

# Industry Readiness for Digital Manufacturing May Not Be As We Thought

Preliminary Findings of MxD\* Project 17-01-01

\*(formerly known as the Digital Manufacturing and Design Innovation Institute – DMDII)

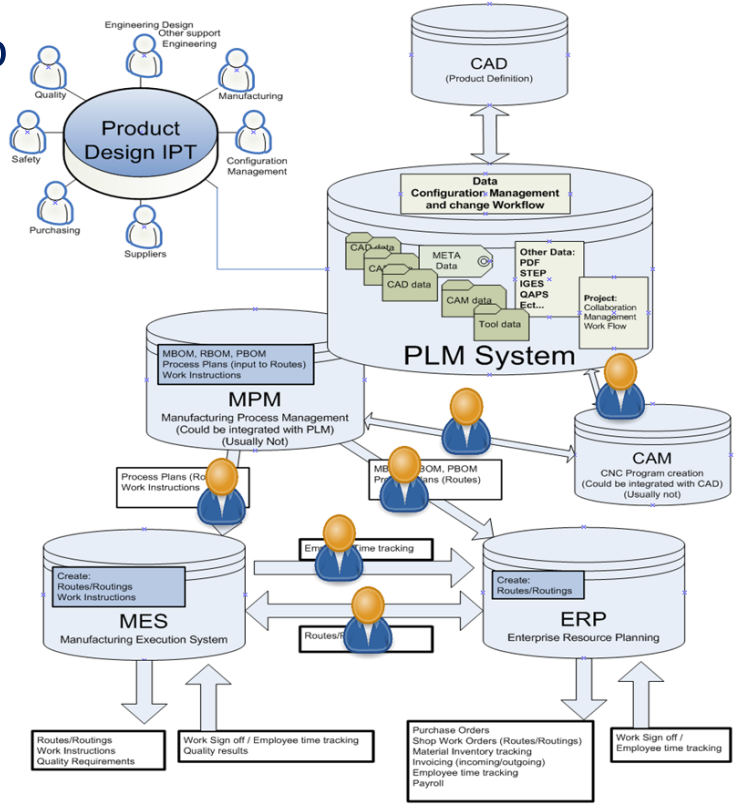


- Significant communications inefficiencies continue to increase costs and time while stymying innovation.
- Many contract manufacturers continue to translate or recreate CAD files without validation or notifying their customer.
- Most collaborative exchanges around technical data are executed via unstructured communications and do not easily allow for capture, analysis and re-use.



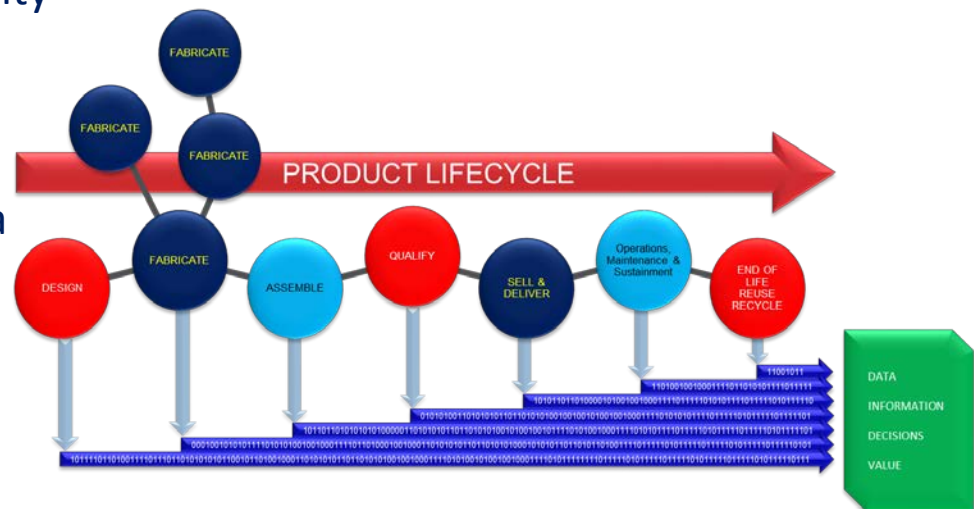
# Assumptions

- There is still a significant manual intervention in the supply chain to adapt to a Model Based Enterprise environment.
- The benefits of reduced cost and time along with innovation would result in a better positioning of the U.S. industrial base to compete in the global market.
- Employ existing tools and technologies to create a roadmap and set of playbooks for OEMs and SMMs to guide the implementation of secure digitally-enabled supply chain practices and technologies.



