IACMI Simulation/Digital Twin Working Group Update

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Purdue University

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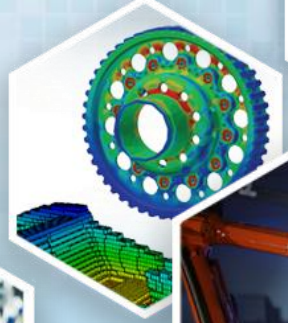


Simulation/Digital Twin Working Group

- **Mission –** Increasing computing power is changing the world of design and simulation. It is becoming possible to model materials at multiple scales and associated manufacturing processes to aid in decision making. The ability to create "digital twins" of physical reality points toward integrating such tools into future manufacturing lines using Industry 4.0 technologies and Machine Learning. What demonstrations can help validate this shift? Where can IACMI and industry work together to accelerate this transformation?
- **Formation**
  - Participants interested in composites design modeling and simulation
  - Participants include industry, academia, government
  - Opportunity to align with external entities (NAFEMS, AIAA, cdmHUB, etc.)

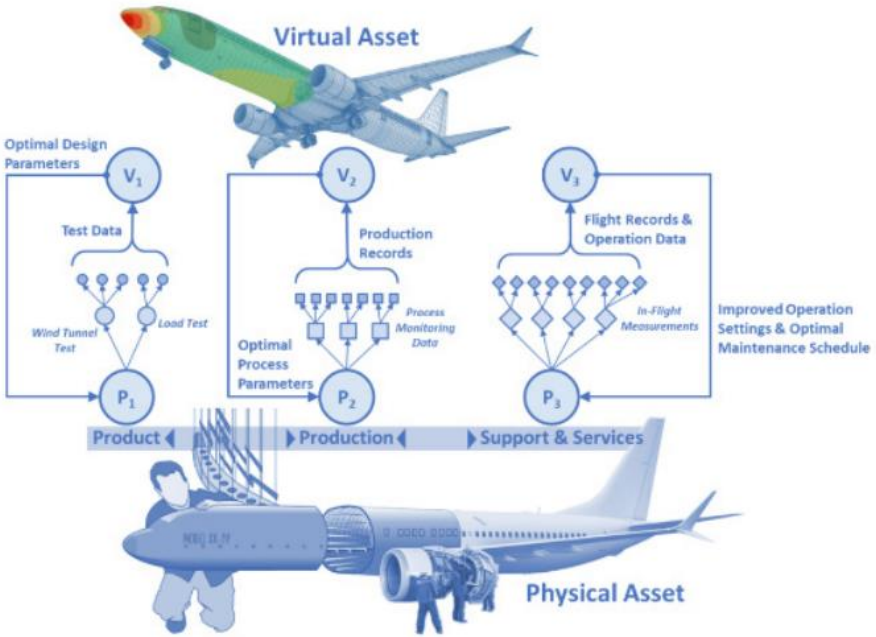
Simulation/Digital Twin Working Group

Principal Activities

- Identify key technical and cost challenges in composites simulation
- Conduct needs assessment specific to composites simulation software
- Propose round robin evaluations of available software tools
- Report activities and successes at IACMI member meetings and other forums, including trade press and conferences
- Engage funding agencies and industries to support R&D needs
- Collaborate with other organizations to advance the field

