

Smart Manufacturing

Turning challenges into opportunities
for the use cases that matter most



Go beyond the hype

An in-depth look at the challenges, opportunities and use cases to take action today

Smart Manufacturing as a concept has been around for over 15 years and is firmly on an upward trajectory as organizations are starting to realize their full transformational potential. For most manufacturers, it's only recently that the Smart Factory is no longer considered a technology experiment. It's now deemed a critical initiative with a clear business case: a Gartner survey of manufacturers found 88% of participants expect smart manufacturing to advance their competitiveness¹.

Smart Manufacturing has finally reached a level of technology maturity. Proven case studies now illustrate the business benefits and C-suite project sponsors no longer feel like their career is at risk by bringing it to the table. To illustrate further, in a Gartner survey "86% of the C-level respondents – who are also final decision makers in their organizations – agree that leadership "gets it."²

Furthermore, the global events that have impacted us over the past couple of years have increased the pressure on manufacturers to not only remain upright and survive, but grow through innovative solutions and thrive in an ever-increasingly competitive landscape.

Manufacturers come in all shapes and sizes, so naturally there can never be a 'one-size-fits-all' approach to rolling out Smart Factory solutions. With that in mind, there is a rapidly growing divide between those organizations who still haven't started their Smart Factory journey (traditionalists) vs. most manufacturers who are, at the very least, making plans to conduct a test as part of a wider digital transformation program.



