

# ARE YOU READY FOR THE FUTURE OF MANUFACTURING?

EBOOK

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# SUMMARY

## PART 1

### UNDERSTANDING THE FUTURE OF MANUFACTURING

How does digitalization transform manufacturing?

The History of Manufacturing

The Future of Manufacturing

Today's Manufacturing Challenges

Three Elements for Success

**3DEXPERIENCE®** platform: The platform approach to manufacturing

## PART 2

### EXPERIENCE THE FUTURE OF MANUFACTURING

How can the **3DEXPERIENCE** platform create a smart factory?

EXPERIENCE 1 | **3DEXPERIENCE** Manufacturing in Operation

EXPERIENCE 2 | Lean Management

EXPERIENCE 3 | Model-Based Manufacturing

EXPERIENCE 4 | IIoT and Manufacturing Analytics

EXPERIENCE 5 | Value Network Optimization

## PART 3

### BUSINESS CASE: HOW LATECOERE EMBRACES THE FUTURE OF MANUFACTURING

## PART 4

### CONCLUSION

Are you ready for the Future of Manufacturing?

# INTRODUCTION

**IN THIS WHITE PAPER, DASSAULT SYSTÈMES INVITES YOU TO:**

**#1 Understand** the main challenges in the Future of Manufacturing

**#2 Experience** the Future of Manufacturing by discovering a smart factory

Steel, steam engines, assembly lines, integrated circuits—drivers of previous industrial revolutions could be physically seen and touched.

Today, however, the new industrial revolution – Industry Renaissance – is driven by virtual worlds created and managed on virtual experience platforms, the infrastructure of Industry Renaissance. This infrastructure allows us to visualize and control in the virtual world what we cannot see in the real world: the entire industrial ecosystem.

**Digital technology**, in enabling virtual experiences, changes our world, just as the printing press did in the 15th century by making books and knowledge available to all. Digital is a transformational medium, improving productivity and competitiveness by making it possible to simulate and evaluate performance and impacts before a product is made. Digital enables people to imagine differently, simultaneously inventing, mapping, modeling, engineering and managing new environments.

**New business models** emerge from the fact that value is now inherent in the knowledge and know-how associated with a product, rather than in the product itself. The leading businesses of Industry Renaissance will be those that empower the Workforce of the Future and their value networks with knowledge and know-how, shaking all sectors in the economy with new categories of industry firms creating new categories of solutions for new categories of customers.

**The Future of Manufacturing** lies in harnessing this entire digital ecosystem to deliver exciting and sustainable experiences to eager customers.



PART 1

# UNDERSTANDING THE FUTURE OF MANUFACTURING

## #1 - THE HISTORY OF MANUFACTURING



**1784**  
**1st Industrial Revolution**



Engineering production driven by the steam engine

**1870**  
**2nd Industrial Revolution**



Mass production based on division of labor (assembly lines) and driven by electrical energy

**1969**  
**3rd Industrial Revolution**



Automated production sustained by electronics and computer science

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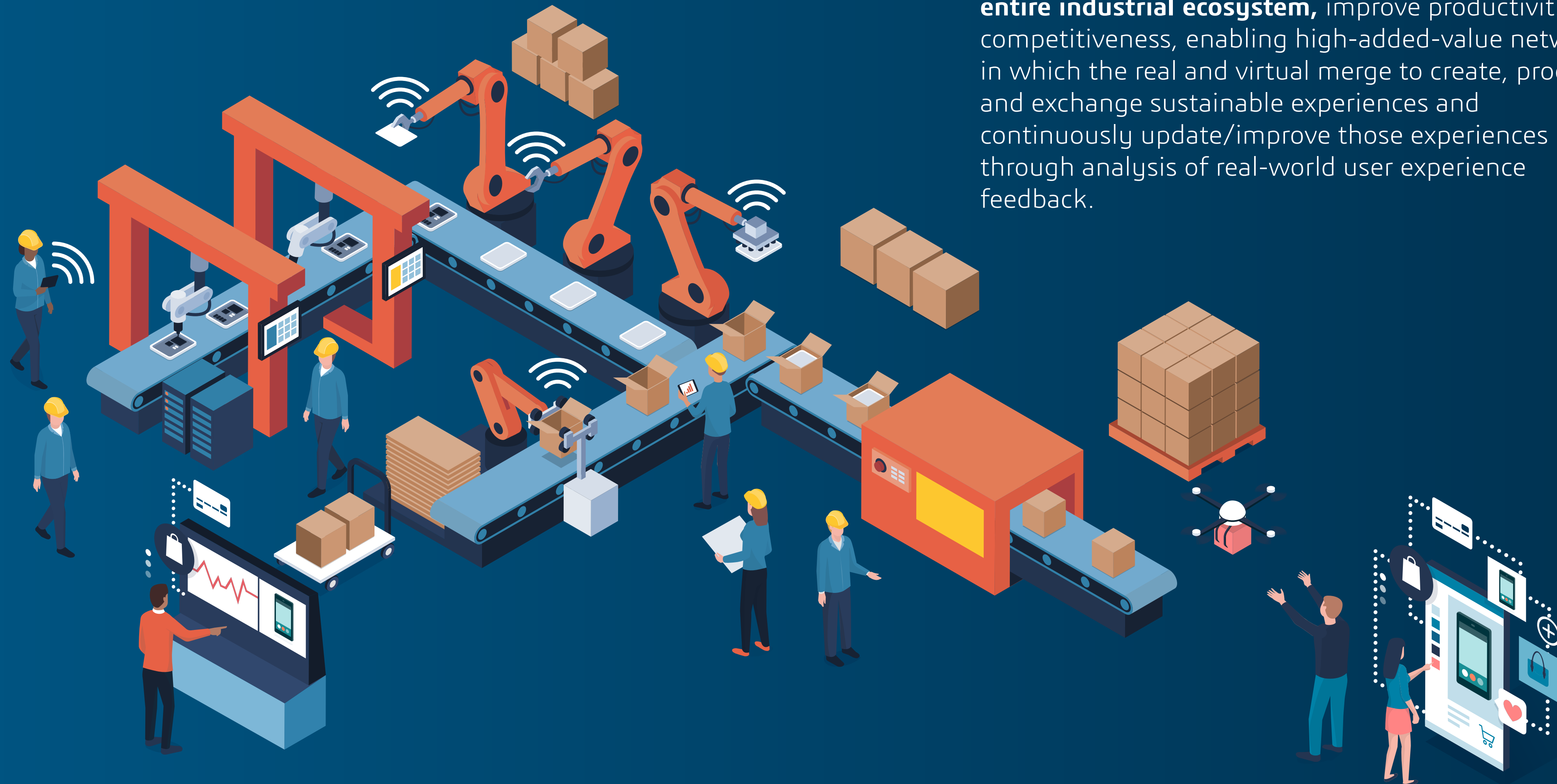
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# NOW - INDUSTRY RENAISSANCE

