

# EFFECTIVELY ASSIMILATE AUTONOMOUS VEHICLES INTO THE FACTORY

Manufacturers are poised for success when they design, integrate and manage autonomous vehicles on a connected platform



## MEET OUR EXPERTS

A portrait of Henri Beringer, a man with dark hair, smiling, wearing a dark suit, light blue shirt, and patterned tie.

**HENRI BERINGER**

**Transportation & Mobility Industry  
Business Consultant Director,  
Dassault Systèmes**

Henri holds a Ph.D. in artificial intelligence (AI). He has worked in various roles relating to advanced analytics and AI software. As a DELMIA Quintiq director, he facilitated the adoption of advanced applications for operations planning and optimization. Currently, he leverages software solutions to optimize customer experiences in the transportation & mobility industry.

A portrait of Laurence Montanari, a woman with dark hair, looking directly at the camera, wearing a red blazer over a blue top.

**LAURENCE MONTANARI**

**Transportation & Mobility Industry  
Vice President,  
Dassault Systèmes**

Equipped with nearly 30 years of automotive engineering and business experience, Laurence spearheads initiatives that help automotive companies leverage the 3DEXPERIENCE® platform to adapt and thrive in a market-changing era defined by mobility-as-a-service, sustainability priorities and new consumer experiences.






## ADVANCING THE AUTONOMOUS FACTORY

Robots are commonplace in manufacturing. From material handling to product inspection and assembly, industrial robots execute repetitive tasks with speed and precision unmatched by manual labor.

Traditionally, robots perform routine tasks with fixed positions along the assembly line. As robotics hardware and software become more sophisticated, manufacturers have a new opportunity to integrate robots across the wider factory – with **autonomous vehicles** (AVs).

AVs are devices programmed to carry out tasks with little or no human intervention. They can identify their surroundings, learn from them and make decisions independently.

Advancements in AVs can help to:

-  Improve speed and accuracy of operations
-  Enhance factory efficiency and productivity
-  Warrant worker safety, especially in high-risk environments
-  Foster better decision-making with data collection and analytics
-  Increase profitability with perfect order fulfillment and faster deliveries



Autonomous factories are highly **adaptable and agile**. By leveraging AVs such as robotic forklifts, automated guided vehicles and autonomous mobile robots, manufacturers can quickly reposition operations and reorganize internal logistics in the face of disruptions to continue serving future production needs.

Read on to discover how to design, integrate and manage industrial AVs to build the factory of the future.

# AT THE DRAWING BOARD: AV DESIGN



Today's intelligent, sensor-rich robots are trained to make autonomous decisions as they navigate the factory. But before they're deployed, manufacturers must be confident that AVs can **execute missions efficiently** without exposing any risk to workers. They can do this by precisely defining what they want the AVs to achieve.

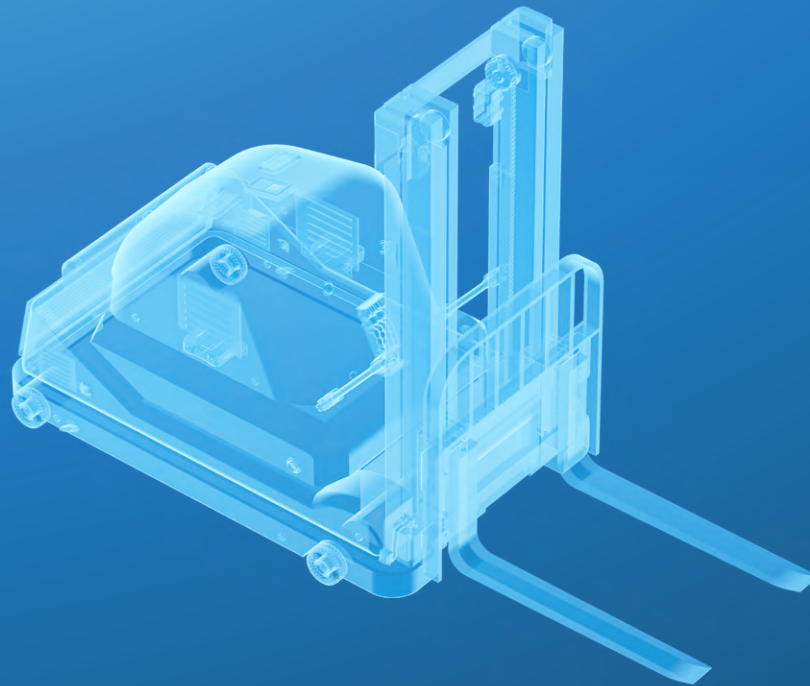
Outlining functions, missions, behavior descriptions and formal system requirements early in the design stage helps manufacturers map out the right AV for their factory floor. They can easily determine its size, functionality, mobility, dexterity and intelligence.

