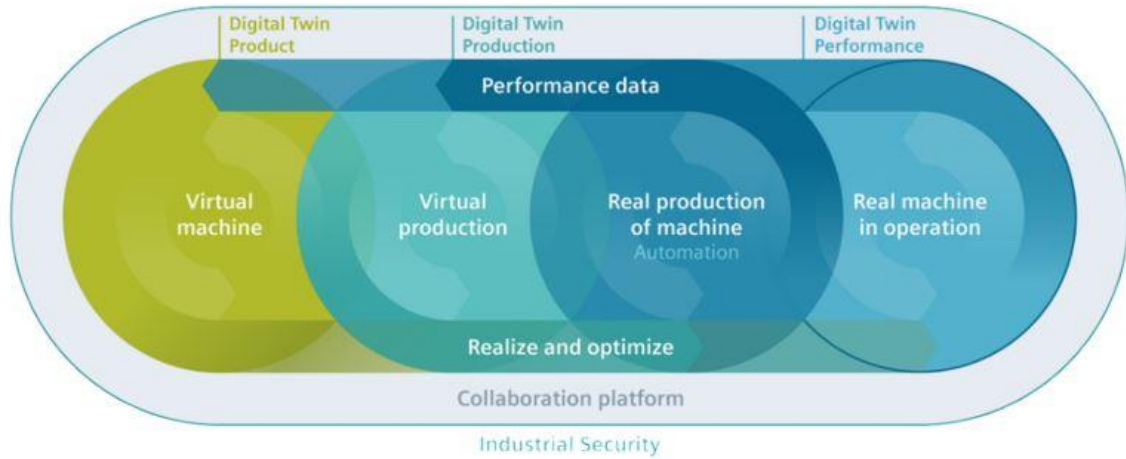


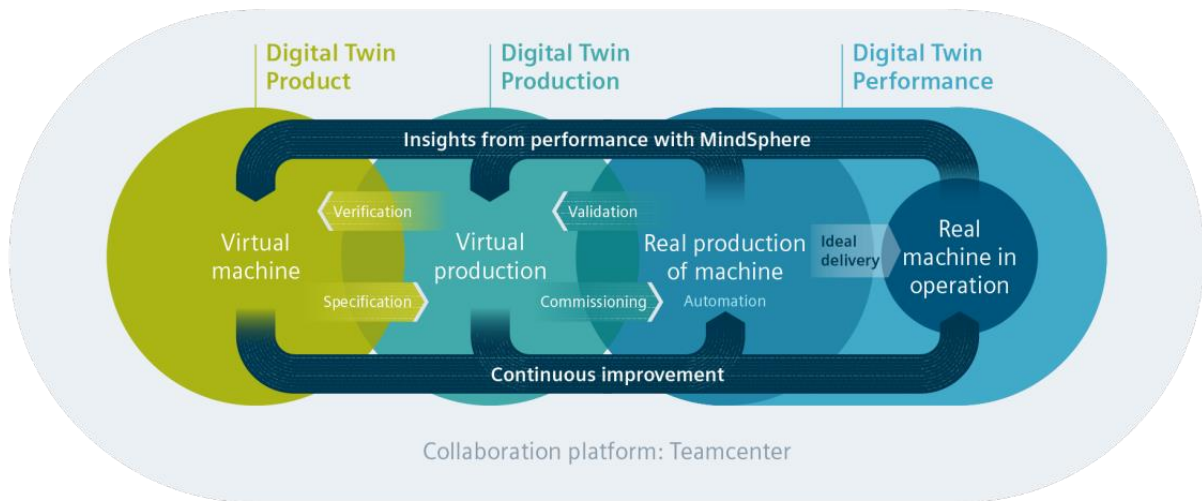
VIDEO LINK Siemens Webinar

<https://vimeo.com/648210297>

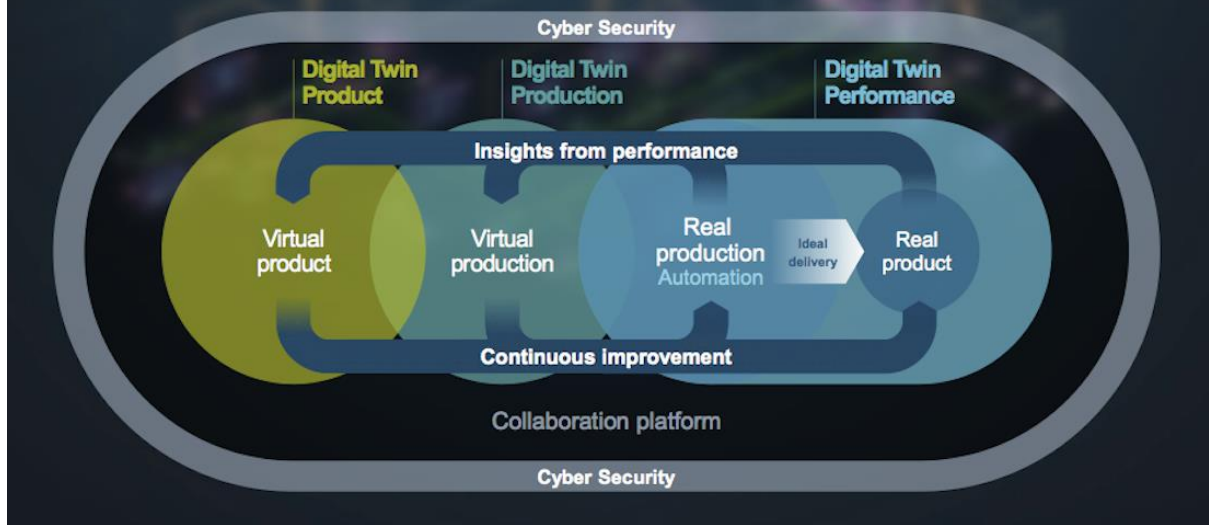
<https://www.techdesignforums.com/blog/2019/04/26/the-evolution-of-the-digital-twin/>



**Digital Twin Ties Together All Phases of the Manufacturing Process, from Design to Shop Floor Operations (Siemens Graphic)**



## Feed back insights to continuously improve product and production in the real world



First, there is the digital twin of the product. This is a complete representation of the product in a virtual environment. It encompasses the shape, the mechanical elements, the components, the electronics and the software. “But,” said Jockusch, “it is also the ideas that are behind the product – the things it has to do as well as the decisions that are made when you come up with the product.”

Second, there is the digital twin of the production. This begins as a virtual form of the factory and the processes that it runs (or will run) to make the product, enabling production simulation at its most basic level. “When you want to make changes to a product, it is really important to understand how the manufacturing process works,” explained Jockusch. “What impact will the changes to the product have on the cost of the manufacturing, in time and other factors?”

Third, there is a hybrid level as the product goes into the real factory. Here, the virtual and physical versions of the process can interact in real-time for monitoring, and continuous improvement. There are now options to move between simulation and real implementation.

Fourth, there is the digital twin of the performance, as the product goes out into the field. “Nowadays, a product produces terabytes of data, and there is going to be 5G [to deliver it]. There is much of that data that we want to bring back because it can seed every step from development to manufacturing. This makes for a big change in how we can work and for productivity.

Fifth, there is the necessary wrapper of security protecting both the product and the process by which it is delivered and improved.

Industrial Machinery

# Key Trends ... the future is...



- PERSONALIZED FLEXIBLE
- SMART CONNECTED
