

UI LABS Update
Report to the Board of Trustees
September 2016

In December 2013, the Board of Trustees approved a \$5 million grant to UI LABS to support the creation of the Illinois Manufacturing Lab (IML). IML was to be seeded with \$10 million, which included a \$5 million grant from the State through the Illinois Department of Commerce and Economic Opportunity and another \$5 million match from other sources. IML was proposed as the first lab within UL LABS, and was intended to accommodate the translation of applied research and development, modeling and simulation, and advanced manufacturing capabilities into new products and processes. The Board Item authorizing the grant specified that the “terms of the final grant will be reported to the Board.” This constitutes that report.

Background

IML is a partnership between UI LABS and the University of Illinois that provides advanced manufacturing solutions to small- and medium-sized Illinois manufacturers. Originally envisioned to be a physical lab and rapid prototyping facility, IML evolved into a series of research projects that are part of the Digital Manufacturing and Design Innovation Institute (DMDII), a *federally-funded* research development organization within UI LABS. However, IML’s goal of increasing the competitiveness of Illinois manufacturers has remained unchanged. The following chronology highlights the key dates and milestones of that evolution.

Key Dates & Milestones

- | | |
|----------------------|--|
| February 2013 | Governor Pat Quinn announces a \$10 million initiative in partnership with the University of Illinois to build the IML. |
| March 2013 | UI LABS is incorporated as an Illinois not-for-profit corporation. University of Illinois reaches a verbal agreement with the Illinois Department of Commerce and Economic Opportunity (DCEO) that IML will be a program within UI LABS. DCEO awards \$5 million to UI LABS to support the IML with the understanding that the University would provide \$5 million in matching funds. |
| May 2013 | Obama Administration announces the launch of competitions to create three new manufacturing innovation institutes as part of the National Network for Manufacturing Innovation (NNMI) with a federal commitment of \$200 million across multiple agencies. UI LABS leads efforts to establish a consortium of academic institutions, industry partners, and supporting companies and community organizations to submit a proposal to secure the DMDII, one of the three institutes. |
| October 2013 | Given the aligned missions of the DMDII and IML to develop new manufacturing technologies to support Illinois manufacturers, the University, DCEO, and UI LABS’ leadership decide to include the IML commitment of \$10 million as part of the federal match requirement for the DMDII proposal. DCEO provides a commitment letter (Exhibit 1) to UI LABS expressing that the \$10 million “partnership” (referring to the dollars provided by DCEO and the University) be used “in support of the DMDII scope of work and objectives.” |
| December 2013 | University of Illinois Board of Trustees authorizes the \$5 million grant to UI LABS to promote research and development activities related to advanced manufacturing through the creation of the IML. Governor Quinn publicly |

launches the IML at a press conference that includes President Easter and former U of I Board Chairman, Chris Kennedy.

February 2014

UI LABS is awarded \$70 million grant from the Department of Defense to create the DMDII, which is backed by another \$250 million in private support.

April 2014

IML pilot projects announced by Governor Quinn in October 2013 are “re-scoped” after the Department of Defense informs UI LABS that the \$10 million IML commitment could only be counted towards the DMDII cost share if the pilot projects were consistent with the scope of DMDII.

September 2014

George Barnych (Director of Technology Integration, DMDII) is brought in to assist with finalizing the pilot project scopes and developing a timeline and framework for executing the new project plans.

July 2015

Initial round of IML/DMDII pilot projects are completed.

March 2016

Second round of IML/DMDII pilot projects are launched. Case studies highlighting the impact of the pilot projects are published (**Exhibit 2**).

Advancing Economic Development

The selection of the UI LABS proposal for the DMDII was a major achievement for the state of Illinois and set the stage for strengthening and amplifying the IML mission. The IML/DMDII has leveraged its initial investment by not only completing an initial phase of pilot projects, but also building a strong foundation for the successful DMDII proposal and integrating with DMDII to tap into a nationwide network and a five-year federal funding stream.

Throughout the first year of the grant, the IML/DMDII established its role as a trusted third party to Illinois’ small- and medium-sized manufacturers for connections to cutting-edge advanced manufacturing technologies, techniques, expertise, and services. The opening of the DMDII facility in May 2015 provided these manufacturers the opportunity to participate in research projects to solve shop floor problems and see the latest digital manufacturing technology and equipment demonstrated in real time.