**Digital experience that visualize and control the entire industrial ecosystem**, improve productivity and competitiveness, enabling high-added-value networks in which the real and virtual merge to create, produce and exchange sustainable experiences and continuously update/improve those experiences through analysis of real-world user experience feedback.



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# THE FUTURE OF MANUFACTURING



**The Future of Manufacturing is based on the concept of the smart factory**, which interconnects machinery and systems on production sites, but also outside to clients, partners and other production sites. It's not just digitalized manufacturing. Instead, it is digitalized manufacturing informed by new ways of inventing, learning, producing and trading that are shaking all sectors of the economy and society.

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DID YOU KNOW?

- ▶ The Artificial Intelligence (AI) market is predicted to grow from US\$8B in 2016 to US\$72B in 2021.
- ▶ 86 percent of the top 100 companies in R&D spending worldwide are manufacturers.
- ▶ **Top technology investment areas for manufacturers include:** advanced analytics, cloud computing, modeling and simulation, Industrial Internet of Things (IIoT) platforms, and optimization and predictive analytics.

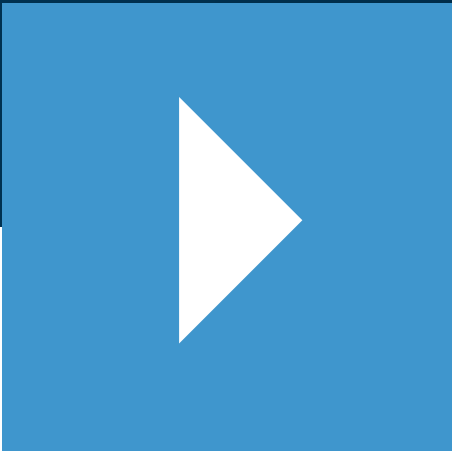


THE EXPERT EYE

" The top industrials try to answer three questions:  
1. How to educate the workforce of the future?  
2. How to reach a proper level of operational excellence?  
3. How to integrate a very dynamic ecosystem of partners? "

**Guillaume Vendroux**  
Chief Executive Officer, DELMIA brand, Dassault Systèmes

MANUFACTURING IN THE AGE OF EXPERIENCE - WATCH THE VIDEO



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## THE EXPERT EYE

“The main challenge is to redefine the ways of working—from streamlining to standardization across a global approach, and leverage the digital transformation that is being pursued.”

**Guillaume Vendroux**  
Chief Executive Officer,  
DELMIA brand,  
Dassault Systèmes

# TODAYS' MANUFACTURING CHALLENGES

## #1 Digitalize Operations



Digitalizing manufacturing is a necessary part of a larger transformation -- the transformation of the entire industrial ecosystem to one that is virtualized and digitalized. New business models will create new demands on manufacturing. Manufacturers need to invest wisely for this transformation.

## #2 Accelerate Innovation



The pace of business keeps accelerating, along with consumer demand for better, faster goods and services. Manufacturers must embrace a digital transformation of their entire enterprise and its extended ecosystem to get to market quickly.

## #3 Overcome Complexity



The “one size fits all” concept is gone. Mass production is being replaced with mass customization. Supply chains are more complex, interwoven and diverse must be digitalized to provide visibility to the OEMs. Meanwhile, margins shrink and skilled employees are harder to find.

## #4 Operate Globally, Serve Locally



Crucial decisions about future technology and IT investment could well determine companies' survival. Diverse production sites must be managed uniformly, managers must be able to see and control extended supply chains while understanding and serving local customers' needs.

## #5 Increase Responsiveness



Since the third Industrial Revolution, manufacturing has been one of the most stable sectors. Now, processes that used to last for years quickly become obsolete. Consumer demand can change overnight, new technologies are disruptive in a heartbeat and processes once cast in stone must now be flexible and easy to change. Agility, whether local or global, is now crucial.

## #6 Drive Operational Excellence



Competition and consumer demand puts relentless pressure on operational performance. Most global manufacturers have addressed the “easy” fixes, such as Lean production. But continuous improvement means never-ending change. Manufacturers need more than a commitment to continuous improvement; they need resources and technology to achieve it.

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# THREE ELEMENTS FOR SUCCESS

Manufacturing is a critical element in a process of value creation, not just a way of producing goods and services. In the Experience Economy, value resides in the knowledge and know-how used to create the product, and in the customer experience the product enables, rather than in the product itself.

Businesses now look to implement digital value networks using virtual experience platforms where multiple resources are connected and the real and virtual merge to enable new business models.

## VIRTUAL EXPERIENCE PLATFORMS DELIVER VALUE BY:



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# 3DEXPERIENCE

## THE VIRTUAL EXPERIENCE PLATFORM APPROACH TO MANUFACTURING

Dassault Systèmes' **3DEXPERIENCE** platform offers technologies and solutions to pursue discoveries, nurture them and bring the results to business and people throughout the world. Sophisticated modeling and simulation, data acquisition, analysis and reporting, and breakthroughs in imaging and manufacturing come together for organizations to achieve what was once thought "impossible": balancing product, nature and life for sustainable innovation.