- HIGH-TECH SUSTAINABLE
- GLOBAL COST-EFFECTIVE

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6:35 mins **EXPLOSION OF COMPLEXITY**



Global  
Smart  
Quality  
Connected  
Personalized  
Efficient  
Flexible  
Integrated  
Cost effective  
Secure  
Sustainable


“ An explosion of complexity... ”

SIEMENS

07:00 mins - **DIGITALISATION + DIGITAL TWIN**

### Comprehensive Digital Twin

Design	Realize	Optimize
1. Product Design 2. Production Development	3. Product Manufacturing 4. Manufacturing Operations	5. Product Utilization 6. Plant Performance and Maintenance



Continuous product/ production improvement

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08:35 mins - **DESIGN TRADE OFFS**

**The beating heart**

We believe that the comprehensive digital twin is critical to the future of engineering innovation and that simulation and test are the beating heart of the digital twin. By providing you with insight into the real-world performance of your product or process, Simcenter allows you to accelerate innovation over the entire lifecycle.

Dr. Jan Leuridan, Senior Vice-President, Siemens

EXPLORATION & ANALYTICS • WORKFLOW AUTOMATION • PROCESS & DATA MANAGEMENT  
 computational fluid dynamics • electro-mechanics & electronics  
 mechanical simulation • system simulation • physical testing  
 ENGINEERING SERVICES • DEDICATED SUPPORT

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9:20 BUSINESS VALUE FROM RELIABLE DIGITAL TWINS

**The beating heart**

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10:30 DIGITAL SIMULATION + TEST

**Solutions**  
Simulation & Test

Test for Simulation	Test with Simulation	Simulation for Test
<p>Deliver realistic input to models</p> <ul style="list-style-type: none"> <li>Model validation &amp; updating</li> <li>Model parameter identification</li> <li>Load identification</li> <li>Test data analysis expertise</li> </ul>	<p>Reduces model uncertainty</p> <ul style="list-style-type: none"> <li>Hardware-in-the-loop testing</li> <li>System-in-the-loop testing</li> <li>Human-in-the-loop testing</li> <li>Virtual sensing</li> </ul>	<p>Measure hard-to-measure things</p> <ul style="list-style-type: none"> <li>Virtual testing</li> <li>Optimal sensor/excitation</li> </ul>