30%
reduction in costs



20%
increase in asset efficiency



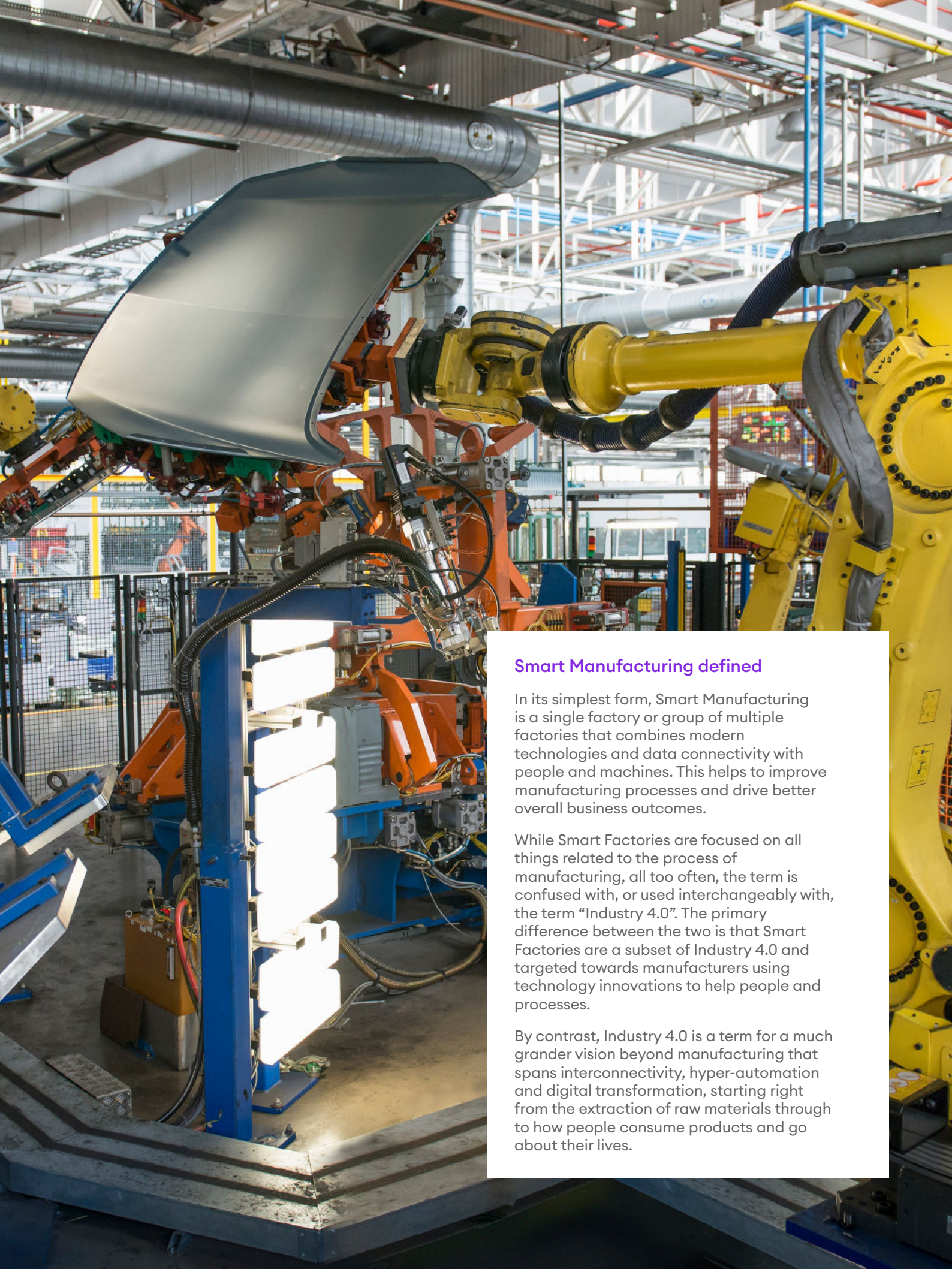
30%
improved product quality

This white paper aims to debunk any notion that you need to be a large manufacturer with a huge IT budget to realize any of the documented business benefits such as a 20% increase in asset efficiency, 30% improved product quality or a 30% reduction in costs³.

Despite the convergence of technology maturity and multiple catalysts forcing businesses to evolve just to stay relevant, there is still confusion around what exactly Smart Manufacturing is in practice. In addition, how to get started without spending a fortune and what specific use cases are worth considering are also top of mind.

In this white paper learn about:

- What is Smart Manufacturing and how does it relate to Industry 4.0?⁴
- The key challenges facing manufacturers that relate to the need for Smart Factories
- What are the specific use cases where Smart Manufacturing could make an impact and how to get started?
- What really matters when choosing your Smart Factory solution partner?



Smart Manufacturing defined

In its simplest form, Smart Manufacturing is a single factory or group of multiple factories that combines modern technologies and data connectivity with people and machines. This helps to improve manufacturing processes and drive better overall business outcomes.

While Smart Factories are focused on all things related to the process of manufacturing, all too often, the term is confused with, or used interchangeably with, the term "Industry 4.0". The primary difference between the two is that Smart Factories are a subset of Industry 4.0 and targeted towards manufacturers using technology innovations to help people and processes.

By contrast, Industry 4.0 is a term for a much grander vision beyond manufacturing that spans interconnectivity, hyper-automation and digital transformation, starting right from the extraction of raw materials through to how people consume products and go about their lives.

Manufacturing challenges

A broad range of challenges is constantly hitting manufacturers, including supply chain issues, rising raw material prices, ever-changing customer demand, staff skills shortages and many more. While none of these are entirely new, what is different is their severity and frequency alongside the speed at which the market landscape is now evolving.

The result of all these challenges that seemingly have no immediate respite in view is the opportunity to promote business resiliency as a top strategic goal for manufacturers according to IDC⁵. To meet such challenges head-on and deliver against their wider objectives, organizations are increasingly turning to innovative solutions like Smart Manufacturing to help differentiate and future-proof their business.

Here are some of the specific challenges that can be tackled through Smart Factory adoption and rollout that can not only help drive the business forward, but also instill greater business resiliency:

- **Quality** – Inconsistent production quality rates with high defect rates
- **Production throughput** – Inefficient manufacturing processes
- **Service levels** – Rapidly changing consumer demand with tighter delivery timescales
- **Cost and margins** – Unpredictable profit margins with a lack of cost control
- **Inaccurate forecasting** – Too much uncertainty around customer demand leads to inaccurate over or under purchasing of what's actually required
- **Cashflow** - Money needlessly locked up in raw materials and inventory that is not used quickly starts to affect the overall bottom line.
- **Sustainability** - Unnecessary wastage during production

Solution maturation

Manufacturers now have considerable choice in terms of the technological innovations available to help drive better business outcomes. As a result, most organizations have now at least started their journey towards smart manufacturing, with manufacturers operating purely in the “traditional” sense becoming few and far between.

The choice of available solutions reflects the maturation of the various Smart Factory capabilities alongside an improved user experience. The result of this is that Smart Manufacturing has gone from an emerging technology aspiration to an array of business-ready solutions for organizations of all shapes and sizes.