The **3DEXPERIENCE** platform provides a global operations management cockpit that supports knowledgeable decision making to keep operations running smoothly. This helps companies optimize production for greater efficiency and output, while reducing costs and time-to-market.



Social & Collaborative Apps

Information Intelligence Apps

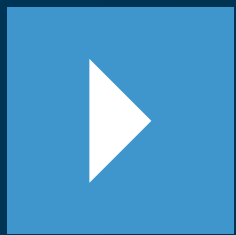
3D Modeling Apps

Real time **3DEXPERIENCE**

Content & Simulation Apps

# 3DEXPERIENCE®

**3DEXPERIENCE IN FOUR MINUTES, TOPS ! - WATCH THE VIDEO**



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DASSAULT SYSTÈMES' 3DEXPERIENCE FUN FACTS



210,000 customers  
12 industries in 140 countries  
12,600 partners

FOR MORE INFORMATION ON THE 3DEXPERIENCE PLATFORM, [CLICK HERE >](#)

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# PART 2

## EXPERIENCE THE FUTURE OF MANUFACTURING

**EXPERIENCE 1:  
3DEXPERIENCE MANUFACTURING  
IN OPERATION**

**EXPERIENCE 2:  
LEAN MANAGEMENT**

**EXPERIENCE 3:  
MODEL-BASED MANUFACTURING**

**EXPERIENCE 5:  
VALUE NETWORK OPTIMIZATION**

**EXPERIENCE 4:  
IIOT & MANUFACTURING  
ANALYTICS**

**Disruptive technologies will drive digitalization in manufacturing as part of an ecosystem-wide transformation.** Companies worldwide are engaging in digital transformation that creates substantial impact across the extended value network.

**Dassault Systèmes** offers you the opportunity to dive into the center of a smart factory and discover five experiences that are revolutionizing the future of manufacturing in the context of this whole-ecosystem transformation.

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# EXPERIENCE 1 | 3DEXPERIENCE MANUFACTURING IN OPERATION

## Manufacturing Operations Management Workflow

Companies need to manage new customer demands and expectations for highly customized products and shorter delivery times. To address these new challenges requires more flexibility and higher efficiency from their manufacturing assets.

### CHALLENGE

#### OVERALL

- Manage new customer demands, highly customized products, shorter delivery times
- Optimize costs to improve margins

#### MANUFACTURING POINT OF VIEW

- Better synchronization across all manufacturing activities
- Improve efficiency of manufacturing assets
- Capitalize, share and develop operator skills

### BUSINESS VALUE STATEMENT

#### INCREASE EFFICIENCY

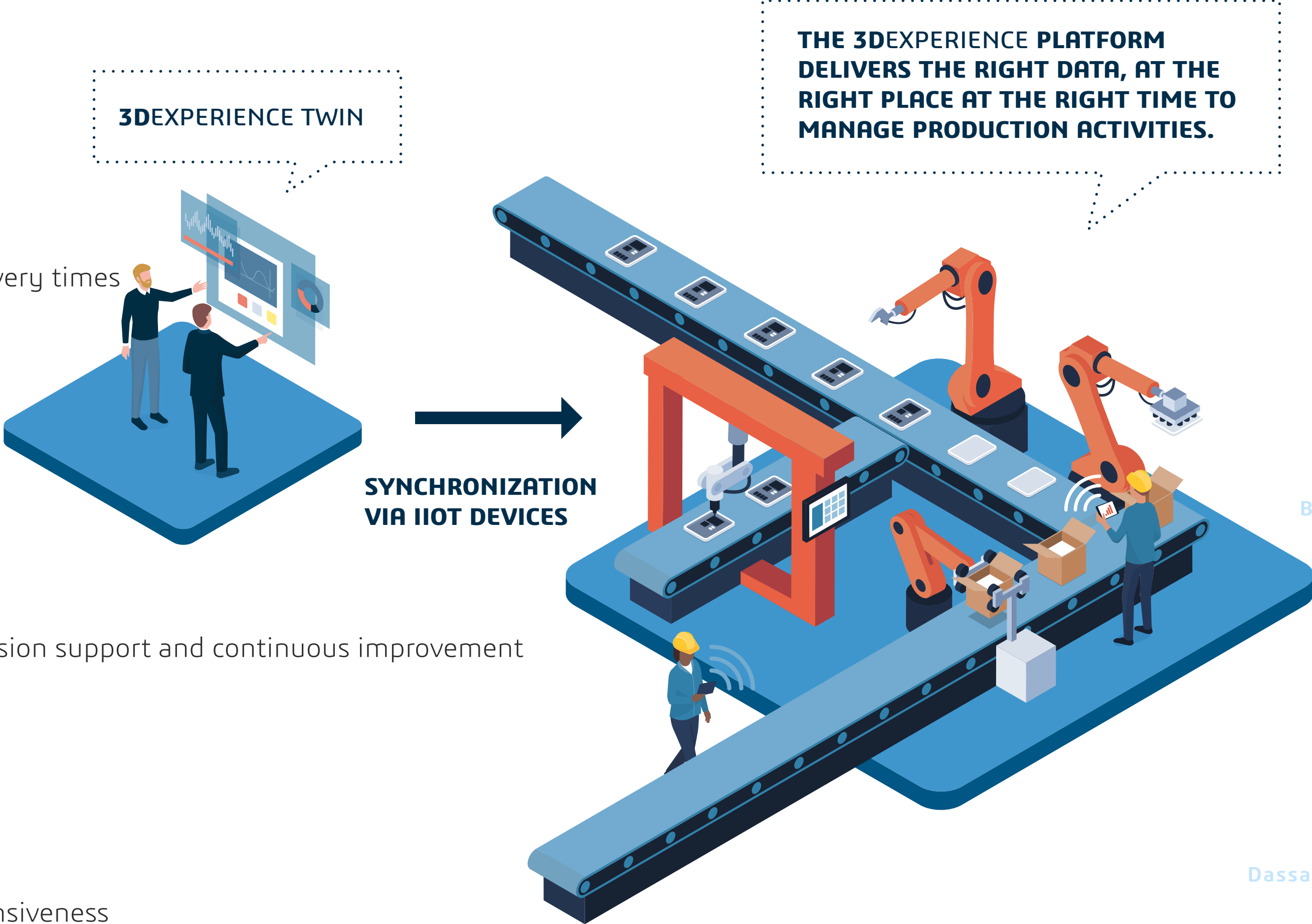
- Visibility, control, orchestration and automation of operational activities
- Business process activities and exhaustive data collection for informed decision support and continuous improvement
- Comprehensive performance monitoring

