointly refine the solution and adapt it to ZF's specific needs

Digital skills and capabilities

The partnership also enabled ZF to build new capabilities in-house

BOX 5

Use case: Analog Devices – automated manufacturing execution and control

Analog Devices successfully piloted a custom software solution on one product portfolio to drive a cycle of continuous improvement and systematically reduce process weaknesses. The solution enables early detection of process wander, and scheduling of preventative maintenance to maintain yield and quality. Through dynamic adaptation of process limits – based on real-time manufacturing yield information – automated notifications are sent to the responsible engineers for a given product, flagging early deviations for root-cause analysis.

7% Yield improvements on high-volume products

↓ Reduced cycle times

Data extraction

Data is being collected from multiple factories and at multiple stages of the manufacturing process, allowing for product parameter traceability

Strategy and roadmap

Aligned roadmaps between R&D and production drive corrective actions and process improvements in both areas

Data platform

Data coming from various internal and external databases is preformatted before storage. Different industry de facto data formats are used in different parts of the manufacturing process

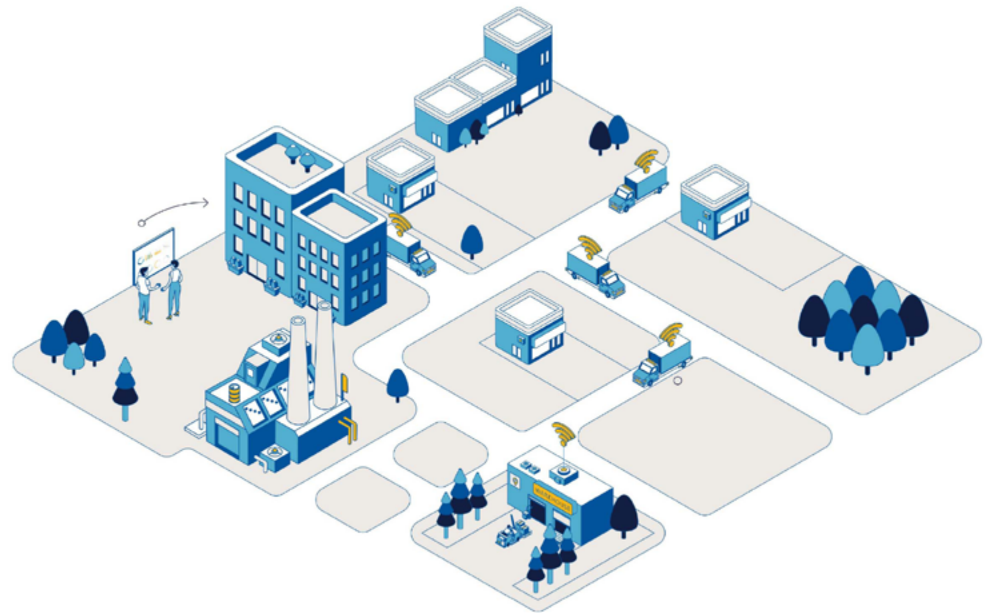
Ecosystem partnering

Partnering up with key suppliers and customers increases access to data, leading to a double-loop feedback to drive corrective actions and process improvements with ecosystem partners

Below: @GCShutter/ Gettyimages

BOX 6 | Use case: Henkel - advanced route optimization

Henkel's track-and-trace solution gathers and analyses data on more than 150 parameters, keeping track of the current location of its freight and providing accurate real-time reporting of goods in transit. The application is deployed in North America and Europe, covering nearly 75% of shipments. It uses a dynamic estimated time-of-arrival metric to optimize dock use and reduce detention on outbound freight. Dashboards provide visibility at stock keeping unit (SKU) level while intelligent algorithms continuously optimize carrier and lane performance, reducing detention and dwell time.



12% Logistics reduction costs

50% Customer penalties reduction

>10pp On-time delivery improvement

Data extraction

More than 150 data points coming from a wide variety of sources: GPS, weather and traffic indicators, carrier and lane information, etc.

Data platform

A standardized model allows integration with ERP and warehouse management systems, with execution of subsequent activities such as invoicing and claims generation

Ecosystem partnering

Henkel works with technology providers such as Microsoft, Databricks and Snowflake to build best-in-class data-processing capabilities on modern digital infrastructure

1.3 Enabling self-optimizing systems

During this stage, data is used to enable self-optimizing systems – platforms and interoperable networks that can take autonomous action, steering themselves without the need for human intervention. Operations therefore become largely self-managing, with historical and real-time data being used as input parameters for self-training algorithms, which get “smarter” as their experience grows.