Examples of capability and user experience improvements in recent years that have combined to help make the overall Smart Factory proposition a mature one include:

- The development of a single ERP solution that runs back-office processes while seamlessly connected to the manufacturing shop floor
- The ability to connect to machines and any of their attached sensors regardless of type or age
- The maturation of analytics, artificial intelligence, and data visualization to interpret data and present meaningful analysis and future predictions
- The utility of robotics and cameras to efficiently outperform humans for some very repetition heavy use cases such as quality control
- The digital automation of processes and workflows
- The improvement of software as a service (SaaS) experiences by leveraging the latest internet web browser technologies and putting greater emphasis on the user throughout development
- The ability to handle large volumes of data combined with advanced “what if” scenario planning capabilities

Defining traditional vs. “smart” manufacturing

With a mature Smart Manufacturing solution ecosystem now firmly in place, there is a rapidly growing divide as two clear types of manufacturers have emerged. The first are the traditionalists operating as they always have; and the second group has embraced technology such as smart manufacturing to help grow, differentiate and future-proof themselves.

“Traditional”

Overview

These organizations are built on manufacturing processes and operations that are thoroughly ingrained. They are supported by a leadership mindset that is skeptical of change, or have the mindset “we have always done it this way.” The traditional manufacturer will have been in business for at least a decade and it’s likely their IT systems and back-office solutions have long reached their expiry date. As a result the organization, while effective enough, will have plateaued in terms of efficiency and lacks the executive sponsorship to try something new, such as leveraging technology innovations to help invigorate and expand the business.

Next steps

The combination of cheaper and more mature solutions coupled with recent global events means that the viable scenarios where it makes sense to solely operate in the “traditional” sense are rapidly shrinking. This means that for a traditional manufacturer to stay in business and be profitable for the long term it is now a case of not if, but when, they begin the journey to transform the operation.

“Smart”

Overview

Business leaders for a Smart Manufacturer have completely bought into the potential to be a digital- first manufacturer and the opportunities it can bring. This attitude means that whether it’s simply scaling up existing smart factory solutions, or a total smart factory roll-out across all sites, these organizations are willing to invest in digital solutions to help future-proof themselves.

Next steps

As smart factory solutions get rolled out the investment will continue to provide an increasing rate of financial return and will also manifest itself through the manufacturing processes themselves. Manufacturing at its core is now underpinned by data connectivity with machines, automation, and artificial intelligence as part of optimizing and streamlining manufacturing operations through technology. As this technology continues to be adopted and embedded into processes, it will eventually be viewed as a real partner and game changer to the shopfloor workers, production schedulers and operations managers.

Technology maturity and underlying use cases

Defining the makeup of a typical Smart Factory set up is difficult as there is no one-size-fits-all approach, and it very much depends on the organization's digital maturity and appetite to embrace technology. That said, here are the most common solution areas that make up the wider smart factory solution set both in terms of business readiness today, and the areas that are emerging and will likely become more mainstream in due course:

Core Smart Factory capabilities delivering value today

Enterprise Resource Planning (ERP)

The overarching back-office solution with capabilities including Manufacturing management, Supply Chain, HR, Procurement and more.

Artificial Intelligence (AI) and Machine Learning (ML)

Data analysis from the shop floor that's automatically analyzed and fed into processes like production planning and preventative maintenance scheduling. Advanced shop floor robotics powered by AI.

Industrial Internet of Things (IIoT)

Connecting machines and sensors of all ages and types to return real time data for review and analysis.

Automation

Workflow and process automation such as turning a machine on or off based on a schedule or event-based when anomalies are detected.

Analytics

Total evaluation of all the data available with key insights, issues and activities now being alerted, categorized, and then visualized in dashboards to help enable greater decision making in real time.

Digital Twin

A 3D representation of products and the shopfloor to help visualize the manufacturing process and the operational status of machines. Perform "what-if" scenarios and simulations.



Emerging themes driving the capabilities for tomorrow

- Further collaboration between shopfloor workers and machines featuring collaborative robots aptly named "cobots".
- A continued push for machines to take over and do the monotonous specific tasks thus promoting staff into different and more value adding roles.
- Greater manufacturing agility that enables higher levels of mass personalization through the next generation of computing and intelligence
- Improved intelligence and automation capabilities as part of enabling even more sustainable and circular economy focused operating models.
- Solution maturation combined with an upskilled workforce familiar with new technology like augmented reality tools within the manufacturing process.