#### IMPROVE QUALITY

- Comprehensive and real-time quality management across the enterprise
- Quality, traceability and genealogy across parts, processes and resources
- Corrective actions to resolve problems and quality issues

#### IMPROVE SPEED AND AGILITY

- Business process-driven tasks and exception handling for agility and responsiveness
- Real-time digital continuity across engineering and manufacturing
- Visibility and synchronization of operations across departments to reduce risk



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# EXPERIENCE 1 | 3DEXPERIENCE MANUFACTURING IN OPERATION

## 3DEXPERIENCE ELEMENTS:

#1

### 3D WORK INSTRUCTIONS

The **3DEXPERIENCE** platform ensures **digital continuity from engineering to manufacturing** and provides the ability to interface with IIoT devices installed on the production line.

#2

### MANAGING NON-CONFORMANCE

Synchronization among all departments to manage operations efficiently.  
Collaboration simplified by **consolidating all information in a single platform** and making it available in the context of each team.

#3

### SYNCHRONIZING MATERIAL FLOW

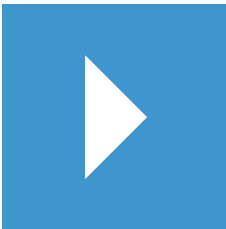
Delivering **the right materials to the right place at the right time**, plus recording of detailed genealogy on components for traceability.

#4

### REAL-TIME PERFORMANCE MONITORING

Ready access to production-activity information:  
**Line Monitoring Cockpit and team information with list of actions and issues.** All information made available for more collaborative work and stronger team involvement.

DASSAULT SYSTÈMES IMPROVES OVERALL PRODUCTIVITY WITH MANUFACTURING OPERATIONS MANAGEMENT  
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# EXPERIENCE 2 | LEAN MANAGEMENT

**Key routines in operational management are mainly coming from the Lean principles, which involve the team to continuously improve overall performance.**

The **3DEXPERIENCE** platform 3DLean app combines the best of both worlds: Lean Best Practices AND Operational Metrics on a single collaborative virtual experience platform.

## CHALLENGE

- Faster and better reaction to manufacturing issues
- Stronger collaboration within and between teams
- Fewer non-value-added tasks

## BUSINESS VALUE STATEMENT

### INCREASE EFFICIENCY WITH DIGITAL LEAN

- Digitalize Lean and facilitate Lean practices across organizations for continuous improvement
- Manage operational performance and Lean KPIs.

### DIGITIZE SUSTAINABLE CONTINUOUS IMPROVEMENT

- Best-practice benchmarking and sharing for operational processes
- Cross-functional and cross-organizational collaboration for greater awareness

### IMPROVE TEAM INTELLIGENCE

- Collaborative worker interaction and creativity within and across peer groups
- Capitalized know-how of the company for better collective intelligence

**3DLEAN ON THE 3DEXPERIENCE PLATFORM COMBINES LEAN BEST PRACTICES AND OPERATIONAL METRICS, ON A COLLABORATIVE DIGITAL PLATFORM.**



- **COLLABORATIVE PROBLEM SOLVING**
- **INTERACTIVE SHOP FLOOR MANAGEMENT**

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# EXPERIENCE 2 | LEAN MANAGEMENT

## 3DEXPERIENCE ELEMENTS:

#1

### FLASH 5 MEETING

From the 3DLean Board of the Maintenance Team, the facilitator prepares and animates the Flash5 meeting:

- Select and review key topics
- Take actions
- Review action log

#3

### MANAGEMENT MEETING

Project management team reviews specific tasks linked to the project in **3DEXPERIENCE** platform and monitors operational performance.

#2

### PROBLEM SOLVING MEETING

Facilitator, Maintenance Technician and Operator review the 3D Work Instruction on the 3DLean board and analyze issue root cause through a problem-solving session.

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## EXPERIENCE 3 | MODEL-BASED MANUFACTURING

**The Dassault Systèmes' 3DEXPERIENCE twin allows manufacturers to model and perform "what if" analysis on manufacturing assets,** products and processes to address current and future challenges. A fusion of technologies blurs the lines between the physical and digital domains, collectively referred to as cyber-physical systems.

**Digital twin = synchronization between the virtual and real world.**

Digital twins enable manufacturers to develop and validate different scenarios in the work cell before implementing them in the real world.