Many types of autonomous application become possible. For example, transportation routes can shift based on information about transit costs, available equipment, delays and traveller demand. Ventilation systems can also adjust to information about weather, optimal temperatures and human activity nearby. At this stage, manufacturers have used data and analytics from one part of the operations to make improvements elsewhere. For instance, shipping and production data is used to reduce the weight and size of a new product variant. Manufacturers thereby break down internal departmental siloes and further collaborate with their partners across the value chain. Collaboration at this scale enables an end-to-end flow of information and leads to results that would otherwise not have been possible. For instance, higher customer satisfaction can be achieved as more accurate predictions on delivery times from third-party logistics providers can be relayed in real time, or more efficient production planning is made possible because of real-time visibility on arrival of goods from suppliers. Insights derived from these partnerships around data inspire new business models, products and services, thereby increasing productivity, creating new customer experiences and improving the impact on society and the environment.

A key technological enabler for such self-optimizing systems at this stage is asset connectivity: high-speed networks and cloud-based systems that link all of a company’s nodes together, exchanging data in real time with the core central platform. The system needs to be robust enough to resist disruption and enable advanced machine-learning algorithms and autonomous activity. Leading manufacturers have also prioritized advanced visualization technology such as augmented reality, which can show insights as a virtual overlay on the physical factory or enable “digital twins” that simulate production and help resolve issues before they escalate.

As these applications are scaled up across geographies and value networks, they require an increased data pool – combining data from internal plants and partnering firms in the ecosystem – to give algorithms a broader base of material to train with, which enables a higher level of self-optimization.

With the appropriate incentives for involvement and data sharing, these cross-company networks grow further. During this stage, mechanisms for collaboration with other companies on the exchange of data or the sourcing and implementation of shared technology are increasingly in place. Legal compliance becomes even more important than it was in earlier stages, because of the degree to which confidential data and intellectual property is shared between parties at this stage.

Another critically important organizational enabler is a company-wide digital strategy. This is often defined at a corporate level and cascaded down to the local plants. While strong governance bodies oversee adherence to it, a degree of flexibility and freedom remains for individual plants to innovate themselves. They can then scale these innovations globally.

Below: @solarseven/ Gettyimages

BOX 7

Use case: Henkel – predictive demand forecasting

A demand-sensing application enables Henkel to predict demand more accurately, reducing inventory levels and optimizing production plans. Advanced gradient-boosted tree-based algorithms analyse data from Henkel and its partners to illuminate patterns among disparate variables, such as the correlated effects of promotions, product cannibalization and competitors' price changes. The resulting new insights help teams on the shop floor reduce material stocks and avoid non-value-adding activities such as unnecessary material movements. The application is deployed globally and steered centrally by a planning and steering team, supported by an in-house data science team.

20% Increase in forecast accuracy

5% Improvement in service level

50% Reduced fluctuations in monthly production

5% Reduction of networking capital and inventory days

Data extraction

Henkel's cloud-based data platform gathers data from internal core systems (such as historical shipment records from the ERP and POS) and external sources such as social media and economic indicators