Smart Factory use cases and corresponding benefits

As capabilities continue to emerge and mature, manufacturers are embracing the smart factory as no longer just a concept, but one that's fully business-ready to help tackle their toughest challenges:

1. Challenge: Production output isn't as optimized as it could be, and we simply aren't taking complete advantage of the resources we have available

Solution: Leverage data by connecting to the machines in conjunction with AI to help easily identify issues and the opportunities for improvement. In addition, open the door to more advanced scheduling in terms of automation and optimization. Combine this with digital twin scenario testing for the shop floor as part of optimizing capacity utilization and production throughput.

2. Challenge: The machinery keeps breaking down and it's hard to know how to reduce this and when to schedule maintenance

Solution: Utilize AI capabilities to analyze the machine and sensor data to help detect anomalies and predict a more accurate and cost-effective maintenance program that keeps the machines running and operating at their expected levels of effectiveness.

3. Challenge: Production defect rates are too high

Solution: Use analytics supported by exception-based alerts across all existing data points to help identify under what conditions production output is below the expected standard. This information can also form the basis of future preventative maintenance plans to help improve overall production quality.

4. Challenge: Shopfloor efficiency needs to improve

Solution: Workflow and process automation that enable event-based actions to be triggered instantly without human intervention via real-time data feeds.

5. Challenge: Production costs and wastage needs to be lower

Solution: Connecting to machinery enables significantly more accurate cost analysis to better understand true margins and which products aren't as profitable as initially forecast. Use AI to help predict how much raw materials are really needed; significantly reduce the amount of throw away scrap waste lowering the overall production costs.

6. Challenge: Faster and better decision making

Solution: Real-time analytics based on shopfloor production data and insights from machine telemetry. This presents a complete picture, including predictions that enable managers to intervene and confidently manage by exception as required.

7. Challenge: Enhanced service levels

Solution: Connect the machines and shopfloor processes seamlessly to the wider manufacturing management and back-office systems to ensure you have the latest view on shopfloor progress and any related issues for customer orders.

Maturity stages in a Smart Factory rollout

With a host of use cases and corresponding top-level benefits available to manufacturers who embrace smart manufacturing, the initial challenge is knowing where to start. While every organization will be on its own unique digital transformation journey, there's never been a better time to accelerate or begin your existing smart factory plans. Broadly speaking Smart Factory adoption can be broadly categorized into three levels of maturity:

Stage one – Making a start

For those remaining manufacturers feeling reluctant, or for those organizations that are convinced but unsure where to start, a simple trial or test is more than sufficient to get the ball rolling. Smart Factory solutions have matured such that they can scale as needed and the capability is now there to connect to machines of all types and ages. As a result, any notion that Smart Manufacturing is only for those large organizations with huge IT budgets is simply false.

Setting up a trial that connects one or even two machines on your shopfloor is a great starting point. Potential examples include any automated quality inspection equipment or production line machinery. The ability to automatically pull back machine data into your existing ERP system will provide data-led insights that will start to challenge existing assumptions around output, ideal machine performance settings and associated costs. As this trial could be the catalyst for a much wider rollout, it's critical to pick one or two machines that are a fair representation of the wider set of machines to ensure the evidence in the business case stands up to scrutiny.

Stage two – A Larger trial / tightly focused rollout

For organizations that have made a start and have seen the vast potential and a tangible glimpse of the future benefits, this middle stage remains an important proving ground before a significantly wider rollout. At this point, the most common approaches are to either identify a small cluster of targeted use cases that the organization believes need to be tackled or roll out smart factory solutions throughout one entire location. This approach and the resulting outcomes will then lay the groundwork as part of building a more complete business case to progress the rollout even further.

Regardless of whether it's a tight grouping of use cases or a single location rollout in this middle stage, it must relate to wider business KPIs. If stage one was about proving machines can be connected and seeing the possibilities, in the second stage, it's critical that the manufacturing challenges are addressed, scalability tested, new processes established, and the outcomes achieved can be mapped back to the overall objectives of business.

Stage three – Wider rollout

In this final stage, executive sponsors have clear evidence that it can work in their organization and see the untapped tangible value. This provides the justification for a much wider rollout and full-scale adoption of Smart Manufacturing.

