



# ADVANCE THE ACCURATE DEPLOYMENT OF MANUFACTURING ROBOTICS WITH VIRTUAL SIMULATION

Discover a 3D virtual environment for robotics design that unites collaborative working and powerful simulation capabilities.

## ABOUT OUR EXPERTS



### **Tony Karew**

Tony has over 20 years' experience at Dassault Systèmes planning, presenting, creating, demoing, implementing and representing products for the DELMIA brand. During his tenure, Tony has held positions as product manager, pre-sales engineer, services engineer, engineering consultant, portfolio manager and robotics specialist.



### **Michael Mayr**

Michael has over 20 years' experience in the field of industrial automation at global sensorics and robotics market leaders (including Leuze, Yaskawa and KUKA). During his journey, Michael has held positions as product manager, head of portfolio management, head of business development and is leading the robotics and machine tools industry segment at Dassault Systèmes as Director of Business Development since 2019.

# INTRODUCTION

While the robotics market continues to expand—[slated to enjoy 9.9 percent CAGR until the end of the decade](#)—there is a growing need to ensure the accurate deployment of robotics in increasingly complex manufacturing environments.

First, products are becoming increasingly personalized in what's known as "[Production of One](#)," that is, manufacturers need to be flexible enough to produce for the unique needs of a single consumer.

Second, global manufacturers have to contend with the prospects of a fast-greying population. There isn't enough available labor to replace retiring talent; therefore, robotics will have to be more quickly integrated to provide a production multiplier effect to meet projected demand levels.

Third, manufacturers have to deliver innovative products in diverse global markets beset with the prospect of volatility and disruption. In these scenarios, coordination of distributed production lines is paramount and manufacturers have to become more agile in modifying their production lines in response to these challenges.

"While robotic systems are extremely flexible, it's up to the manufacturer or the robotics system integrator to quickly develop or modify a robotics system to solve a problem," explained Tony Karew, a Senior Specialist in the DELMIA Robotics Portfolio.



“In many cases, these stakeholders don’t consider how to fully utilize such a flexible manufacturing system. They don’t have an avenue to explore all the possibilities and simulate the implementation of highly flexible systems.

“Because their current approach is too focused, they don’t always have a complete view of the shop floor to realize the other issues they could alleviate with that system,” Tony added.

Therein lies the value of **virtual simulation** for manufacturing. It is the only avenue for innovative manufacturers to advance the deployment of flexible robot systems to:

- Increase the production output of personalized products across multiple lines
- Discover new ways to create innovative products more quickly
- Reduce production costs, especially within research and development (R&D)
- Decrease R&D risks and improve risk appetite to test new ideas and product innovation

In this ebook, we will discover how the right 3D virtual environment transforms the accuracy of robotics deployment to meet manufacturing goals.



**CHAPTER 1**  
**THE NEW ROBOTICS**  
**DEPLOYMENT PARADIGM**

To increase the integration of robotics systems in manufacturing, the right robotics design and deployment solution needs to cater to various end-users at different maturity points. This includes teams consisting of people with and without the skills and knowledge to use simulation to deploy manufacturing robotics.

In the new robotics deployment paradigm, multidisciplinary stakeholders need to be united on the same collaboration platform to leverage powerful virtual simulation capabilities that can account for variables such as:

- Planning for space on the factory floor and power use
- Ensuring that operations does not endanger human workers
- Defining how robots can fit into existing production line practices
- Ensuring that robots are compatible with the tools needed for the jobs
- Understanding industrial equipment coordination

**When the value of manufacturing robotics is improved, manufacturers can expect to avoid costly mistakes, increase production agility and maximize resource efficiency.**



## THE COLLABORATIVE APPROACH TO MORE EFFICIENT AND SAFER ROBOTICS INTEGRATION

The right virtual simulation capabilities gives multidisciplinary stakeholders the tools they'll need to make robotics deployment successful.

With safety, for instance, this virtual simulation environment helps both designers and engineers to accurately visualize:

- Where and how the robots are working
- How they can best program and configure workcell safeties
- Ensure compliance with various regulatory safety requirements

“ Our virtual simulation tools enable manufacturers to use a **3DEXPERIENCE Twin** to imagine, design and test the most complex robot workcells in the context of their factory operations. This means manufacturers can always know how that robot system is going to perform against real-world requirements regarding robot peripherals, fastener planning, maintenance, production output, human safety and more.”

— Tony Karew,  
Senior Specialist,  
DELMIA Robotics Portfolio

The 3D representation of the robotics workcell *in situ* greatly enhances how multidisciplinary stakeholders can modify and enhance robots in the context of its production line over its lifetime. These modifications and enhancements include changing the **peripherals** and **programmable logic controllers** (PLCs) in response to new production requirements.