### Here are some questions for manufacturers to consider during AV design:

What is the AV's mission?  
What type of sensors is best for this mission?

Is the AV dependent on its surrounding elements?  
How will it interact with workers, factory equipment and other AVs?

How fast should the AV travel? What safety features should it have?



AVs such as autonomous mobile robots have the potential to transform entire manufacturing processes.

How is the AV fleet managed?  
Will it require a central dispatcher?

Is the AV fully autonomous throughout its mission? Will it perform the same task repeatedly?

How is the AV charged?  
How frequently does it need to be recharged?



Once manufacturers identify the best parameters for their specific production facilities and processes, they can embark on the AV's mechanical design and systems design.

**A platform approach** encompassing the end-to-end process from mechanical engineering to systems engineering can help designers imagine, sketch and prototype innovative AV concepts. Managing projects and reviews on a single platform foster collaboration, so designs are validated more quickly.

Through advanced simulation, design teams can explore **geometric techniques** compatible with AV missions, manufactured goods and the factory layout. By syncing this data with the **virtual twin** – an executable 3D model – of the physical plant, manufacturers can visualize and optimize each AV's role within the entire factory.

“ Simulation capabilities ensure that manufacturers design AVs that can consistently achieve their missions as a part of the global production system.”






– **Henri Beringer**  
Transportation & Mobility Industry  
Business Consultant Director  
Dassault Systèmes