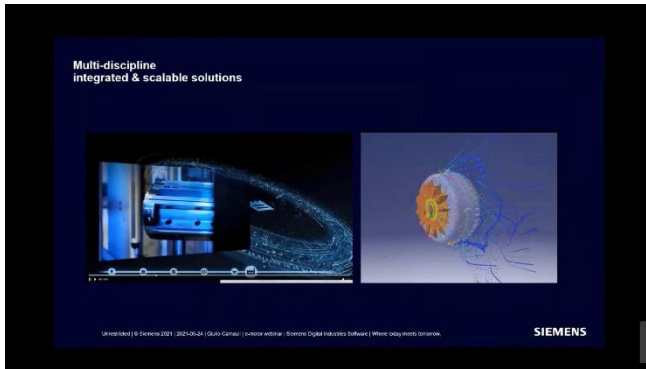
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**Solutions**  
Business value from reliable Digital Twins

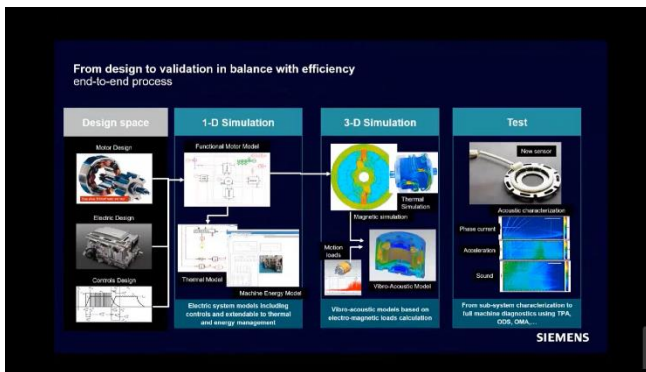
Simulation & Testing enhanced capabilities	Multi-discipline integrated & scalable solutions	Industry specific know-how & best practices

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12:00 SCALABLE + INTEGRATED SOLUTION PROCESS



13:30 END TO END PROCESS



15:00 CASE STUDY 1 - MECHANICAL PERFORMANCE



17:50 CASE STUDY 2 - VIBRATION



18:45 CASE STUDY 3 - NOISE

**CHALLENGE**

Make durable and NVH compliant motors.

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18:45 / 39:49

21:40 CASE STUDY 4 – ELECTRICAL PERFORMANCE

**CHALLENGE**

Measurement of electric motor parameters at inaccessible locations.

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21:44 / 39:49

23:30 CASE STUDY 5 - END USER COMFORT

**CHALLENGE**

End-user comfort

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23:26 / 39:49

30:30 CASES STUDY 6 - MANUFACTURING QUALITY

**CHALLENGE**

Comply to high quality standards is necessary to be competitive and gain global market share.

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30:03 / 39:49

33:40 KEY PRACTICES + COMPETENCES OF 'DIGITAL TWINS'

Where engineering meets tomorrow  
Investment imperatives for a comprehensive digital twin strategy

- Model the complexity**  
Ensuring decision confidence
- Explore the possibilities**  
Enabling insights
- Go faster**  
Achieving speed and agility
- Stay integrated**  
Connecting all activities

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36:45 KEY VALUE 'WINS' FROM THE DIGITAL TWIN STRATEGY

Simcenter  
Driving customer benefits

- better products
- higher ROI
- greater productivity
- earlier insights
- faster innovation

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37:15 INTEGRATED PROCESS AND COLLABORATION

Better together

- Siemens**  
Engineering powerhouse that has the strength and vision to continue pushing boundaries
- Xcelerator**  
Simcenter is an integral part of a broad portfolio including MCAE, PLM and EDA
- Extensive portfolio**  
Performance engineering for all phases for closed-loop product development
- Simulation & testing**  
Unique combination that is essential for IoT/digital twin strategic deployment
- Support & services**  
Skilled teams with industry expertise to help you gain competitive advantage

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38:30 SUMMARY - DIFFUSED SILOS – REAL TIME INTEGRATION – INTERDISCIPLINARY COLLABORATION

In Summary

To master complexity you need

- ... solutions that help drive innovation
- ... and enable collaboration by breaking down silos
- ... weaving a digital thread across all development activities

With a comprehensive portfolio

- ... that combines simulation & test
- ... with engineering services and dedicated support
- ... and backed by the strength of Siemens and Xcelerator
- ... Simcenter offers a unique DNA to help you in your digital journey

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