With a wider view of the production line, these stakeholders can more accurately implement a maintenance task, realize a new type of product or program the robot to accommodate a new style of an existing product.

These collaboration ability also extends to global operations.

“Our capabilities don’t just allow for the implementation and the integration of multiple robot processes that might be happening in a workcell.

“We also help integrate with the engineering office, and the design effort there, wherever that office is situated. When manufacturers have a product that’s maturing and changing, they need to be able to better accommodate those engineering changes and seamlessly integrate them into their distributed manufacturing systems so that products can go to market more quickly,” Tony said.

The new robotics deployment paradigm disregards the physical constraints of the engineering office and the production line. Instead, it empowers manufacturing engineers, product design engineers, and tooling design engineers to work seamlessly while being aware of the different changes that are being implemented. What emerges from this new paradigm is the confidence to deploy advanced robotics systems for production lines.







# CHAPTER 2 SIMULATE THE DEPLOYMENT OF ADVANCED ROBOTICS

With new thinking and powerful tools, manufacturers can pave the way for more innovative production lines. They can confidently integrate complex and flexible robotics systems with their production lines with ease because of a new **virtual commissioning** and **robotics** experience.

### Virtual commissioning

Virtual commissioning gives manufacturers the ability to test their robotics design solution from the concept phase or parallel to production line planning.

“With hundreds of planned sensors in a production line, it is difficult for a line builder to guarantee that they can finalize the line and start production on time based on necessary modifications and the end-users’ wishes, on top of the original project scope,” explained Michael Mayr, a Dassault Systèmes Industrial Equipment Sales Strategy Expert.

“Those crucial three or four weeks that are set aside for commissioning at the end of production line planning is when things usually go awry as hundreds of misconfigured sensors result in more and more problems to fix and further delays.”

Instead, with the right virtual commissioning capabilities, line and cell builders can determine from the outset how to best design all the production line components, assemble them and subsequently program all the automation to run these lines.

Beyond being able to model the physical behaviors of robots on the production line, the right virtual simulation solutions enable manufacturers to attach a PLC to the workcell—be it a software- or hardware-based controller—to enable communication inside the virtual workcell.





**Manufacturers can integrate their robotics engineering teams more closely with the PLC programming and electrical engineering teams, all on the same virtual collaboration platform.**

As a result, teams can program their automation virtually and look at the designs in a virtual workcell and attach their program to it. They can address all of the devices in that workcell and devise their program around what will be built on the floor before any resources are committed to construction.

This is particularly crucial when production lines have to be quickly altered to allow for different production configurations.

Also, with the right simulation tools for virtual commissioning, production engineers can easily assess which kind of robotics elements can be used to quickly scale up output. They can determine the best way to split one production line with ten workers into two production lines with five workers each that are enhanced with collaborative robots.