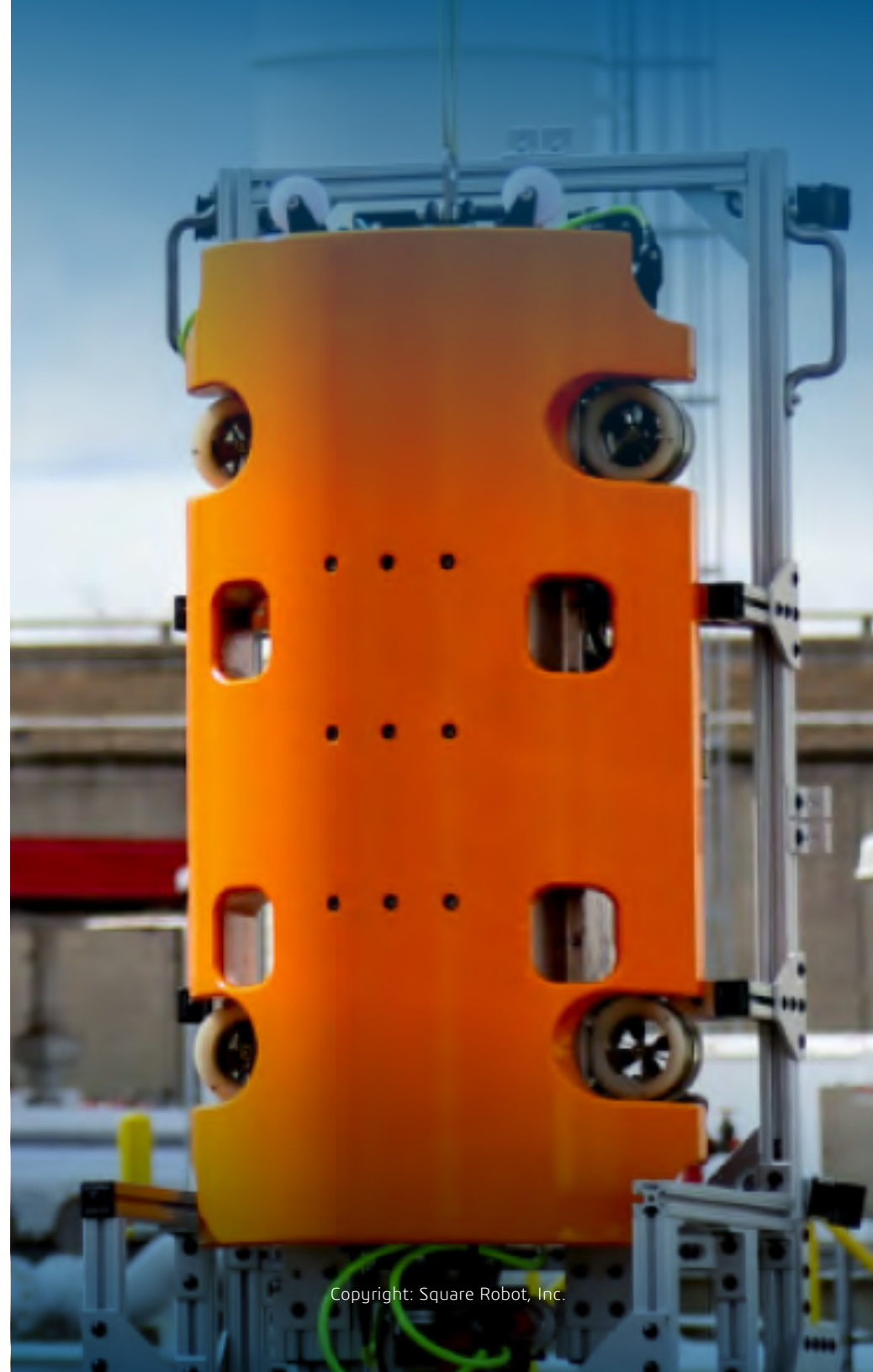
## Case in Point: Square Robot, Inc.