### CHALLENGE

#### OVERALL

- Limit risk when investing in new manufacturing assets or existing facility change, thanks to virtual simulation and validation to validate projected results in advance

#### MODELIZATION POINT OF VIEW

- Reduce cost and time to digitalize existing resources to generate models for simulation
- Manage large numbers of product variants having a high-frequency of product changes
- Simulate manufacturing processes and validate asset capability in context of real organizational conditions

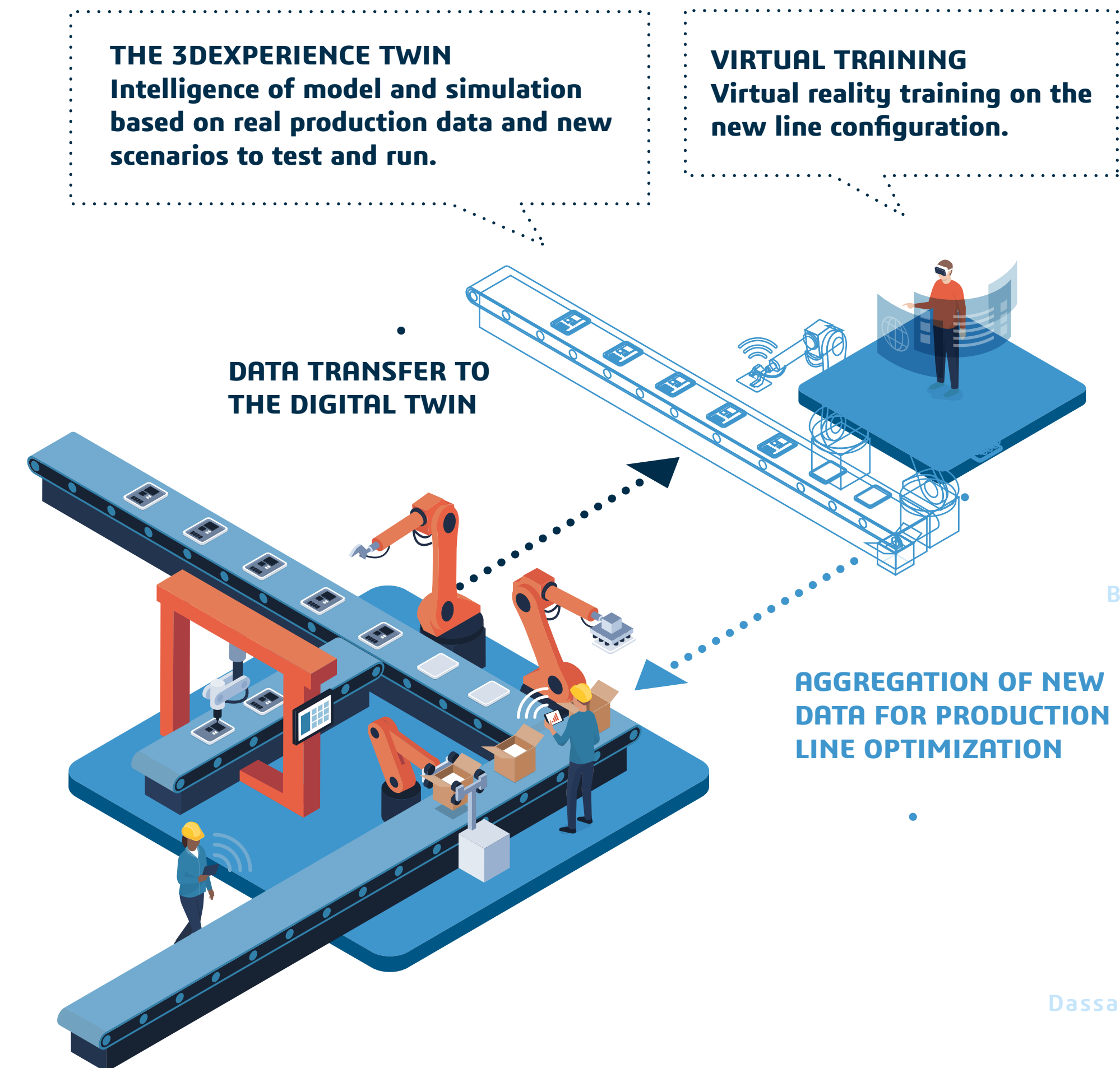
### BUSINESS VALUE STATEMENT

#### INCREASE SPEED AND EFFICIENCY

- Validate and test manufacturing strategies, processes and throughput to understand enterprise behavior
- Reduce time and cost by simulating the impact of product introductions and changes or factory configuration changes

#### INCREASE RESPONSIVENESS AND AGILITY

- Identify and reduce the risk of interdependencies and bottlenecks with what-if scenario analysis
- Achieve real-time digital continuity between product engineering, manufacturing engineering and manufacturing operations
- Virtually model manufacturing processes based on real production constraints and data



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# EXPERIENCE 3 | MODEL-BASED MANUFACTURING

## 3DEXPERIENCE ELEMENTS:

#1

### Immersive Shop Floor Experience with Dassault Systèmes' 3DEXPERIENCE Twin

Leveraging the latest 3D scanners and analytics technology, the **3DEXPERIENCE** platform identifies the **manufacturing situation** to quickly visualize the current state of the shop floor and maintain digital continuity from product ideation to shop floor activities.

#3

### Factory Flow Simulation

The flow simulation **analyzes the utilization rate of an asset**. (Imagine the difficulty and the cost of doing what-if scenarios in the real world!)

#5

### Virtual Training For Assembly Station

With virtual training, gradually **teach** the operator using a typical **"show me"**, **"help me"** and **"let me"** scaffold methodology.

#2

### MBOM, Process Plan and 3D work instructions definition

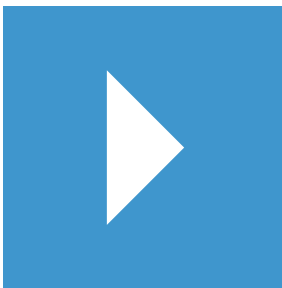
The MBOM, the process plan and the 3D work instructions **can be shared directly with the shop floor**. In the event of changes, the entire process will update automatically thanks to the digital continuity.

#4

### Ergonomic Workplace Design

**Simulate and validate operator tasks on the Dassault Systèmes' 3DEXPERIENCE platform**. Using the simulation, quickly understand which part of the process is risky for the operator. The intelligence engine automatically sets up the posture of the virtual manikin, based on the task to be performed.