## Human-robot collaboration

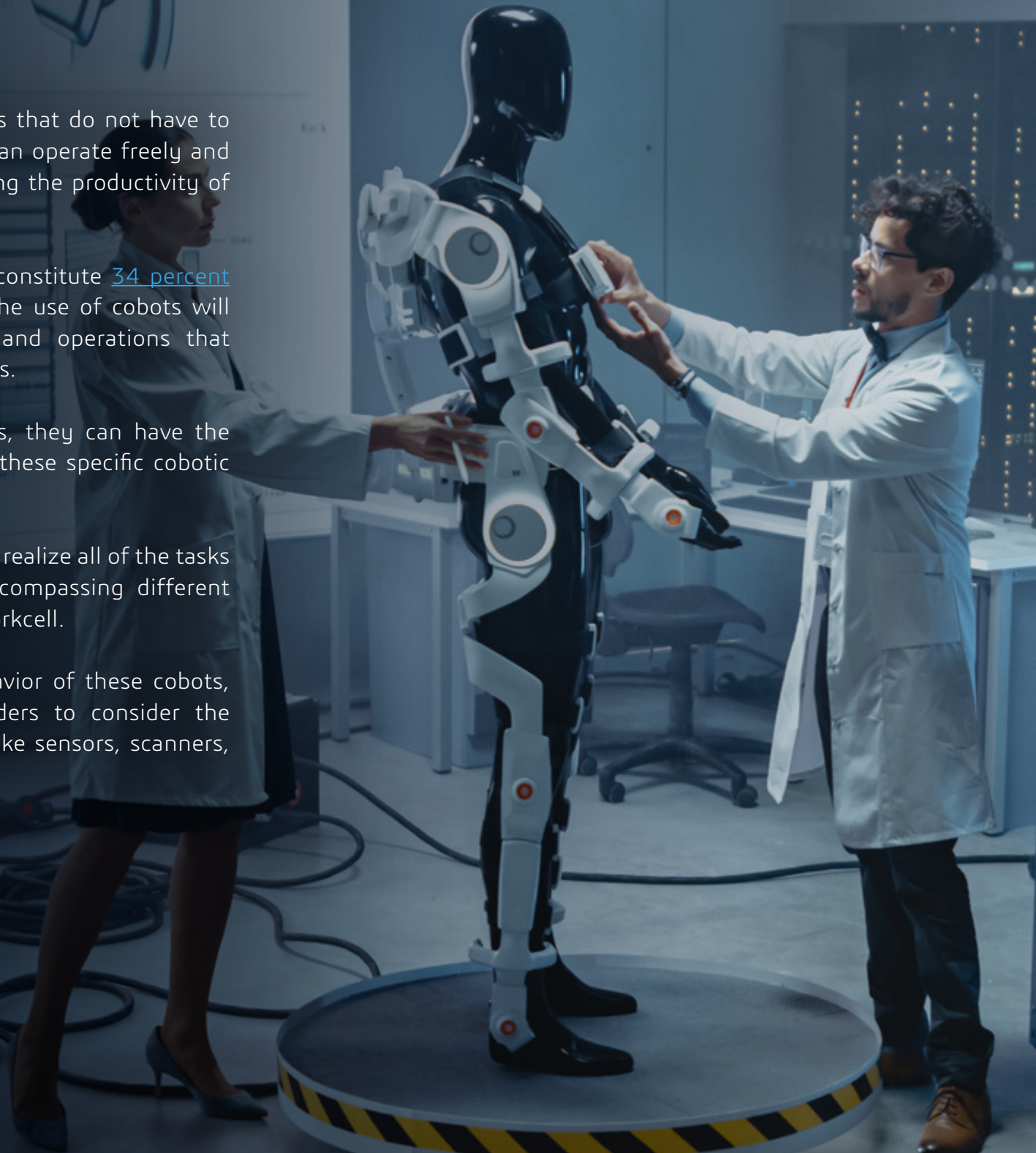
Collaborative robotics, or **cobots**, are robots that do not have to be penned in safety cages to operate but can operate freely and safely alongside human workers, maximizing the productivity of both.

It is estimated that, by 2025, cobots will constitute [34 percent of all robot sales](#). However, popularizing the use of cobots will require the same insight into planning and operations that currently devils traditional industrial robotics.

Fortunately for cell builders and end-users, they can have the right virtual simulation solutions to create these specific cobotic cells or cobotic lines.

These tools deliver the capability to virtually realize all of the tasks that the human and cobot are doing, encompassing different parameters around the operation of that workcell.

But, beyond the ability to model the behavior of these cobots, our simulation solutions enable stakeholders to consider the placement and application of **peripherals** like sensors, scanners, cameras and detectors.





This is a crucial ingredient in the cobotics integration experience and the ability to simulate the performance of peripherals ensures manufacturers can realize results in the real world.

But using the sensors in the simulation, designers and engineers can simulate a human's operation in that workcell alongside the cobot. This includes determining:

- How long a person can comfortably reach, grab and manipulate objects in the workcell
- The cobot's reachability, cycle time and how and when it should react to reduce risk to the human in the workcell

**Simulation enables manufacturers to accurately determine the risk that is introduced when a human is within proximity of the robot.**