At this end of the maturity scale, the greatest potential pitfall is no longer about "proving it" but is about successfully rolling out the processes established in stage two. In addition, it's about making sure the solution stack and, if applicable, implementation partners used previously remain the right fit as part of helping to ensure successful delivery against the agreed project requirements and targeted success criteria.

Finding your ideal solution partner

As organizations move from dipping their toe in the water through to a complete immersive dive into all things Smart Manufacturing, ensuring you have the right technology partner really is a make-or-break decision. By making the right choice your solution provider should help unlock your organizations true potential as a manufacturer. Here are some key solution criteria that need to be weighted heavily within your selection criteria:

Single platform

With such a range of solutions in the marketplace the choice can be overwhelming. Software vendors often claim to have a complete range of capabilities; however, when lifting the lid, it is commonly a collection of disparate systems that have been bolted together over time. Implementing and maintaining these systems will become incredibly complex, time-consuming and will ultimately undermine your true potential as a Smart Manufacturer.

Composability

A solution that doesn't force you to take unnecessary capabilities and modules as you start your Smart Factory journey but can scale up when you are ready. True composability means that you only need to build a smart factory solution business case based on what you need in the short term with the confidence that as your organization grows so can your solution.

Manufacturing industry depth

Ensuring your solution partner has genuine industry expertise instilled from the ground up is vital. Ultimately Smart Manufacturing is about helping take your business to the next level and realize its true potential; to do that, a solution needs to support and add to your manufacturing processes seamlessly. Unless a solution has solid industry roots giving you confidence that best practice is inherent, beware of any solution that requires you to drastically change how you operate as a business just to fit how their software has been built.

Innovation ready to use

Capabilities such as AI and Machine Learning to analyze the data coming from machines ideally need to be natively embedded in the solution. The risk of picking a solution that relies on additional systems and/services to provide "innovation" can be very costly in terms of time, resources and an overly complex user experience that can outright stop you from realizing the intended value.

User experience

The user experience must be a focal point in your chosen solution; it should quickly provide information where and when it's needed intuitively so the next action can be the right one. Ultimately smart manufacturing software with capabilities such as analytics connecting back into a single ERP system should make your users' lives easier while driving tangible value. To make this a reality, it's critical to have the buy in and supporting change management processes for your people on the ground. Simply put, without user buy-in, it is very unlikely the solution will be adopted and realize its true potential for your organization.

Clear product roadmap

When choosing a solution, it's vital to understand the direction of travel for the product and make sure it lines up with your business strategy. Make sure there is an ongoing commitment to Smart Factory capabilities and future innovation that should become available as the industry evolves from 4.0 to 5.0.

Customer success and delivery partners

The software vendor should become a true technology ally with programs in place to support your success beyond the traditional product support. For example, as new smart factory related improvements and innovations become available, a great customer success program will be there to help ensure you can leverage this new functionality to complement, and not complicate, your existing processes. In addition, your vendor should give you access to help influence and shape the future of the product to help ensure it continues to evolve in a way that supports you not just now but into the future.

Conclusion

The pressure on manufacturers to survive and get by has never been greater in what has become an increasingly tumultuous period for businesses and society. That said, there are concrete opportunities for organizations to leverage innovation and embrace Smart Factory solutions to help turn these challenges into opportunities to strengthen the business significantly.

In recent years Smart Manufacturing has cemented itself as no longer a technology experiment but a confirmed direction of travel for the entire industry as solutions have matured and business cases have been proved correct with a vast array of tangible benefits.

While there are still a handful of traditional manufacturers operating sufficiently, never has it been easier to get started and the evidence more compelling to make that leap. In essence, the days when Smart Manufacturing was only for the biggest organizations with huge IT budgets are now well and truly behind us.

Being a proven initiative as part of a digital transformation means that the Smart Factory solution landscape is now vast. Whether you are in the early trial stages or planning an extensive rollout, choosing the right solution and technology partner is critical.

IFS is a manufacturing solution leader and is the ideal Smart Factory solution partner for any manufacturer regardless of sub-industry. Choosing IFS Cloud provides the ultimate confidence that no matter where you are on your Smart Manufacturing journey, it will provide the technology backbone to help transform your business today, and be there every step of the way as your business evolves to be a leading manufacturer of tomorrow.

Find out more out www.ifs.com

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