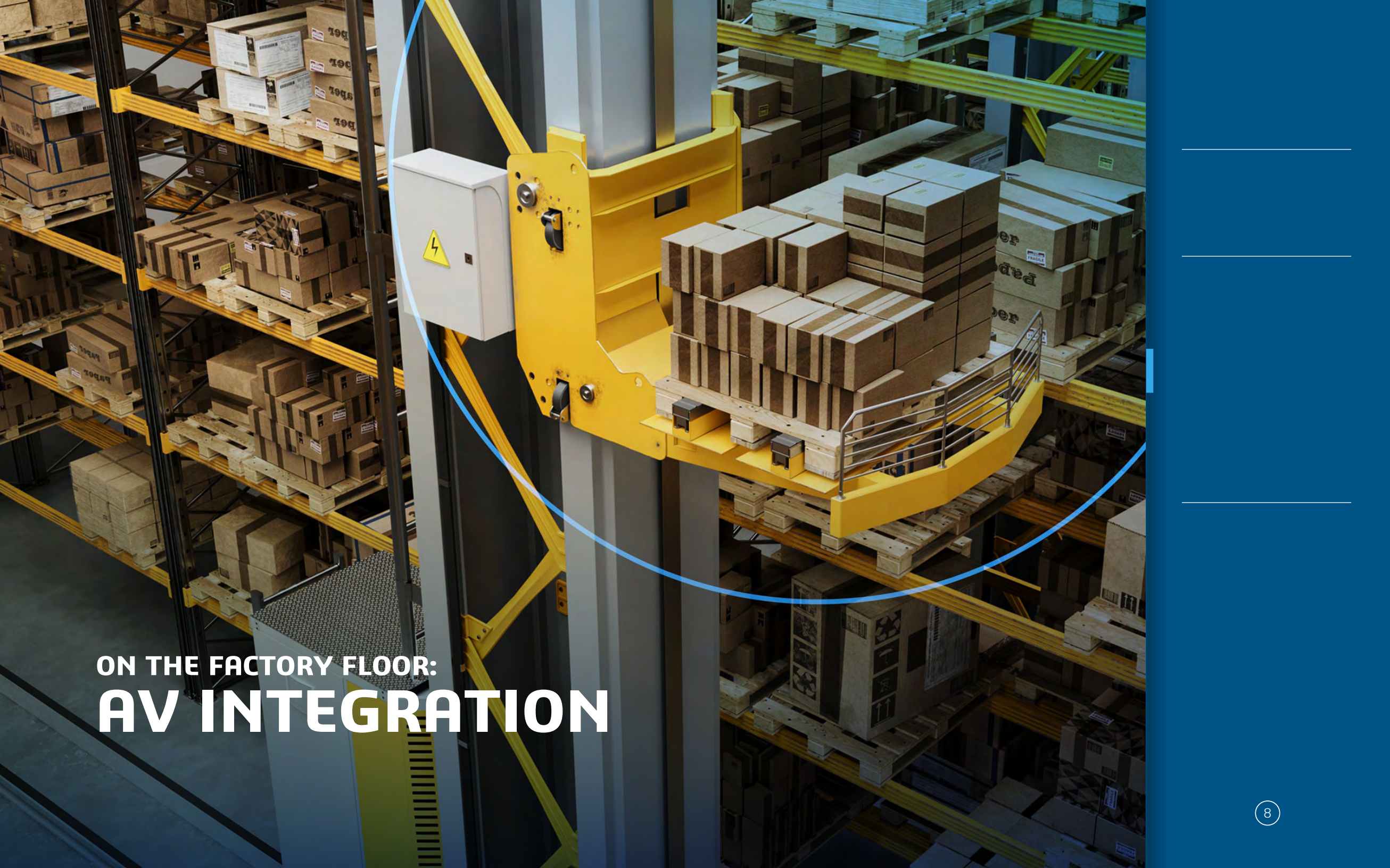
[Square Robot, Inc.](#) is a Boston-based company that develops autonomous underwater vehicles to inspect the interiors of petroleum storage tanks.

The company extended computer-aided design (CAD) with data and lifecycle management solutions on the **3DEXPERIENCE** platform to facilitate the remote design of their AVs. With the cloud-based solution, design models were **synchronized simultaneously** regardless of where designers were based. Teams could easily communicate changes and integrate them into top-level assemblies.

A single platform for design management helped the company:

-  Accelerate the collaborative development process
-  Efficiently communicate design flaws and challenges
-  Improve revision control and reduce errors
-  Enhance teamwork and productivity
-  Develop a certified robotic system for inspection within hazardous locations





ON THE FACTORY FLOOR:  
**AV INTEGRATION**










After establishing the design of industrial AVs, the next step is determining where and how to integrate them into factory operations. Manual testing in the physical plant interrupts processes and introduces safety risks, but **validation through a virtual environment** mitigates these issues.

In the **virtual twin experience**, manufacturers leverage modeling and simulation to visualize what they want to accomplish. Then, they can implement this in the real world. Knowledge and data simultaneously collected from the physical plant update the virtual twin and spur continuous improvement. As manufacturers explore different what-if scenarios for industrial AV integration, they can ensure that AVs operate safely and efficiently.

A closed-loop integration between the virtual and real worlds creates **real-time visibility** of factory operations. As a result, manufacturers can:

-  Define how AVs fit into existing processes
-  Ensure AV operations don't endanger workers
-  Plan for space and AV movement on the factory floor
-  Streamline workflows and generate additional value



“Dassault Systèmes’ solution enables the comprehensive simulation of all the flows in a factory, including the movement of equipment, people and AVs. This way, manufacturers can decide how many mobile robots are needed to serve a precise purpose and how to execute the mission in an achievable manner.”

– **Henri Beringer**  
Transportation & Mobility Industry  
Business Consultant Director  
Dassault Systèmes

## Driving Innovative Production Lines

With a detailed and transparent view of the factory, manufacturers have the confidence to integrate complex AVs and robotics systems into their production lines.

