

A Framework for a Regional Modeling, Simulation and Analysis Midwest Pilot Program for the Manufacturing Supply Chain

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Council on Competitiveness Summit & Workshop
The University of Chicago Booth School of Business
Gleacher Center
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Introduction and Background

The Council on Competitiveness and selected original equipment manufacturers (OEMs) are developing a Midwestern regional pilot program as a public-private partnership with the U.S. federal government. The pilot program is aimed at improving competitiveness and innovation in small- and medium-size enterprises (SMEs) in the U.S. manufacturing supply chain. The ultimate outcome of the pilot program will be a workforce with enhanced technical skills, improved product quality, better customization of products, and job retention and growth.

On August 31, 2010, a Summit & Workshop was held at the Gleacher Center in Chicago that brought together representatives from a broad cross-section of industry, academia and the federal government to brainstorm ideas and to agree upon the necessary and desired components for such a pilot program. This document captures the decisions made at that meeting, and provides guidelines for implementing the pilot program.

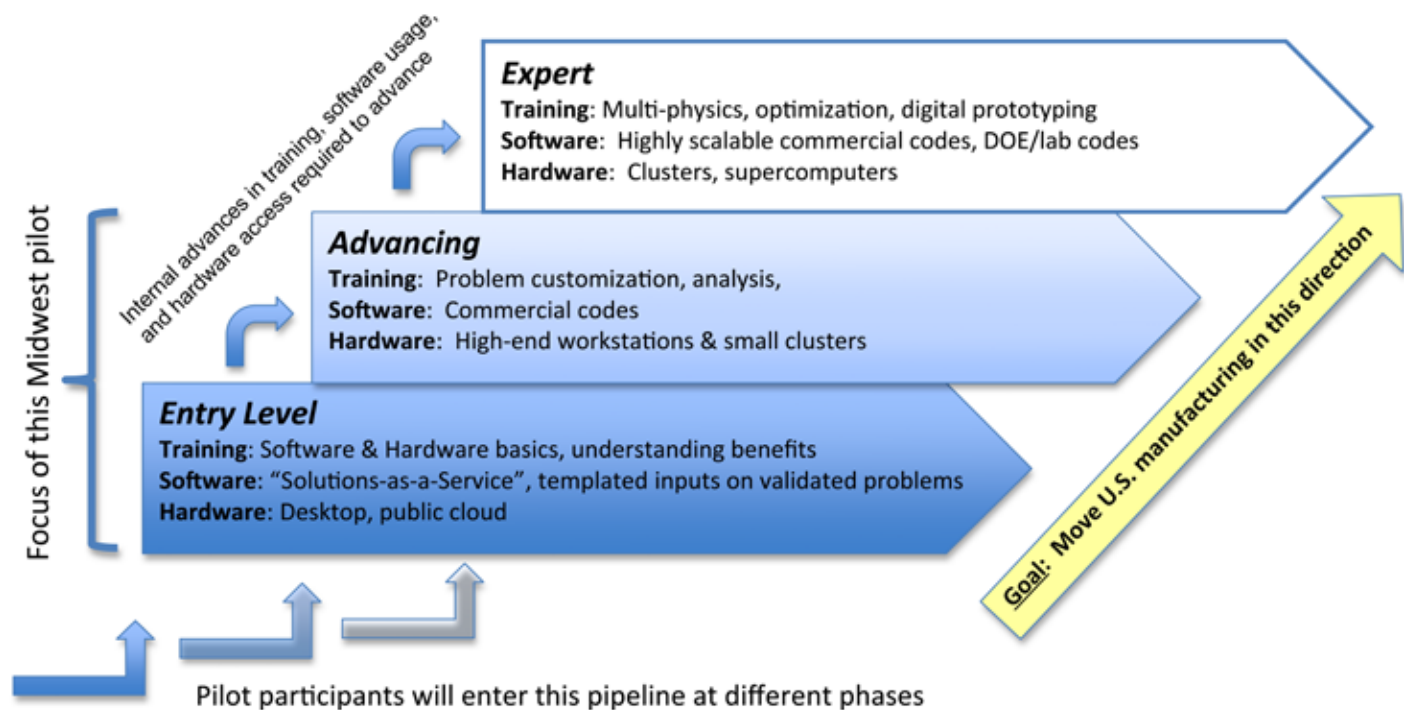
The high level goal of this pilot program is to develop and demonstrate a sustainable, scalable and replicable model for accelerating and broadening use of modeling, simulation and analysis (MS&A) in Midwestern SMEs through a public-private partnership (described below). Funding will be provided as seed money for this pilot program, with the expectation that it will demonstrate a path toward long-term sustainability. This is only achievable if (a) the supply chain members can rapidly reach a point where the results produce cost-benefits that allow and incentivize them to continue use of MS&A, either independently or within the continued context of the pilot program, and (b) software vendors can develop a business model that provides easier and more affordable access to software tools for SMEs.