Pilot Projects

IML/DMDII brought together research capabilities, technical resources, and commercialization expertise in an initial round of pilot projects at ten Illinois companies that concluded in June 2015. Case studies for the projects demonstrate tremendous gains in productivity and cost savings (**Exhibit 2**).

A second round of pilot projects launched recently will build upon the success of the first round of projects and continue to drive developments in advanced manufacturing in Illinois. Research will be conducted by University experts and third-party engineering service providers to assist small manufacturers to solve challenging problems that are having a direct effect on their competitiveness. The objective of the research efforts is to facilitate the development of new online capabilities that will be incorporated into the DMDII’s Digital Manufacturing Commons, an open source software tool that will enable increased efficiency during the product development process and support an online community of users. In an effort to strengthen the University’s involvement in the projects, UIC Physics Professor George Crabtree and Illinois Applied Research (ARI) Director Jeff Binder will be providing logistical and strategic support to the initiative.

Conclusion

While the IML has evolved since its inception in 2013, its mission of increasing the competitiveness of the Illinois manufacturing sector has remained unchanged. The \$5 million grant awarded to UI LABS by the University to support the IML was a critical factor in the success of the DMDII proposal. DMDII and IML continue to support the University's research, economic development, and land grant missions.

Report submitted to the Board of Trustees by Michael Bass, Senior Associate Vice President and Deputy Comptroller.

Date: September 8, 2016

Exhibit 1



Illinois
Department of Commerce
& Economic Opportunity
Pat Quinn, Governor

October 3, 2013

Lawrence B. Schook, Ph.D.
Chair, UI LABS Scientific and Technology Advisory Board
2201 W. Campbell Park Dr.
Chicago, IL 60612

SUBJECT: Illinois Department of Commerce & Economic Opportunity (DCEO) Cost Share Commitment Letter for the Digital Manufacturing and Design Innovation Institute (BAA-13-01DMDI)

Dear Dr. Schook:

DCEO is pleased to be a member of the UI LABS team proposing the creation and implementation of the Digital Lab for Manufacturing (Digital Lab) in response to the subject solicitation for the "Digital Manufacturing and Design Innovation (DMDI) Institute". This program plays an important role in transforming the marketplace by leveraging and focusing digital manufacturing technologies to create an approach that aligns the incentives of manufacturing companies, software companies, and manufacturing service providers.

Illinois has long been a leader in manufacturing with the sector accounting for 10% of all jobs in the state. In 2011, manufacturing was 12.9% of the Illinois economy. The state also has inherent strengths in high performance computing and the associated information technology infrastructure. The state is committed to leveraging these resources to support manufacturing, and manufacturers, as they look to remain competitive through the next industrial revolution in digital manufacturing and design. The Illinois Manufacturing Laboratory (IML) is a \$10 million partnership between the State and UI Labs to accelerate the adoption and use of leading-edge technologies to improve the competitiveness of manufacturers.

Co-located with the Digital Lab, the IML will serve as the SME and workforce-facing component of the Institute, being made available for demonstration, training and shared equipment access. DCEO commits \$5 million in cash for initial build out of the IML and up to an additional \$7.5 million in cash as required for equipment and facilities modification to 1) support

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supplementary services at IML in later years, or 2) to SMEs and network partners to fully realize the training they receive, as determined necessary.

As the Director of DCEO, I have the authority to make cost share commitments in support of this effort. Specifically, DCEO hereby commits a total of \$16 million in cost share, of which \$13.5 million is cash cost share, \$0 is cash equivalent, and \$2.5 million is in-kind cost share, to be provided over the program’s 5-year period. Specific cost share items include the following and are all sourced by DCEO:

| Item | Type | FY14 | FY15 | FY16 | FY17 | FY18 | Alternate Source? |
|--|---------|----------------------|----------------------|----------------------|----------------------|----------------------|-------------------|
| Cash for Illinois Manufacturing Lab equipment/build out | Cash | \$5 million | \$ -- | \$ -- | \$ -- | \$ -- | N/A |
| Cash for Additional IML equipment and/or SME equipment (as needed) | Cash | \$ -- | \$1.5 million | \$1.5 million | \$2 million | \$2.5 million | N/A |
| Digital manufacturing workforce training | In Kind | \$500,000 | \$500,000 | \$500,000 | \$500,000 | \$500,000 | N/A |
| Sponsorship of SMEs to Institute | Cash | \$200,000 | \$200,000 | \$200,000 | \$200,000 | \$200,000 | N/A |
| TOTAL CASH | | \$5.2 million | \$1.7 million | \$1.7 million | \$2.2 million | \$2.7 million | |
| TOTAL CASH EQUIVALENT | | \$0 | \$0 | \$0 | \$0 | \$0 | |
| TOTAL IN-KIND | | \$500,000 | \$500,000 | \$500,000 | \$500,000 | \$500,000 | |