The virtual twin eases the transition toward **autonomous factories** in three ways:

### Perform virtual commissioning

Manufacturers can test AV design solutions and validate them in a virtual environment. They can program AVs and devise optimal movements before committing any physical resources.

### Explore collaborative robotics (cobotics)

Cobots operate alongside human workers to maximize productivity. By simulating a range of interactions, manufacturers can determine how cobots should behave to reduce risk to workers.

### Leverage AI and analytics

With AI-based image processing and machine learning, AVs can identify patterns and make the best decisions for safer integration into factories.

## Case in Point: CenterLine (Windsor) Limited

Canadian-based [CenterLine \(Windsor\) Limited](#) is an industrial automation process and technology company aiming to simulate and understand every robot before deployment on the factory floor.

The company leveraged the **3DEXPERIENCE** platform to virtually model products, processes and factory operations. It **visualized and verified robot movements** before introducing them to factory floors, resolving any issues upfront for smooth robot integration.

A connected platform enabled the company to:

**20%**

Save up to **20%** of the time to market for simulation and design

**75%**

Slash programming time on the floor by as much as **75%**

**90%**

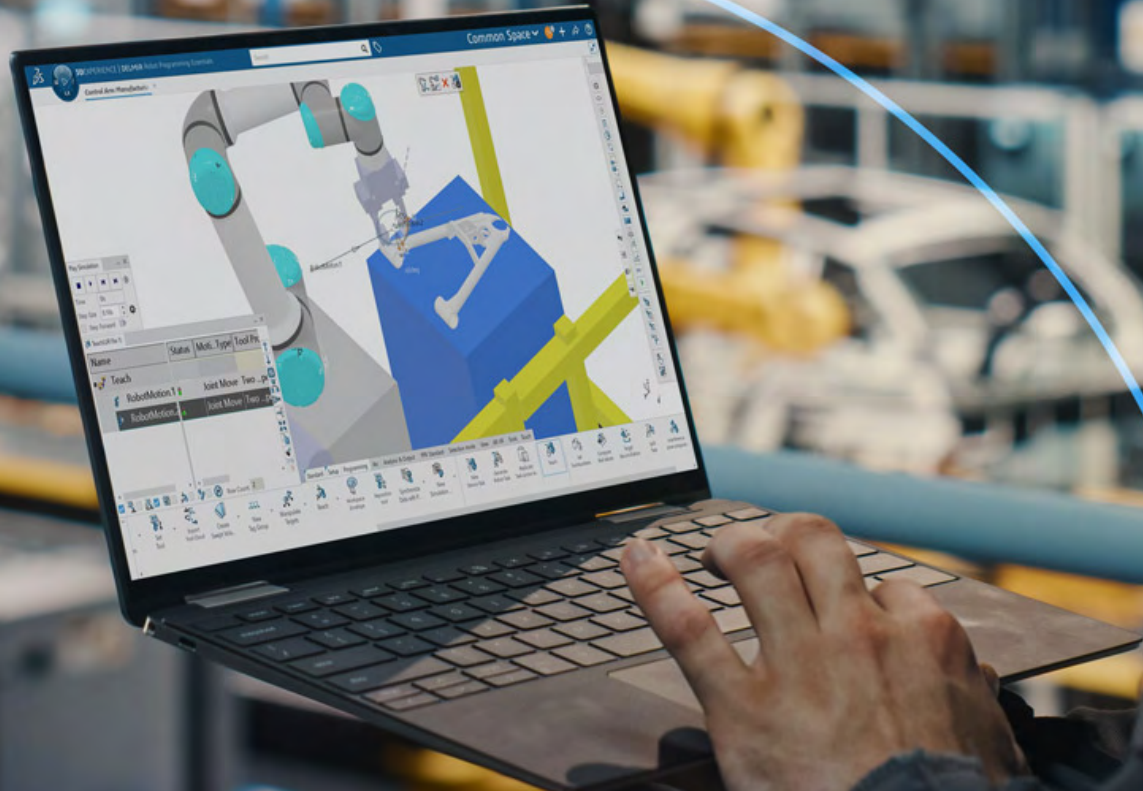
Reduce up to **90%** of tooling-related issues and rework

“Systems engineering linked with KPIs through the virtual twin helps manufacturers describe mobility systems and their impact before investing in physical parts, physical infrastructure and physical vehicles.”