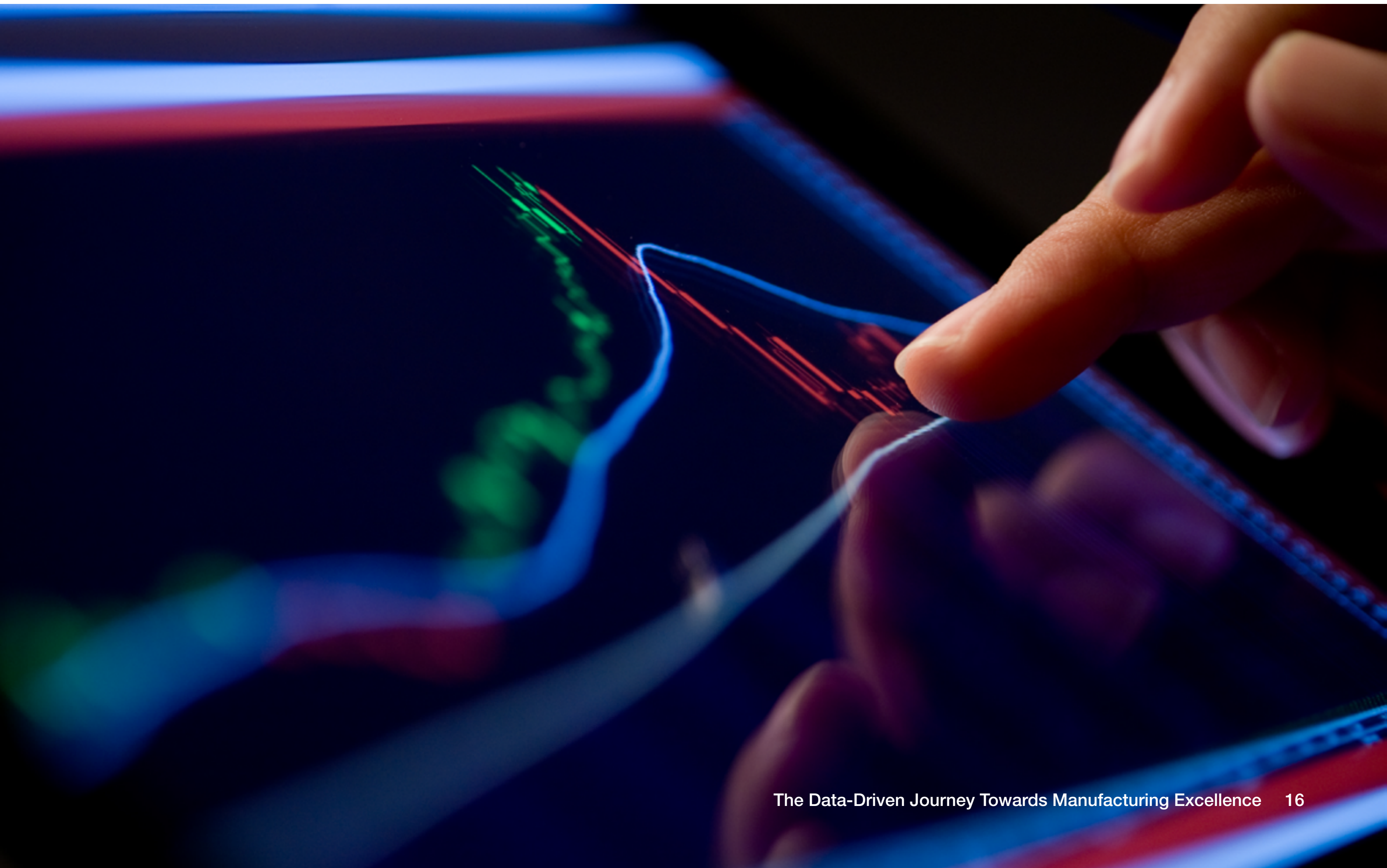
Governance and processes

With a "try fast, fail fast" mindset in place, a first minimum viable product was built in weeks and then iteratively scaled in a number of focused agile sprints

Data platform

Henkel developed a big data framework that provides a common reference model, business rules and its own programming library, reducing software development time by more than 35%