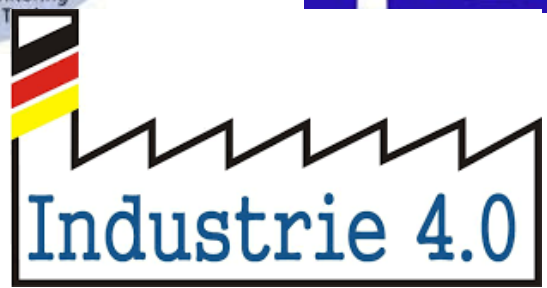
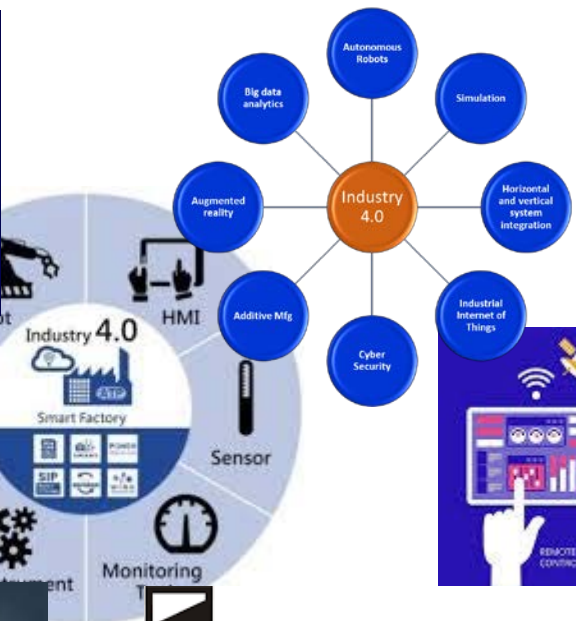
- Primary research
  - Gathered input from team members
  - Conducted industry interviews
    - Fourteen commercial and defense manufacturers
    - Range of sizes, geographies and type of products produced
    - All were low-volume, high-mix
- Secondary research
  - Academic literature review
  - Review of recent DoD-sponsored manufacturer surveys
  - Investigation of applicable and developing standards
- Focus on three elements fundamental to digital manufacturing
  - Interactions
  - Inefficiencies
  - Adoption motivators and barriers

- Industry interviews revealed a significant gap in the believed readiness or capability of suppliers to adopt digital manufacturing processes and participate fully in a digitally enabled supply chain.
- ✓ Little understanding of what is “Digital Manufacturing”
- ✓ Most interviewees translate or recreate CAD files, even STEP, without validation or notifying the customer
- ✓ 91% use email to exchange tech data, 23% still use fax, with both methods leading to loss of data fidelity
- ✓ Very little design collaboration
- ✓ Limited exchange of production data



# 14.0/Smart Mfg./Smart Factory

- Digitally enabled manufacturing is discussed using many terms that all mean something specific, but are quite often used interchangeably by manufacturers, government and academics.



- Report on Korean and U.S. industries found “... that, for all manufacturing digitalization’s promise, U.S. manufacturers – especially small- to medium-sized enterprises (SMEs) ... have been particularly slow to adopt digital manufacturing practices, with most companies remaining just at the initial stages of smart manufacturing technology adoption”
- Wuest et al. found that “Overall, there is little awareness of Smart Manufacturing and related topics among manufacturing SMEs in WV”
- A DoD study in 2016 provided insight into a number of issues with organizations, albeit government, adopting digital manufacturing/model-based enterprise (MBE) capabilities.
- Mittal, et al., found similar issues with European manufacturers with adoption of Industry 4.0 digital capabilities.



- Multiple studies indicate a serious gap between the OEMs (early adopters) and their SME supply chain partners (laggards).
- The technical issues of connecting the digital thread have overshadowed the business and cultural issues.
- The MBE community has mainly consisted of researchers, solution providers and OEMs thus far, but very few lower-tier suppliers.
- Lower-tiered suppliers in the supply chains that do not have the resources and funds to participate in the development of the technology.
- SMEs need greater awareness of what digital manufacturing is and the business cases to help them justify the cost and effort.
- Lack of adoption by SMEs impacts the entire U.S. industrial base.

- Define the “As-is” state
  - Quantify the current state of DM adoption in the U.S.
  - Identify differences between high-volume/low-mix and low-volume/high-mix production.
  - Compare adoption of DM between U.S., Europe and Asia
- Define the “To-be” state
  - Determine what industry-wide adoption of DM looks like.
    - Identify the target audience (All 255,000 U.S. manufacturers?)
    - Define the different levels of adoption and their characteristics
  - Identify the key metrics for the different adoption levels.
- Develop a road map
  - Identify existing resources that drive DM adoption by the target audience.
  - Determine any resource gaps that may exist.
  - Define resources needed to move us from the “as-is” to the “to-be” state.
  - Develop a plan for road map implementation.

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- [3] Hedberg, Jr., T.D., 2018, "Enabling Connections in the Product Lifecycle using the Digital Thread," Ph.D. Dissertation, Industrial & Systems Engineering Dept., Virginia Polytechnic Institute and State University, Blacksburg, VA.
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# Questions?

Thank You!

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“This work was funded by MxD with support in part by the U.S. Department of the Army. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the Department of the Army.”