– **Laurence Montanari**  
Transportation & Mobility Industry  
Vice President  
Dassault Systèmes



# IN THE CONTROL TOWER: AV MANAGEMENT





When manufacturers successfully integrate AVs into their factory, they must ensure that the production line operates at maximum efficiency at all times.

A **control tower approach** enabled by the virtual twin helps manufacturers monitor and optimize entire factory activities. From the characteristics of manufactured goods and the movement of AVs to the standard parameters for equipment efficiency, data is captured and contextualized in 3D. Analyzing this information drives continuous improvement initiatives, such as resolving bottlenecks, enhancing AV performance and boosting factory efficiency.

Powered by the **3DEXPERIENCE** platform, manufacturers gain comprehensive intelligence and analytics in real time to observe business **key performance indicators** (KPIs) and ensure that AVs remain productive.

“A manufacturing control tower solution allows manufacturers to track all the movements in a plant. They get a full picture of what has happened, what is happening and what will happen with a rich concatenation of all the information within the factory.”

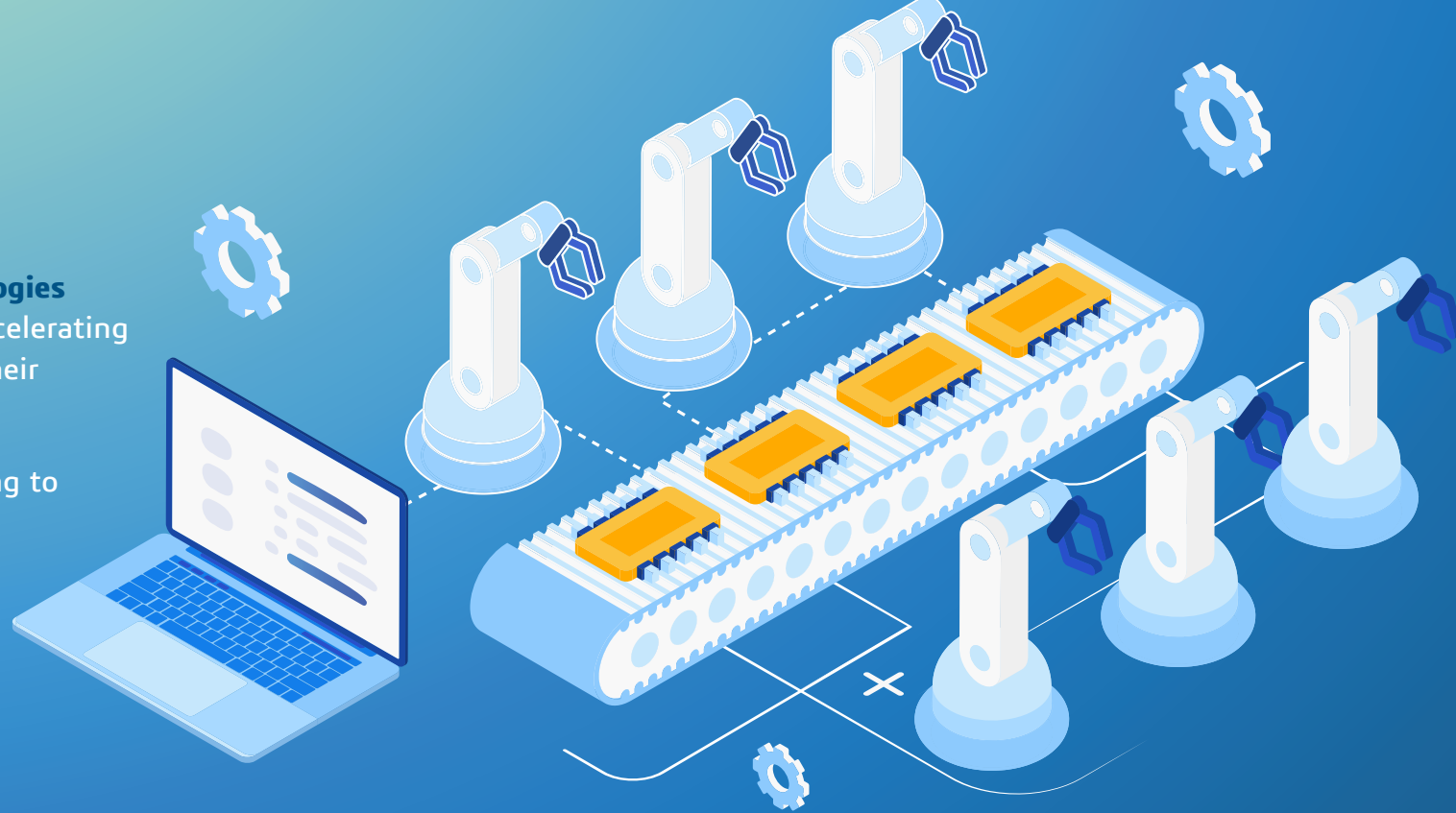
– **Henri Beringer**  
Transportation & Mobility Industry  
Business Consultant Director  
Dassault Systèmes



