President’s Council

April 4, 2014
Partnership Update

Janis Terpenny
Joseph Walkup Professor and Chair
Industrial and Manufacturing Systems Engineering
Director, Center for e-Design
Outline

- What is the Digital Lab for Manufacturing?
- Iowa State Partnership
- Center for e-Design
- DMDI Status Update
What is the Digital Lab for Manufacturing?

A consortium to transform American manufacturing

Create an Innovative Ecosystem
Increase the innovative capacity of OEMs and their suppliers through digital integration and strategic collaboration.

Commercialize Research
Move ideas from TRL 4-7 through a network of physical and virtual demonstration sites.

Strengthen the U.S. Economy

- $100B in value to OEMs per year
- $30B in value potential to DoD per year
- 75,000 jobs created in the first 5 years

Source: McKinsey Global Institute and team analysis
Digital Manufacturing & Design Innovation

• One of President Obama’s NNMI’s (National Network of Manufacturing Institutes)
• DOD Funding $70 million
• Partner Funding $250 million
A partnership of world-class companies including:

- Dow
- GE
- Siemens
- PARC
- Lockheed Martin
- CAT
- ITW
- Rolls Royce
- P&G
- John Deere
- Boeing

Top engineering schools and the world’s most powerful computer including:

- University of Illinois
- University of Notre Dame
- Northwestern University
- University of Texas at Austin
- University of Cincinnati
- University of Missouri S&T
- Iowa State University
- Illinois Institute of Technology
- Purdue University
- NCSA
- University of Wisconsin Madison
Proven pipelines of talent from a consortium of state, educational, and vocational institutions
WHAT IS DIGITAL LAB?

THE DIGITAL LAB OFFERS:

A state of the art advanced manufacturing collaboration center.

A facilitated group of industry, university, and government collaborators who will determine the direction of the research.

Access to the leading thinkers in the advanced digital manufacturing space.

A shared resources pool that allows for higher risk & higher reward research.

An opportunity to be the 'central nervous system' for the Government funded NNMI and all the institutes that will follow.
### What is Digital Lab?

**The Digital Lab Guiding Approach**

#### Three Technology Focus Areas

<table>
<thead>
<tr>
<th>Area</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advanced Manufacturing Enterprise (AME)</strong></td>
<td>Agile and robust manufacturing strategies and integrated capabilities that dramatically reduce the cost and time of producing complex systems and parts.</td>
</tr>
<tr>
<td><strong>Intelligent Machining (IM)</strong></td>
<td>Integration of smart sensors and controls to enable equipment to automatically sense and understand current production environment in order to conduct “self-aware manufacturing”.</td>
</tr>
<tr>
<td><strong>Advanced Analysis (AA)</strong></td>
<td>Utilization of high performance computing to model materials, products and processes to enable “design with manufacturing in mind”.</td>
</tr>
</tbody>
</table>

### Open Source Platform

<table>
<thead>
<tr>
<th>Platform</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Digital Commons</strong></td>
<td>An open source technology system across the entire manufacturing value chain.</td>
</tr>
</tbody>
</table>

### Hub & Spoke Model

<table>
<thead>
<tr>
<th>Network</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>National Network</strong></td>
<td>A 'hub and spoke' model, where the 'hub' will be the Digital Lab for Manufacturing based in Chicago and the 'spokes' will be all the applied research on the manufacturing floors of our partners across the US.</td>
</tr>
</tbody>
</table>
Goals and Approach

- Using digital technologies to integrate design and “making” processes
  - align manufacturing companies, software companies and manufacturing service providers

- Outcomes
  - reduce time and cost of manufacturing
  - strengthen capabilities of US supply chain
  - reduce acquisition costs for DoD

- Expect to
  - develop and demonstrate digital manufacturing technologies
  - deploy and commercialize these technologies across key manufacturing industries
WHAT IS DIGITAL LAB?

THE DIGITAL LAB’S FIRST YEAR PROJECTS

DIGITAL DESIGN
- Next-gen product design analytics and platform
- Crowd source design
- CAD-CAM interoperability

DIGITAL FACTORY
- Advanced analytics and real-time shop floor feedback
- Mobile predictive maintenance
- Digitized Factory optimization

DIGITAL ECOSYSTEM
- Intelligent machine ‘plug & play’ solution
- Legacy parts remanufacturing
- Supply chain optimization
- Small, Medium Enterprise (SME) portal

THE DIGITAL LAB’S INITIAL THREE PROJECTS
Potential Research Partnering from ISU

- Center for e-Design
- Virtual Reality Applications Center (VRAC)
- Center for Nondestructive Evaluation (CNDE)
- Industrial and Manufacturing Systems Engineering
- Mechanical Engineering
- Computer Science
- Statistics
- High performance computing (HPC)
- Aerospace Engineering
- etc!
Iowa State is a Tier I Partner

- Pledge of $10M cost share
  - Associated with projects funded
  - Actual amount depends on projects selected
  - Breakdown: $0 cash, $9M cash equivalent (research costs, startup for new faculty and Battelle Chair, education and outreach), $1M in-kind (infrastructure)
- Representation on Executive Board
- Access to Digital Manufacturing Commons/Marketplace
Primary Objectives

1. Enable the design and realization of high quality products and systems at reduced cost and reduced time to market through research and development of methods and tools for:
   - Improved design process and methods
   - Knowledge/information engineering
   - Integration environments
   - Collaboration and decision making

2. To nurture and cultivate a new breed of engineers, scientists, and business leaders through a synergistic university/industry collaborative model
Impact of Design Decisions

Priority: utilize/develop methods/tools that shift knowledge and information availability for decision making earlier when changeability is highest

-- COST, PERFORMANCE, and QUALITY GET LOCKED IN EARLY --
A Growing Public-Private Partnership

Founded in 2003 as NSF Industry/University Cooperative Research Center

Thrusts Areas
- New Design Paradigms and Processes
- Design Optimization
- Visualizing and Virtual Prototyping
- Design Education
- Enabling Information Infrastructure

Application Domains
Complex Products and Systems:
- Aerospace
- Automotive
- Nautical
- Medical Devices

- Agriculture
- Consumer Products
- Controls
- Software
Iowa State Site

- New Center ‘home’ in Howe Hall
- Ph.D. in Integrated Design and Innovation
- 9 industry/govt agency members
- 7 current projects
think BIG

ducation
xperience
xtended life
abled design

http://www.centerforedesign.org/
National Engagement and News

- Leading special session at Industrial and Systems Engineering Research Conference (ISERC)
- Leading DMDI Panel at International ASME IDETC Conference (GE, Boeing, Parc, NIST, Purdue, Iowa State, Digital Lab)
- DMDI feature story in IE Magazine with Iowa State emphasis, to appear May 2014
- U.S. Airforce interest in 1:1 match with industry on e-Design projects
ISU a Recognized National Resource and Key Partner

• Digital Lab requesting membership in Center for e-Design
• Digital Lab executive director spoke at Center industry advisory board (IAB) meeting (April 2)
• Digital Lab executive director joins industry advisory council (IAC) for IMSE department at ISU (April 17-18)
• Serving as national technical lead of Advanced Manufacturing Enterprise (AME) area
Latest Weekly Update

• Hold off on launching any projects for now
• Proceed with getting membership agreements in place
• Standing up a formal Executive Board, Technical Advisory Committee, and Strategic Advisory Committee
• Weekly meetings with architect to discuss basic planning details for the lab
• Evaluating a few potential key hires for onboarding to UI LABS.
“Thank you so much to ISU and the Center for e-Design, we could not have done this without you!”