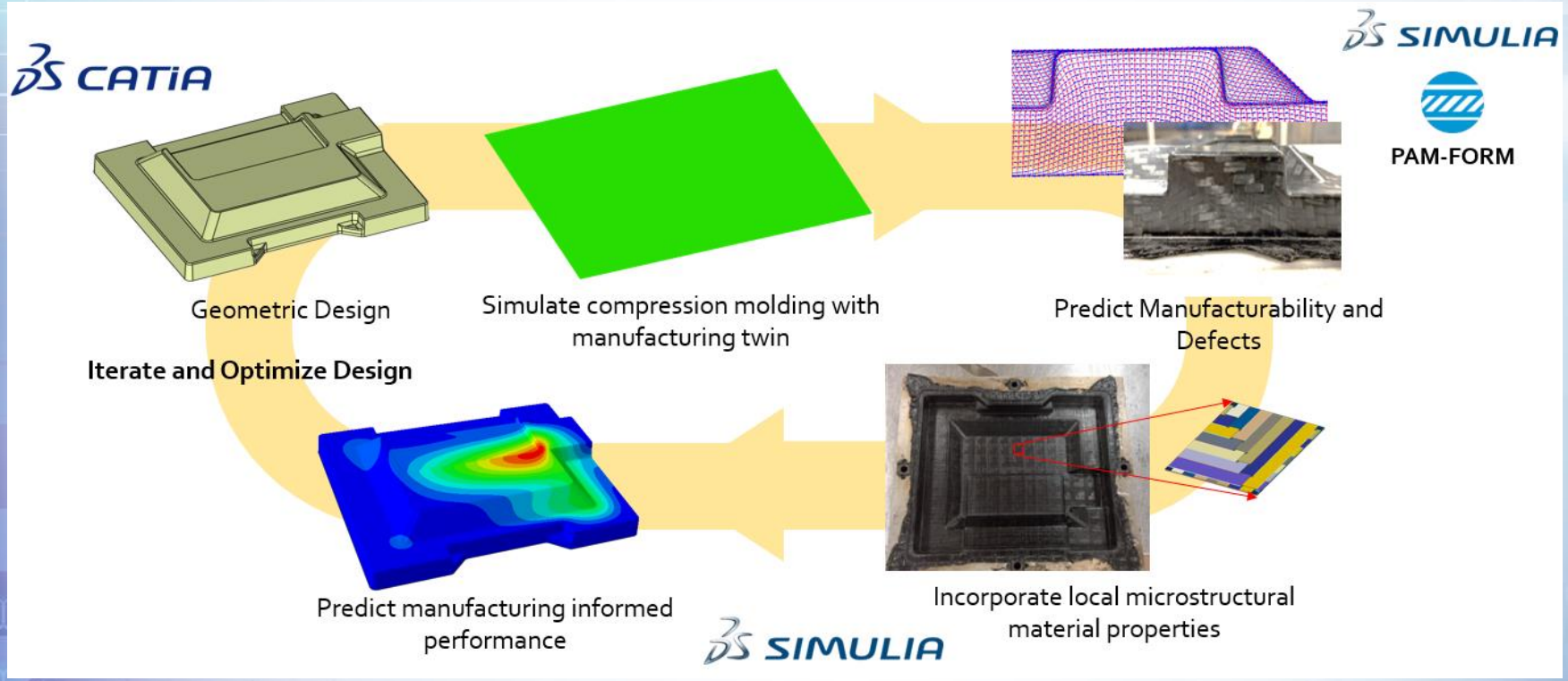
Digital Twin Definition

A **Digital Twin** is a virtual representation of a connected physical asset.



- *Digital Twin: Definition & Value*, An AIAA and AIA Position Paper, December 2020.
- *Department of Defense Digital Engineering Strategy*, Department of Defense, June 2018.

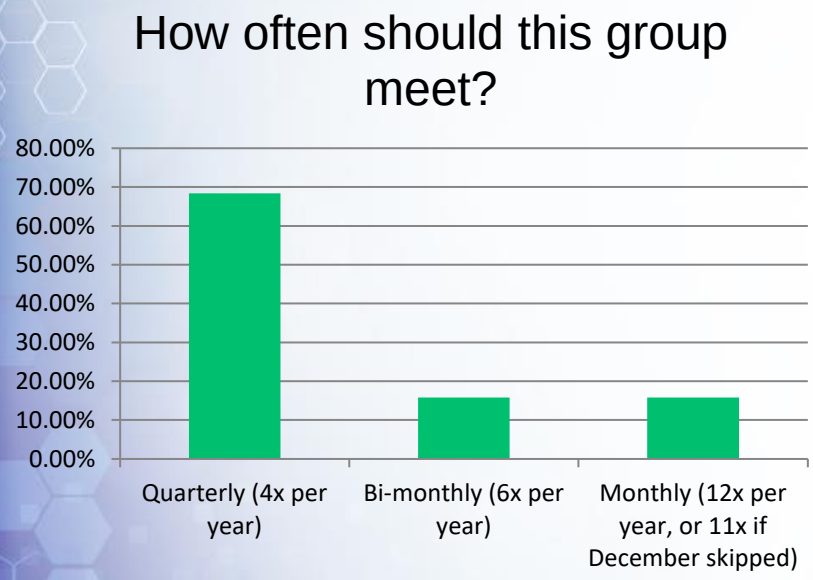
Integrated Workflow for Thermoplastic Stamping