## Harnessing Advanced Technologies

New and powerful tools are accelerating the advancement of AVs and their smooth deployment. Here are

**4** technologies promising to deliver greater value:



### Industrial Internet of Things (IIoT)

Monitor operations in real time for end-to-end situational awareness of AVs. Share data through an interconnected network to deliver information intelligence and drive smarter business decisions.

### 5G

Leverage higher bandwidths and lower latencies for fast and reliable data transmission between AV sensors and the smart factory. Analyze abundant data to increase AV reliability and efficiency.

### AI

Train AVs to identify and react to various situations, including potentially dangerous ones. Create predictive models that detect failures and automate equipment maintenance.

### Machine Learning

Develop self-learning AVs that teach themselves how to adapt to shifting environments and perform tasks better. Allow AVs to learn from each other with knowledge sharing on the cloud.



## Case in Point: Robot at Work

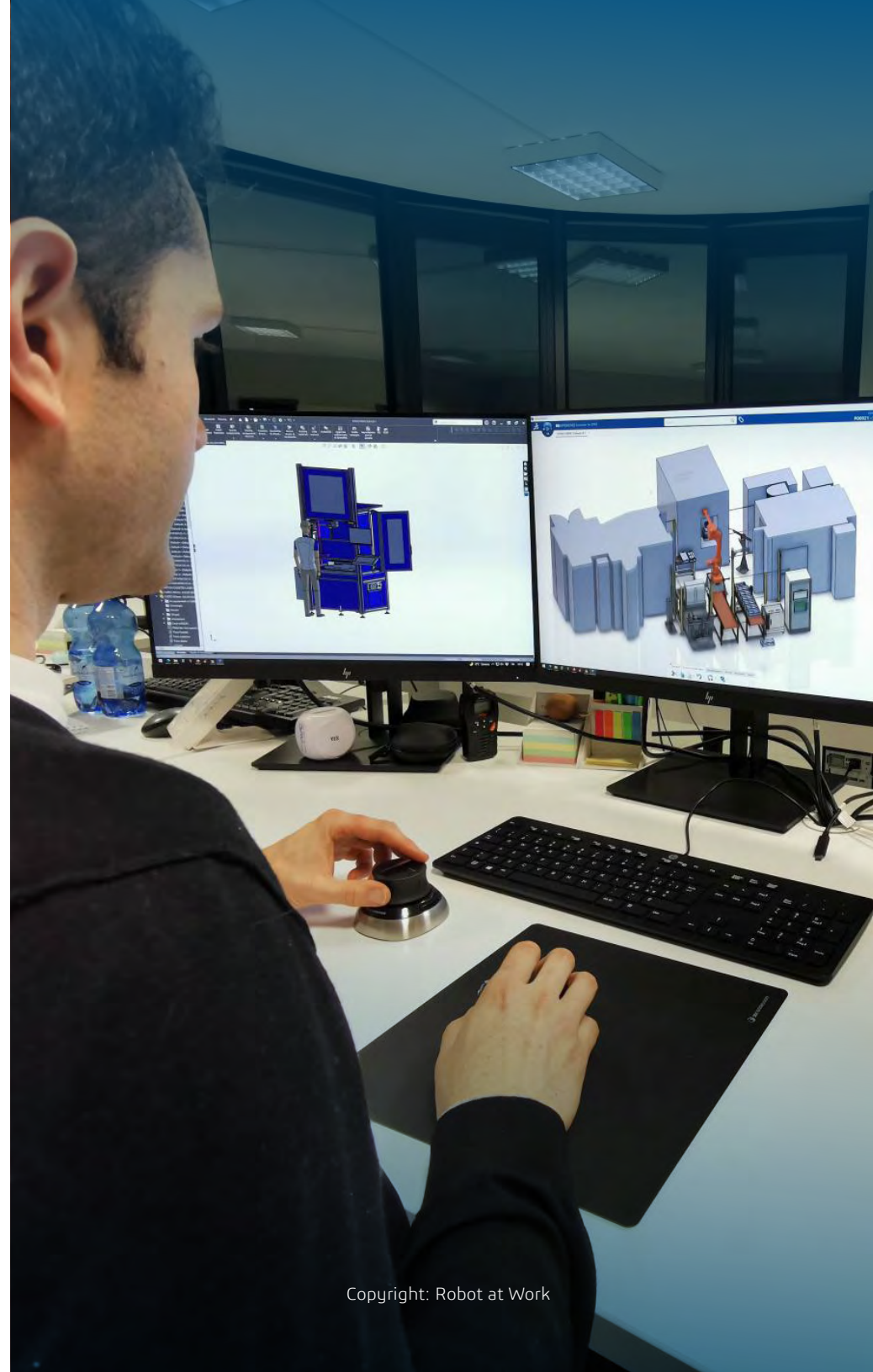
[Robot at Work](#) is an Italian production line solutions specialist. It provides innovative cobots and industrial robotics for manufacturing operations.

The **3DEXPERIENCE** platform helped the company monitor production systems, create models for adjustments and automatically make changes to the system to ensure **maximum manufacturing efficiency**.

When a customer had to modify their production a few times a month, the company simulated changes through the virtual twin before making the switch. This reduced downtime and increased manufacturing output.