The items listed above are available to the project and restricted by DCEO for use by the Digital Lab and IML in support of the DMDI scope of work and objectives. A portion of the cost share commitment may be incurred prior to contract award as upfront costs for physical buildout of the co-located IML and Digital Lab facility. If any such costs are incurred, we respectfully request they be authorized as allowable pre-award costs that will in turn be recognized by the Digital Lab as realized cost share. This request is made in the spirit of more rapidly establishing the facility’s physical presence, which we believe is beneficial to the Government.

We look forward to working with UI LABS through the Digital Lab for Manufacturing and with the Department of Defense as we transform U.S. manufacturing and increase the long-term competitiveness of American companies.

Sincerely,



Adam Pollet
Director

Exhibit 2



Location

Batavia, IL

Problem

Tek Pak machines thermoform molds and wished to improve their machining process. The sample machining operation provided was an Aluminum mold that had taken approximately 125 hours to machine.

Solution

For this project, we first collected information about the machine, holder, cutting tool, and cutting fluid that was currently being used. Using new technologies from participating partners, we determined the optimal feed, speeds, depth and width of cut for the mold operation. It was found that new MasterCAM “Dynamic Milling” technology, MLI “MetalMax” software, and a better coolant from Tower Oil contributed to a decrease in machining time. Most notable was the drastic decrease in roughing time.

Estimated Project Impact

15% reduction in machine cycle time; 15% reduction in polishing time.

Actual Project Impact

Sample Mold Machining Operation – ~60% reduction in roughing machining cycle time; ~10% reduction in finishing time.

Subsequent Mold Machining Operations – ~50% reduction in roughing machining cycle time.

Return on Investment

One time investment: \$9,500

Gain: \$72,000/year

ROI: 658%

Company Outcome

Tek Pak increased profitability due to decreased cycle time and increased demand due to faster mold delivery. Rich Novicki remarked, “Learning the vibration frequency of the tools (MetalMax Software) was very impressive. By knowing the stable speeds, we can now run the tools about 50% faster without a decrease in tool life. That saves us about 20 hours of machine time each week.” After seeing the financial impact of the pilot project, Tek Pak would like to implement the technology on three additional machines. Greg Perkolup added, “If we can save an additional \$100k with a \$12k investment in software and training, that would really impact our business.”

Project Partners





Case Study #2: Atlas Tool and Die Works, Inc.

Location

Lyons, IL

Problem

Atlas Tool Works maintains a careful balance between quality and cost containment by continually investing in new technologies to increase productivity. While experiencing double-digit revenue growth in recent years, they have run into capacity issues. In order to meet their stringent on-time delivery rating, they needed to decrease the machining cycle times on a complex supply program where delivery was critical to their customer.

Solution

We followed a simple process to significantly decrease the machining cycle time for producing two different aluminum parts in the program. Due to the heavy work load of Atlas Tool employees, we tried to minimize their time commitment for changing this process; we were able to achieve project results with less than two days of internal resources. After collecting and analyzing current machining programs and specifications, we implemented a new profit milling tool path strategy from Esprit technology. Using MLI MetalMAX software and hardware, we determined the most stable speeds to use for the current cutting holders and tools. After consulting with Benchmark Carbide and Ingersoll Cutting Tools, we were able to achieve optimal metal removal rates.

Estimated Project Impact

15% reduction in machine cycle time.

Actual Project Impact

Aluminum Part #1 – Approximately 30% decrease in machining cycle time. This represented a cost savings of more than \$8,000 over the duration of the program and was one key reason Atlas Tool was able to ship parts well before its deadline. The significant decrease in machine time also enabled Atlas Tool to add over three weeks of machine capacity, which represents an additional \$20,000 of revenue.

Aluminum Part #2 – Approximately 34% decrease in machining cycle time, representing \$5,300 in savings over the duration of the program and two weeks of new machine time open capacity.

Return on Investment

One-time investment: \$9,500

Gain: \$105,000/year*

ROI: 1,005%*

*Based upon the same job running all year. The job in the study ran for several months and savings were extrapolated for one year.