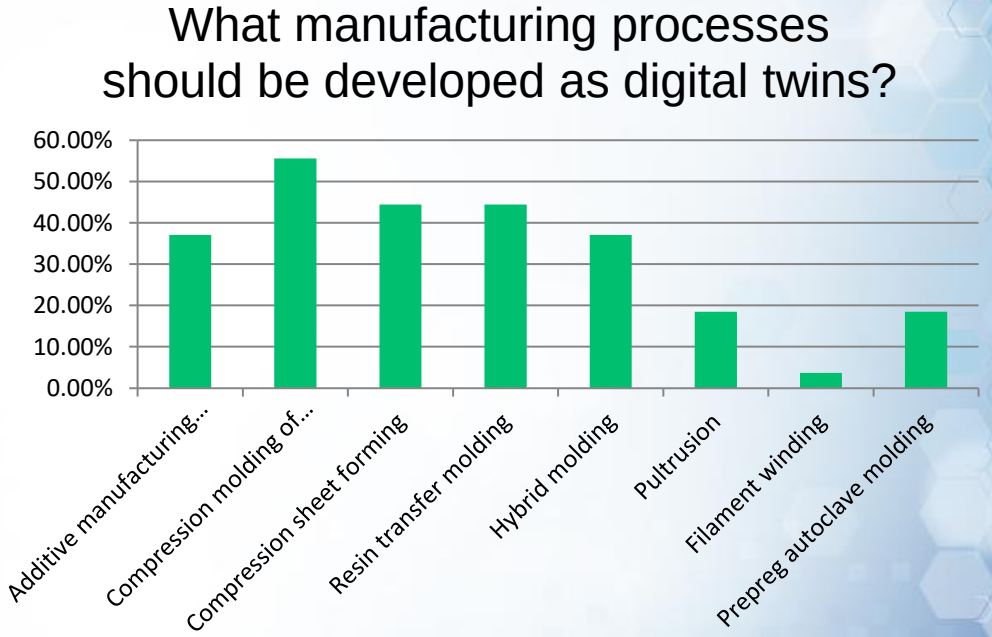


First Meeting (10/8/2020)

- Attendance: 83
- Discussion topics
  - What is model based engineering? – Don Farr, Boeing
  - What is the digital twin?- R. Byron Pipes, Purdue
  - What is integrated computational materials engineering? – Josh Dustin, Boeing

First Meeting (10/8/2020)





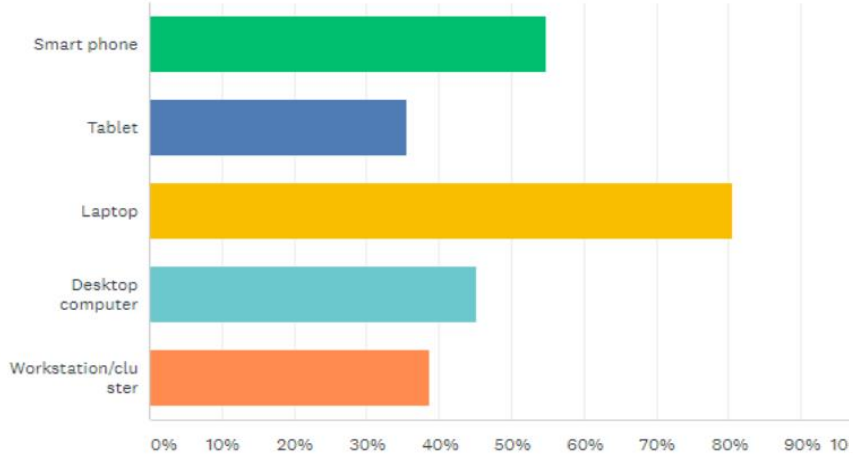
Second Meeting (2/16/2021)

- **Attendance: 84**
- **Discussion topics**
  - **Introduction to cdmHUB as an online platform for composites modeling and simulation – Wenbin Yu, Purdue University**
  - **Demonstration of cdmHUB tools for modeling composites – Xin Liu, UT Arlington**

Second Meeting (2/16/2021)

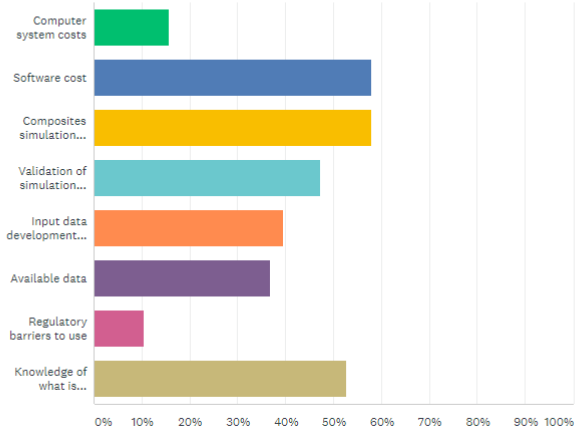
What computing capacity do you have?