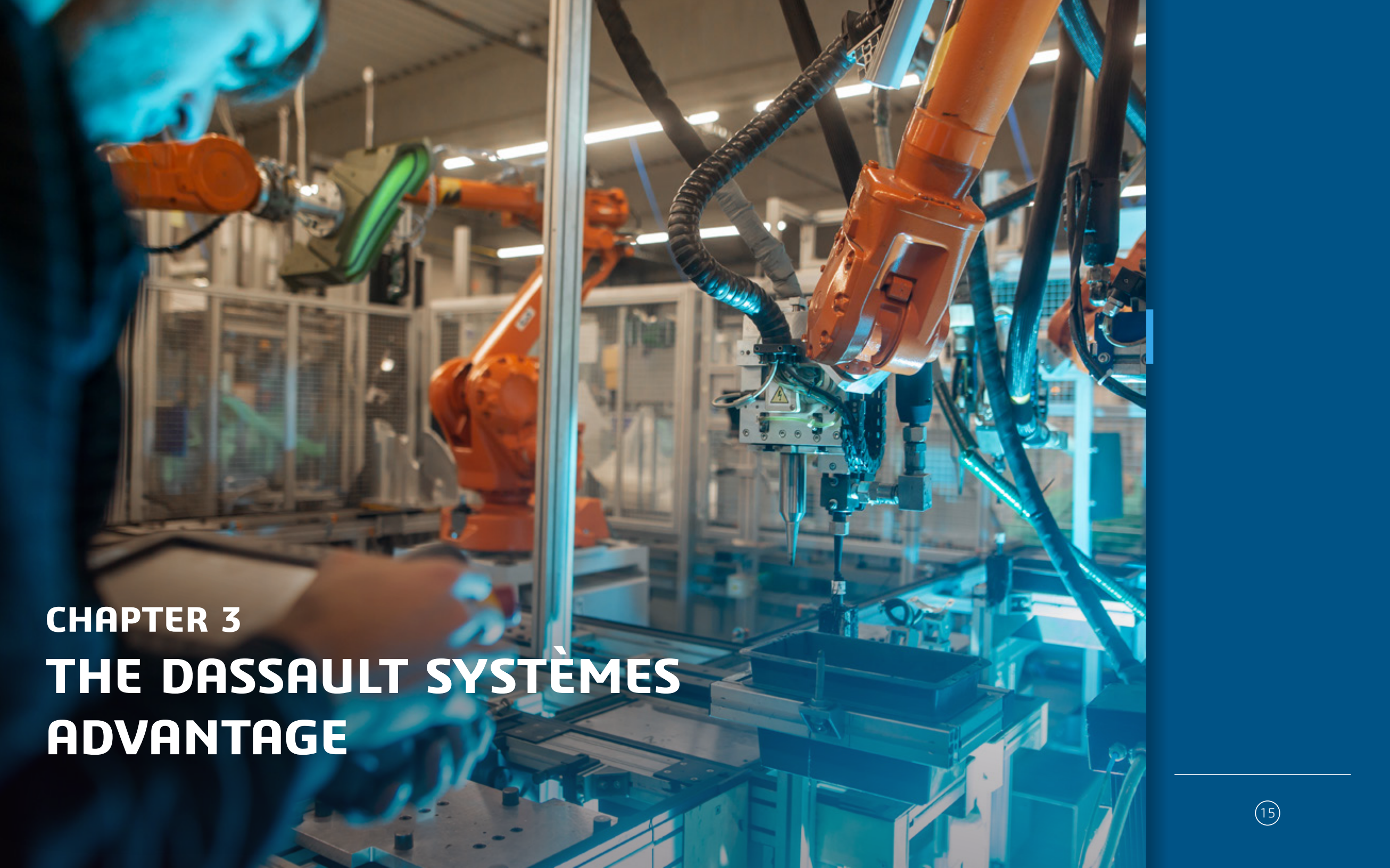
The right simulation capabilities help manufacturers to identify the limitations of the cobot physically and from a time standpoint; they can identify time constraints in the practices assigned to the cobots.

As a result, a manufacturer can fully utilize their cobotics investment because cobots can be deployed as flexibly as possible to make the production line as smooth as possible.

**“With our virtual simulation solutions, customers can more easily take ownership of their automated systems and the intellectual property that goes along with it. This enables them to be more agile in their manufacturing and have the capability to address market demand more easily because they can realize faster innovation for both their products and manufacturing systems.”**

**— Tony Karew,  
Senior Specialist,  
DELMIA Robotics Portfolio**





**CHAPTER 3**  
**THE DASSAULT SYSTÈMES**  
**ADVANTAGE**

The changing landscape of the manufacturing workforce is one that, in a decade or two, society is going to see increasing demand but a drop in the talent supply. As such, it's becoming increasingly urgent to quickly integrate robotics in production lines to become more efficient with fewer workers and increase the output per worker to meet future demand.

Furthermore, as manufacturing worker salaries become more costly and products become smarter and more complex, these create increasingly volatile market conditions.


The Dassault Systèmes [robotics portfolio](#) on the **3DEXPERIENCE®** platform gives manufacturers the ultimate virtual simulation and collaborative environment to explore and identify all the possibilities and nuances that a manufacturing robotics system can assume.

This involves Dassault Systèmes' robotics translators that can translate virtual simulation into the various robots' native languages. These translators are bi-directional, meaning manufacturers can both download and upload to these production robots. We currently have 13 translators that support over 1,700 robot models in our robot library today.

**“Dassault Systèmes' technological acquisitions in the past 10 years put it at an unparalleled advantage when it comes to providing end-to-end robotics simulation capabilities and ensuring more sophisticated digital continuity than its competitors.”**

**– Michael Mayr,  
Industrial Equipment Sales Strategy Expert**





The platform delivers the capability to accurately visualize and experience all of the possibilities of an automated system, whether it's one robot or many. Manufacturers are free to structure any type of automation that they can contrive using robots while virtually realizing how that system works and reacts.

Manufacturers can optimize their robotics investment by doing more with less because they can reduce the amount of equipment needed to more fully utilize that purchase.

**With simulation, manufacturers can do more with less, thereby saving capital through reduced equipment expenditure. This capital can then be deferred to other profitable uses.**

Interested in learning more about advances in manufacturing, robotics and virtual simulation? [Visit our dedicated manufacturing portal now.](#)

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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