MODEL YOUR MANUFACTURING ASSETS WITH  
DASSAULT SYSTÈMES' 3DEXPERIENCE TWIN  
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# EXPERIENCE 4 | IIOT & MANUFACTURING ANALYTICS

**Increasingly, connected devices are used on the shop floor to manage manufacturing operations.** Those devices can be connected to machines, tools, sensors, RFID tags, AGVs, etc. They all contribute to a higher level of visibility into operations, higher levels of safety for the operator, better control of product quality and a more detailed level of traceability.

## CHALLENGE

- Connect and aggregate data from disparate sources in a unified way
- Achieve high volume and velocity of manufacturing data from sensors

## BUSINESS VALUE STATEMENT

### INCREASE PRODUCTIVITY

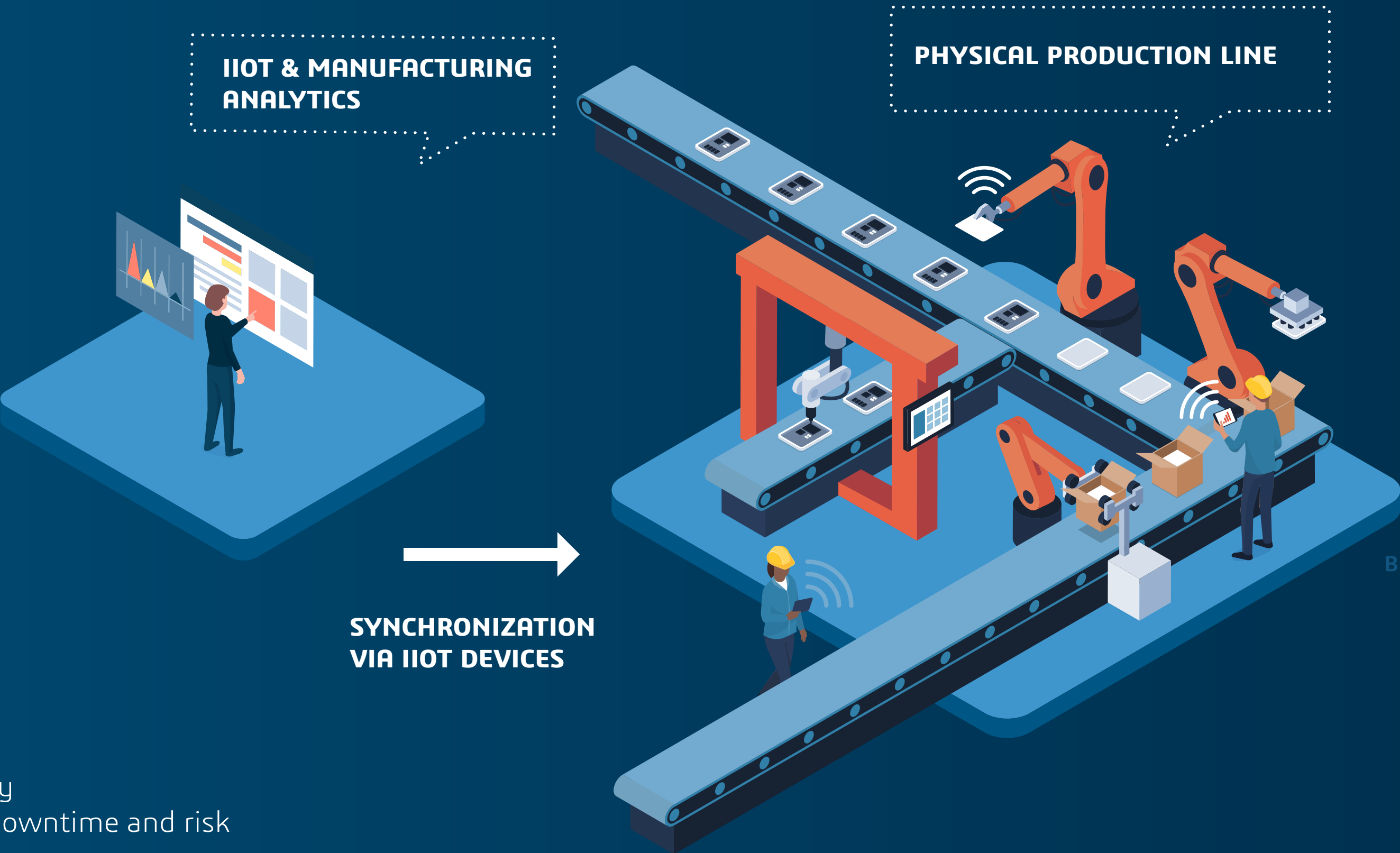
- Business context of production and machine data for decision support
- Real-time monitoring and performance of manufacturing assets with IIOT
- Machine-learning and analytics to optimize asset utilization

### IMPROVE EFFICIENCY

- Benchmark performance across multiple factories through analytics
- Automate data collection and eliminate mundane non-value-added activity
- Enable data-driven alert and exception handling to minimize operational downtime and risk

### INCREASE QUALITY

- Contextualize quality resolution by leveraging a comprehensive set of data types and sources
- Provide intuitive and powerful visualization to understand complex problems impacting quality
- Provide AI-based decision support for a wide range of process and product quality issues



- **REAL-TIME MACHINE PERFORMANCE MONITORING**
- **PREDICTIVE ANALYTICS AND SELF-LEARNING**
- **PREVENTIVE MAINTENANCE**

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# EXPERIENCE 4 | IIOT & MANUFACTURING ANALYTICS

## 3DEXPERIENCE ELEMENTS:

#1

### IIOT - EQUIPMENT INTEGRATION CAPABILITIES

The **3DEXPERIENCE** platform allows operators to connect directly to IIoT devices and to contextualize the information in a data model.

#3

### PLAN PREVENTIVE MAINTENANCE

Supports operators in finding the best time to implement scheduled maintenance on a machine: before the issue occurs, of course, and with the lowest impact on service rate.

#2

### REAL-TIME MACHINE PERFORMANCE MONITORING

From their stations, operators can interact with other teams to address any unexpected issue or to send requests.  
**Communication among departments is faster and more efficient** thanks to the information that is automatically contextualized with the issue.