Answered: 31 Skipped: 0



What are the barriers to your use of composites simulation? (select all that apply)

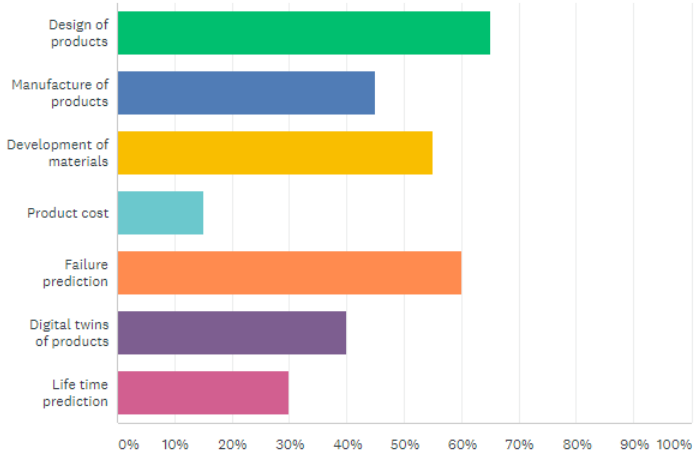
Answered: 38 Skipped: 0



Second Meeting (2/16/2021)

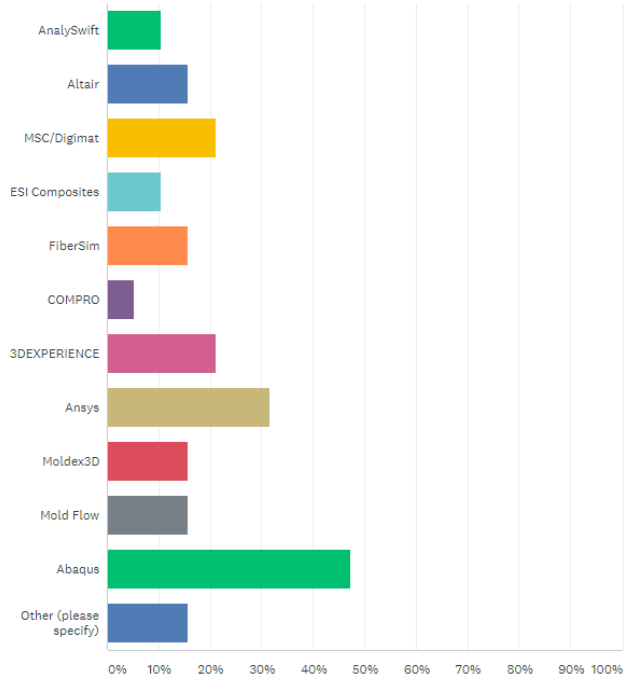
What do you use simulation for? (select all that apply)

Answered: 20 Skipped: 0



What computer codes do you use now? (select all that apply)

Answered: 19 Skipped: 0



Third Meeting (5/18/2021)

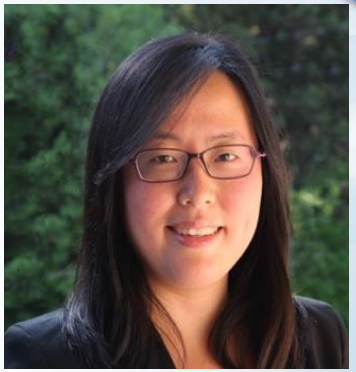
- **Attendance: 45**
- **Discussion topics**
  - Importance of simulation for design, manufacturing, and performance prediction of composite products. Most considered simulation indispensable for composites engineering.
  - Most attendees want to know more about **simulation capabilities through tech talks from software vendors**.

Third Meeting (5/18/2021)

- Heating Up: Leveraging Integrated Computational Materials Engineering (ICME) in the multi-scale performance modeling of ceramic composite materials
  – **Robert Cook, Hexagon Design and Engineering (MSC Software/Digimat)**

Fourth Meeting (8/10/2021)

- **Discussion topics**
  - **Integrated Multi-Physics and Multiscale Composite Manufacturing Simulations for Predicting Dimension and Performance Variations – Dianyun Zhang, Purdue**



  - **Integrated Tools for Process Simulation in the Composites Manufacturing Digital Thread – Alireza Forghani, Convergent Manufacturing Technologies, Inc.**

Fifth Meeting (10/5/2021)

➢ Discussion topics

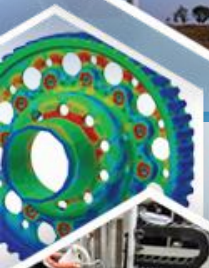
- Finding Success with Composites Manufacturing in the Digital Era Through Simulation – **Arnaud Dereims, ESI**

- An Integrated Approach for Simulation of the RTM Process – **Anand Bora, Moldex3D**

Joining the Simulation/Digital Twin WG

- If you would like to join the Simulation/Digital Twin WG, send an e-mail to:

  - Kim Hoodin khoodin@iacmi.org
  - Wenbin Yu wenbinyu@purdue.edu



You are welcome to join us!!