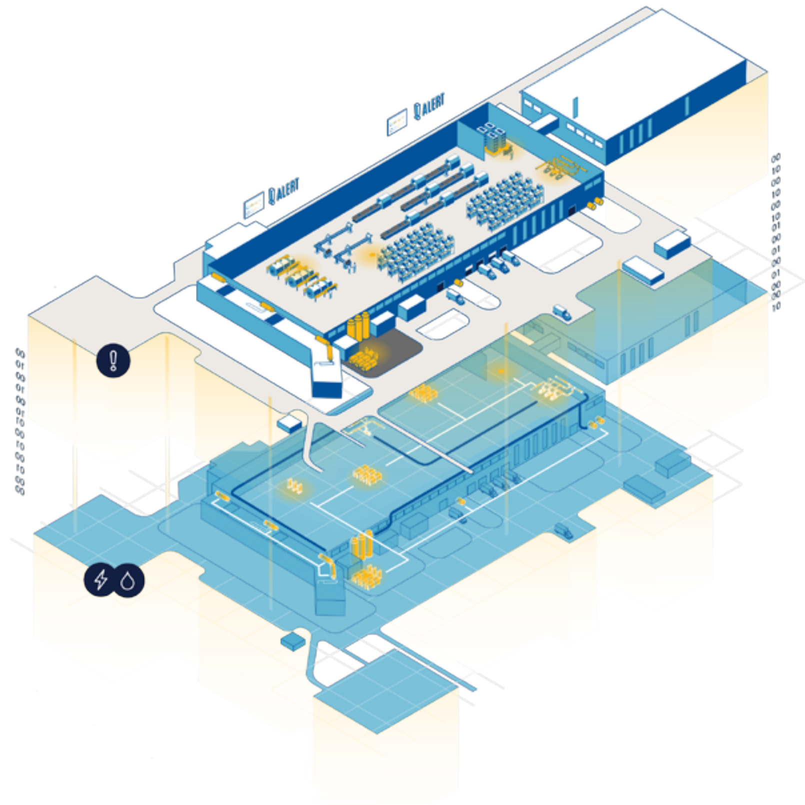
Below: @woraput/ Gettyimages



BOX 8

Use case: Arçelik – smart energy management

Arçelik uses data from more than 400 sensors and energy-measurement devices such as energy analysers, natural gas meters, compressed air flow meters and calorimeters to reduce its energy consumption. A "digital twin" model of the plant self-adjusts the lighting and optimizes the cooling and heating systems based on an algorithm that uses real-time data input. The real-time energy consumption and production quantities of machinery (and auxiliary facilities) can be traced, enabling machinery-based comparison, efficiency analysis and energy consumption forecasting. This solution was piloted at a greenfield plant and is now being rolled out across the globe.



20% Energy consumption reduction per product compared to conventional plants

Connectivity

Assets have onboard IoT sensors for real-time data capture as well as remote access and monitoring

Data processing and visualization

The digital representation of the factory is made available through interactive dashboards, allowing monitoring and control of designated systems

Ecosystem partnering

Arçelik collaborated with different stakeholders to develop the digital twin and control algorithms

Strategy and roadmap

Government legislation incentivizes companies to implement green solutions

BOX 9 | **Use case: Analog Devices – smart generative design**

Analog Devices creates digital models of new products, models that are sensitive to mechanical and thermal changes. It uses inline information gathered from the fabrication and assembly processes, including data about variations, to continually update its models. Simulation algorithms automatically optimize product performance based on predictive modelling of process corners and other design and fabrication parameters. This minimizes systematic design weakness in manufacturing execution and helps achieve necessary customer performance and quality standards more rapidly. This method has been incorporated as part of the standard workflow for relevant product categories around the world.

50% Reduced R&D timespan

18% Reduction of time-to-market in months

Data platform

Industry formats for easy exchange of data between subcontractor suppliers and internal manufacturing systems were key to building the models and algorithms

Ecosystem partnering

Close working relationships within the complex semiconductor supplier ecosystem were critical to success; they enabled the sharing of detailed process parameters required for the model

Data extraction

Custom-scripted data transformation was used to help automate the loading of the data into the Analog Devices design database and preprocess it

Strategy and roadmap

Aligned roadmaps between R&D and production allowed more efficient and automated manufacturing execution and control

Below: @ simonkr/ Gettyimages

Conclusion

Companies that master data applications across ecosystems, deploying advanced technological and organizational enablers, are the data champions of this journey.

Consultations and workshops conducted with the Unlocking Value in Manufacturing through Data Sharing initiative, together with the application of the Manufacturing Data Excellence Framework within the manufacturing community, have established best practices and validated the importance of data-driven applications and collaboration across the value chain to derive actionable insights, predict future outcomes and enable self-optimizing systems.

Companies that master the use of data, successfully deploying advanced technological and organizational enablers in data applications across their ecosystems, are the data champions and consistently have the greatest impact on productivity and customer experiences, as well as society and the environment. This success is a natural effect of combining data from multiple sources, internally and across supply systems. Given the ever-growing volumes of data, there are unlimited opportunities for new insights to be gleaned.

Almost all manufacturing companies have started their journey towards data excellence, but no company has reached the end of the path. Because of the ever-evolving nature of technology and practices, companies need to continuously innovate and improve. To accelerate this process, achieving a solid understanding of one's current status and comparing it against peer-group or industry benchmarks will help in setting transformation and growth priorities. Manufacturers can also use the framework to disseminate learnings from success stories and facilitate the scaling of applications that will raise their level of mastery, within and across their company boundaries.

Moving forward, the World Economic Forum will continue to identify best practices and recognize those who are leading the way towards data excellence. The Forum will also further support the incubation of new pilot projects, the scaling-up of cross-company and public-private collaborations, and the bringing together of coalitions and initiatives. These are critical steps towards manufacturing data excellence – a world of globally connected business ecosystems continually gaining in performance – while having a positive impact on society and the environment.

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Endnotes

1. World Economic Forum, Data Excellence: Transforming Manufacturing and Supply Systems, 14 January 2021: https://www.weforum.org/whitepapers/data-excellence-transforming-manufacturing-and-supply-systems.
2. Ibid.
3. Ibid.

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