#4

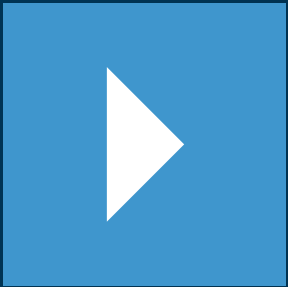
### EXECUTE PREVENTIVE MAINTENANCE

On his mobile device, maintenance technician automatically receives the details of maintenance orders that he needs to execute.

### IIoT = Industrial Internet Of Things

The IIoT refers to the extension and use of the Internet of Things (IoT) in manufacturing sectors and applications. The IIoT enables industrials to have better efficiency and reliability in their operations.

**DASSAULT SYSTÈMES IIOT & MANUFACTURING ANALYTICS IMPROVE MANUFACTURING PERFORMANCE**  
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# EXPERIENCE 5 | VALUE NETWORK OPTIMIZATION

Good manufacturing requires good planning. Value Network Optimization will show you how to resolve challenges, optimize supply chain planning and enhance transparency and efficiency.

## CHALLENGE

- Maintain and exceed production rates
- Maximize asset utilization
- Minimize operation, employee and maintenance costs

## BUSINESS VALUE STATEMENT

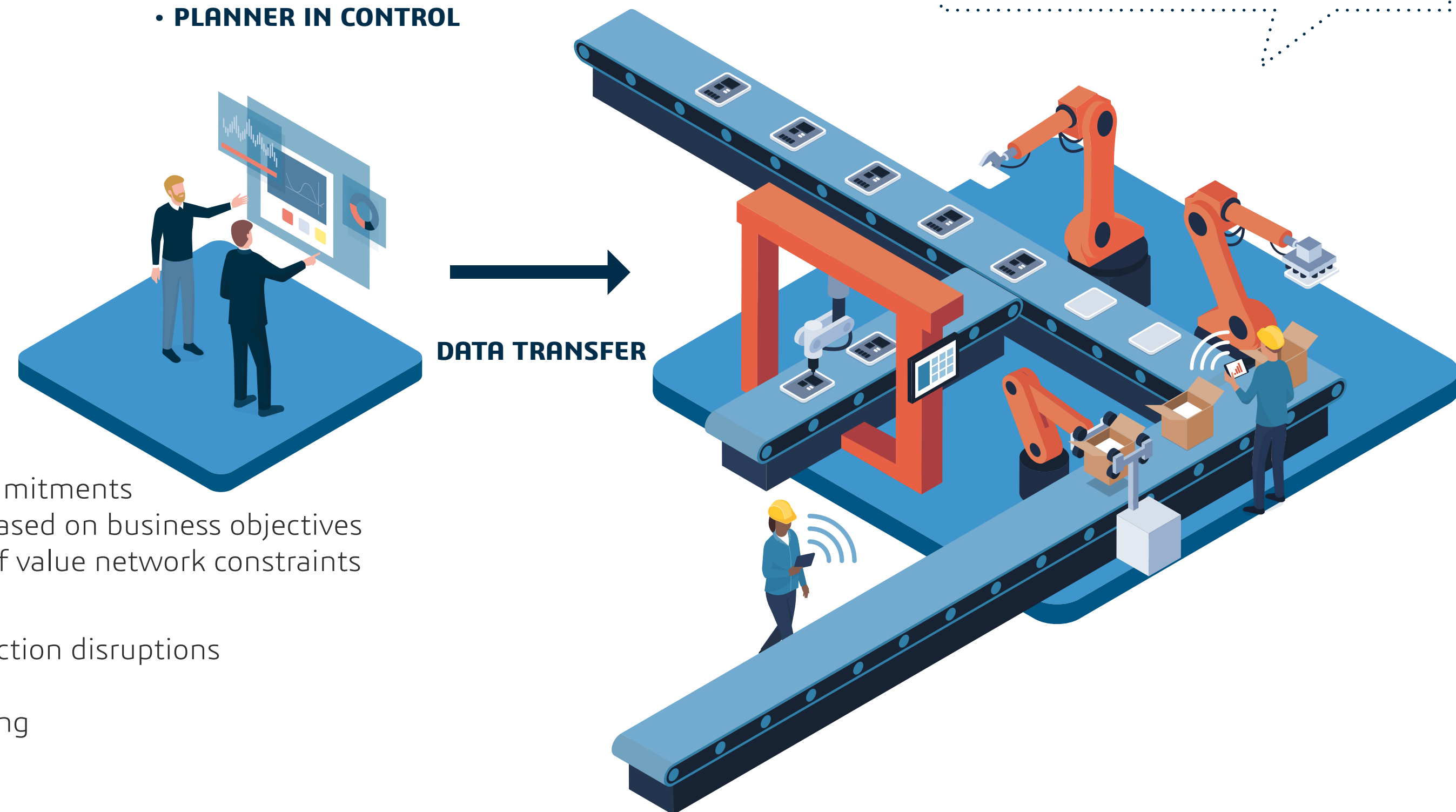
### IMPROVE CUSTOMER SERVICE

- Optimize throughput to meet or exceed customer service level commitments
- Continuously balance production variables for optimal outcomes based on business objectives
- Improve available-to-promise accuracy based on a true reflection of value network constraints

### REDUCE COSTS

- Enable dynamic rescheduling to reduce the impact of costly production disruptions
- Lower inventory without impacting production
- Improve transportation and delivery costs through optimized routing

- REVIEWS
- DEDUCTIONS
- VISUALIZATION AND KPIs
- OPTIMIZED PLANS
- PLANNER IN CONTROL



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# EXPERIENCE 5 | VALUE NETWORK OPTIMIZATION

## 3DEXPERIENCE ELEMENTS:

#1

**REVIEW**  
The factory traffic manager reviews **production schedule and traffic requirements**. The **3DEXPERIENCE** platform ensures work cells are utilized at maximum capacity and avoids locked work cells.