The longer term goals of this pilot program are to put U.S. manufacturing on a path toward using MS&A for digital prototyping of new and existing products and for process manufacturing. The commensurate benefits that these goals provide are outlined in the white paper developed by the Council on Competitiveness for the Chicago meeting. Also, we expect this pilot program to be a demonstration of effective coordination that will be used in the startup of other regional centers.

Figure 1 captures one dimension of the current landscape of MS&A in U.S. manufacturing. The key points are that U.S. manufacturers are at different levels in their adoption of MS&A in their processes, and that a natural progression of adoption and expertise exists to either adopt or advance usage to the next level. The focus of this pilot program is on the first two levels:

- Entry level—supply chain manufacturers who currently have no capabilities in MS&A, but recognize the benefits as a way to increase their competitive advantage.
- Advancing—supply chain manufacturers who currently have some initial capability, but want to become more advanced in their use of MS&A to promote innovation and ensure their long-term competitive advantage.

Figure 1. Stages of MS&A Adoption



Public-Private Partnership for the Pilot Program

A public-private partnership will be formed to create the pilot program. This partnership will include the U.S. government and selected OEMs willing to collaborate with their Midwest manufacturing supply chain members in a MS&A pilot program. The federal government will provide funding support and in-kind contributions—such as computational assets, expertise, professional education, etc.—as their contribution to the pilot program. The selected OEMs will provide in-kind contribution—such as expertise, coaching, etc. The federal government and the selected OEMs will be designated as shareholders.

The selected OEMs will identify and recruit members of their supply chain (Midwest locations) to participate in the pilot program. Some SMEs not affiliated with the OEMs may be considered for participation. The next step is to determine the operation and required funding needed for the pilot program (management, professional education, software/hardware required, delivery mechanism, etc.) that will advance SMEs use of modeling and simulation and that best support the pilot program goals.

Goals of this Proposed Pilot Program

The stated goals of this pilot program include the following:

- Introduction of MS&A into SMEs that currently have no capabilities, or have been unsuccessful introducing it into their processes in the past.
- Advancement of MS&A beyond the entry level in SMEs who currently have existing capabilities.
- Demonstrate competitive value and cost-benefits of MS&A for typical supply chain manufacturers.
- Explore new business models based on web-based software access through cloud computing.
- Promote sustainable bi-directional knowledge transfer between OEMs and their supply chain partners (OEMs providing guidance on advanced usage, SMEs providing expertise in their specific fields).

Essential Components of the Pilot Program

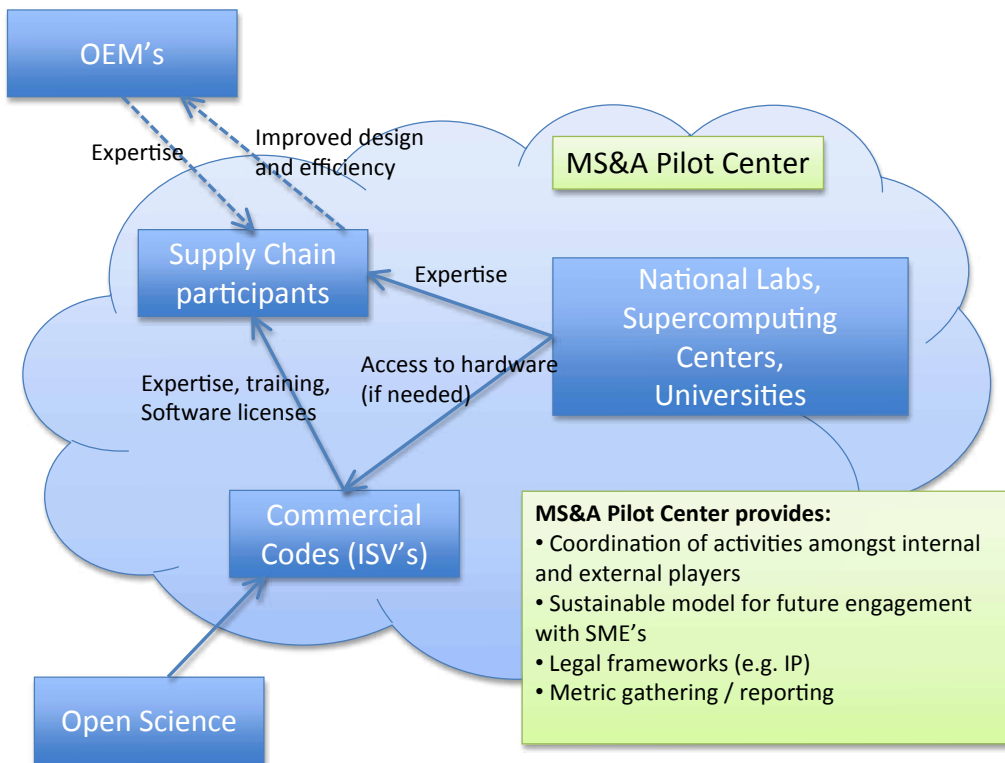
A successful realization of this pilot program will supply the SMEs with access to all of the necessary conditions for maximum success. This includes the following minimum set of core components:

Expertise, consulting and training: A successful pilot program will provide the SMEs with not only guidance on the benefits of MS&A, but access to expertise in the respective fields (e.g. finite element modeling, fluid dynamics, process modeling, etc.). Likewise, training geared toward the SMEs should be provided—both in the use of commercial modeling software and in the demonstration of its application through specific case studies—so that SMEs can appreciate the value proposition. This has been noted as the most important driver of success, with a strong partnership between OEMs, SMEs, independent software vendors (ISVs), national labs, universities, manufacturing consortiums, etc., driving knowledge transfer and collaboration.

Commercial software packages: ISVs should develop innovative licensing agreements that help lower the barriers to entry, greatly expanding market penetration—for example, pay-as-you-go services that promote the ability for SMEs to introduce MS&A at a lower initial cost.

Platforms: One of the key elements of this pilot program is to demonstrate software-as-a-service (SaaS) type web-based tools that are easy to access and use, including on-line education and training resources. Finally, it is understood that this pilot program, as well as any subsequent pilot programs, will have a regional focus that allows frequent interaction among participants, and exploits regional commonalities among supply chain industries and regional assets (academic, national labs, high performance computing (HPC) centers, etc). Figure 2 represents an example of how the pilot program might be realized.

Figure 2. Example Template for MS&A Pilot Center



Attributes of the Pilot Center

In addition to the explicitly stated goals defined above, a successful pilot program should take into account the following desired attributes and outcomes:

Sustainability: While this pilot program program will provide seed money to assist in the startup efforts of building a regional center, it will only be deemed successful if it can become self-sustaining.

Scalability: The scope of this pilot program will be limited to a relatively small number of OEMs and SMEs. However, the methods proposed and developed must be transferable to other SMEs at all levels of expertise, and replication of the pilot program to other regions in the United States is a required attribute.

Metrics for success: The successful pilot program will define measurable metrics upon which the success and sustainability of this and future pilot models can be defined/measured.

Intellectual property and security: Processes must be put in place to ensure that the partnerships can succeed without compromising proprietary data, products or methods of participants. This includes legal protection of intellectual property (IP), as well as a computing and networking infrastructure that is impervious to malicious attack.

Collaborative projects: The identification of high-value challenges of maximum benefit to both the OEMs and SMEs should be identified (e.g. design of mix tanks, injection molds, stress analysis, etc.). In addition, process flow modeling (e.g. discrete, continuous and batch simulations) should be considered.

Domain portals and SaaS: Development of domain specific interfaces aimed at solving a specific class of problems should be considered. This is deemed especially important in gaining adoption of MS&A in entry level organizations.

Validation: Providing SMEs with validated models and the expertise to analyze results is critical to helping them move to a complete digital prototyping infrastructure, where the results can replace traditional prototyping methods and expensive experimentation.

Pay-as-you-go models: SMEs typically do not have R&D budgets that allow them the ability to pay for commercial licenses during the time when cost-benefits are still under analysis. Providing software that allows them to pay for only the time they are running models (versus up-front license tokens) is a possible solution. Other innovative solutions are desirable as well, perhaps developed by the ISVs.

Next Steps

It is anticipated that the U.S. government will need an integrated proposal that will include:

- An overview of the pilot program, with specific explanations of how each of the essential and desired components above is addressed. In addition, an overview of the management and organization for the pilot program and descriptions of the anticipated relationships between internal and external entities. (2–4 pages)
- Optionally, additional features not discussed in this framework description that can further promote the end goals of the pilot program. (0–1 page)
- Cost of the development and running of the pilot program for a 24 month period. (0.5–1 page)
- Explanation of long term sustainability at the end of the proposal period. (0.5–1 page)
- Brief descriptions of the partners involved. (1 paragraph each)