“By connecting modeling applications with data intelligence, manufacturers can be sure they’re making the right decisions at the right time.”

– **Laurence Montanari**  
Transportation & Mobility Industry  
Vice President  
Dassault Systèmes



# THE FUTURE IS AUTONOMOUS

AVs are leading the manufacturing transformation toward Industry 4.0, but its successful assimilation depends on the **virtual twin experience**.

Dassault Systèmes' **3DEXPERIENCE** platform helps manufacturers leverage virtual twin technology to design and integrate AVs into the factory. It also improves the management of AV operations and unlocks benefits such as increased adaptability and agility.

By embracing industrial AVs, manufacturers are equipped to build operations that meet today's needs while overcoming tomorrow's challenges.

Advance your autonomous factory today. Learn more [here](#).



## Our **3DEXPERIENCE**® platform powers our brand applications, serving 11 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3DEXPERIENCE** Company, is a catalyst for human progress. We provide business and people with collaborative virtual environments to imagine sustainable innovations. By creating 'virtual experience twins' of the real world with our **3DEXPERIENCE** platform and applications, our customers push the boundaries of innovation, learning and production.

Dassault Systèmes' 20,000 employees are bringing value to more than 270,000 customers of all sizes, in all industries, in more than 140 countries. For more information, visit [www.3ds.com](http://www.3ds.com).



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