#3

**VISUALIZATION AND KPIS**  
Unlimited scenario capability supports exploration of **various alternate options** and understanding of **impact on KPIS before publishing the plan**.

#5

**PLANNER IN CONTROL**  
**Real-time communication** with execution and feedback for adherence tracking.

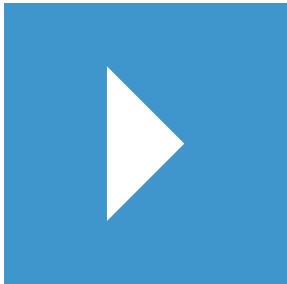
#2

**ANALYSIS**  
The **3DEXPERIENCE** platform provides **immediate feedback on the schedule to proactively avoid potential conflicts**.

#4

**OPTIMIZATION**  
The **3DEXPERIENCE** platform allows **continuous improvement of assumptions based on data collected from execution**.

**DASSAULT SYSTÈMES AUTOMATION SIMULATION ALLOWS FOR FLEXIBLE PRODUCTION AND INCREASED EFFICIENCY**  
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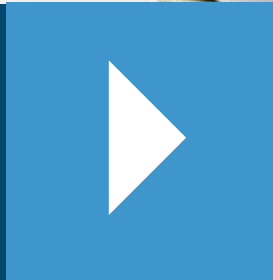
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# PART 3

## BUSINESS CASE: LATÉCOÈRE EMBRACES THE FUTURE OF MANUFACTURING



MEETING CONSUMERS DEMANDS WITH A  
3D MODEL FACTORY  
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### KPIs

- Localize detailed parts manufacturing in France and produce cheaper and faster
- Increase productivity and flexibility of operations
- Make a better place to work for operators
- Reduce environmental footprint of the production facility

### Context

- Founded in 1917, Latécoère helped establish the aeronautics industry in the Toulouse region.
- Latécoère was a manufacturer of its own aircraft before repositioning itself to focus on the fields of aerostructures, cabling and embedded systems.
- Today, Latécoère is pursuing an ambitious plan that includes construction of a fully automated smart factory that operates 24/7.

### Challenge

Latécoère must adapt its business to meet its customers' highly demanding and fast-changing needs.

### Solution

Dassault Systèmes' **3DEXPERIENCE** platform enables the creation of **3DEXPERIENCE** digital twins of the building, machines, workstations and internal workflows, allowing operators and management to visualize all operations before construction, enabling them to make informed and accurate decisions.

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# PART 4 CONCLUSION

## ARE YOU READY FOR THE FUTURE OF MANUFACTURING?

Manufacturing is complex, and today's hyperconnected, fast-evolving markets only add to the challenge. To address a global economy in an advanced digital age, manufacturers must have the visibility and control to satisfy customers who are demanding more than products and services—they want individualized, emotional experiences that they can “own.”

**WE MUST RETHINK INDUSTRY OF THE 21ST CENTURY TO EMBRACE AND BENEFIT FROM INDUSTRY RENAISSANCE. DASSAULT SYSTÈMES AND THE 3DEXPERIENCE PLATFORM ENABLE YOU TO:**

### **Achieve Sustainable Innovation and Excellence**

Reduce risk, improve and predict operational performance by combining the power of virtual and real worlds where people and machines come together to transform manufacturing.

### **Create Value Networks**

Transform supply chains into value networks by removing barriers between business partners to deliver sustainable innovation to consumers.

### **Empower the Workforce of the Future**

Reveal the workforce talents of today to enable the workforce of tomorrow with ready access to knowledge and know-how.



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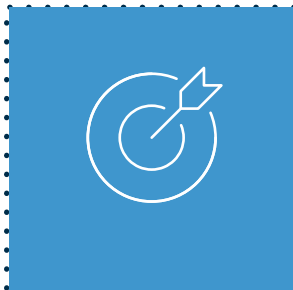


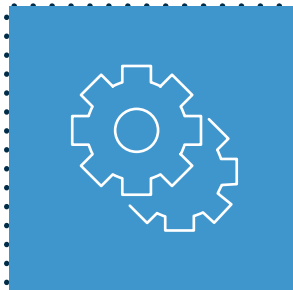
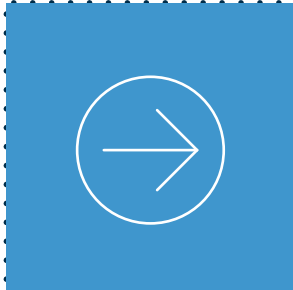
Part 5  
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# CONCLUSION

## ARE YOU READY FOR THE FUTURE OF MANUFACTURING?

MCKINSEY & COMPANY REPORTS THAT ENTERPRISES BEST EQUIPPED TO MEET THESE SIX SUCCESS FACTORS WILL BE THE WINNERS IN THE COMING YEARS:

	<b>Success factor #1</b>  Approach the opportunity “bottom-line value backwards” – rather than technology forward		<b>Success factor #2</b>  Assemble a comprehensive target-state technology stack that is scalable		<b>Success factor #3</b>  Drive transformation from the top and communicate results and success stories
	<b>Success factor #4</b>  Approach digitalization holistically, with a clear vision and a phased roadmap for the entire enterprise and its extended ecosystem		<b>Success factor #5</b>  Build and lead a focused ecosystem of technology partners		<b>Success factor #6</b>  Get ahead of the capability gap and build the culture to sustain success (“go Lean before going digital!”)

Summary

Part 1  
Understand

Part 2  
Experience

Part 3  
Business Case

Part 4  
Conclusion

Dassault Systèmes

Source: 6 Factors for a Successful Digital Manufacturing Transformation by Dr Karel Eloot, Senior Partner, McKinsey & Company.  
Read the complete Report >

## PART 5



# ARE YOU READY FOR THE FUTURE OF MANUFACTURING?

Contact Inceptra, Dassault  
Systèmes Platinum Partner,  
to learn more:



> Learn more

Summary

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Understand

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