
IIE INNOVATIONS IN CURRICULUM AWARD:

THE INNOVATION: INTEGRATION OF A ‘BEST IN CLASS’ LEANSIGMA CERTIFICATION ‘OPTION’ INTO THE ISE CURRICULUM IN THE COLLEGE OF ENGINEERING AT OHIO STATE.

THE LEAD INNOVATOR: D. SCOTT SINK, PH.D., P.E., DIRECTOR OF LEANSIGMA CERTIFICATION PROGRAM, INTEGRATED SYSTEMS ENGINEERING, COLLEGE OF ENGINEERING, THE OHIO STATE UNIVERSITY

THE SPONSOR AND COLLABORATOR FOR THE INNOVATION: JULIE L. HIGLE, PH.D., PROFESSOR AND CHAIR, INTEGRATED SYSTEMS ENGINEERING, THE OHIO STATE UNIVERSITY

THE NOMINATOR: GEORGE L. SMITH, PH.D., P.E., VICE PRESIDENT - WORLD CONFEDERATION OF PRODUCTIVITY SCIENCE PROFESSOR EMERITUS AND FORMER CHAIR - INTEGRATED SYSTEMS ENGINEERING, THE OHIO STATE UNIVERSITY

DESCRIPTION OF THE INNOVATION:

There were two catalysts for this innovation:

1—Dr. Higle (Julie) holds exit interviews with all ISE Seniors. In those exit interviews, one recurring ‘issue’ that continued to come up was the feeling on the part of the students that they don’t have a sense of how all the core curriculum create an integrated whole. Even after the traditional capstone senior design course/project provided an opportunity to experience application and integration, there was still a lingering sense that they weren’t able to connect the dots.

2—Dr. Sink (Scott) came to the ISE at Ohio State following 10 years in the private sector serving in a business process improvement capacity. This responsibility provided him with extensive experience hiring recent graduates as well as seasoned ISE or business process improvement professionals. From 2004-2007 he designed, developed and deployed a “best in class” Operational Excellence (LeanSigma) Program for a Global Life Science company headquartered in Toronto. His experience with hiring and deploying new ISE graduates was that many were simply not prepared to ‘hit the ground running’, they were not adequately seasoned to succeed right out of the starting gate and as such were simply often avoided in the hiring screening process. This shortcoming is widely held among corporate recruiters.

In June of 2007, Julie and Scott met to discuss possibilities of creating a LeanSigma Certification Offering in ISE at Ohio State. The **primary ‘audience’** for this innovation was ISE Undergraduates.

The **Objectives** for this innovation were:

1. Design, develop and implement a LeanSigma Certification option for ISE Undergraduates in the Summer of 2007 with a Launch and Delivery starting in Fall of 2007.
2. Integrate the Black Belt Foundation course (for certificate, not certification) with the Capstone Senior Design Course/Project to achieve certification. The traditional Capstone Senior Design Course was re-designed and tailored to meet additional requirements of certification. Note: This is an option/elective therefore only a selected subgroup of ISE students qualify to follow this route. (20-30% from 2007 to present)
3. Develop the offering in a fashion that would be sustainable with respect to delivery and funding requirements. and
4. Measure and monitor the extent to which candidates report that the program: adds value to and for them; helps them experience how all the courses create an integrated whole; and prepares them to “hit the ground running.”

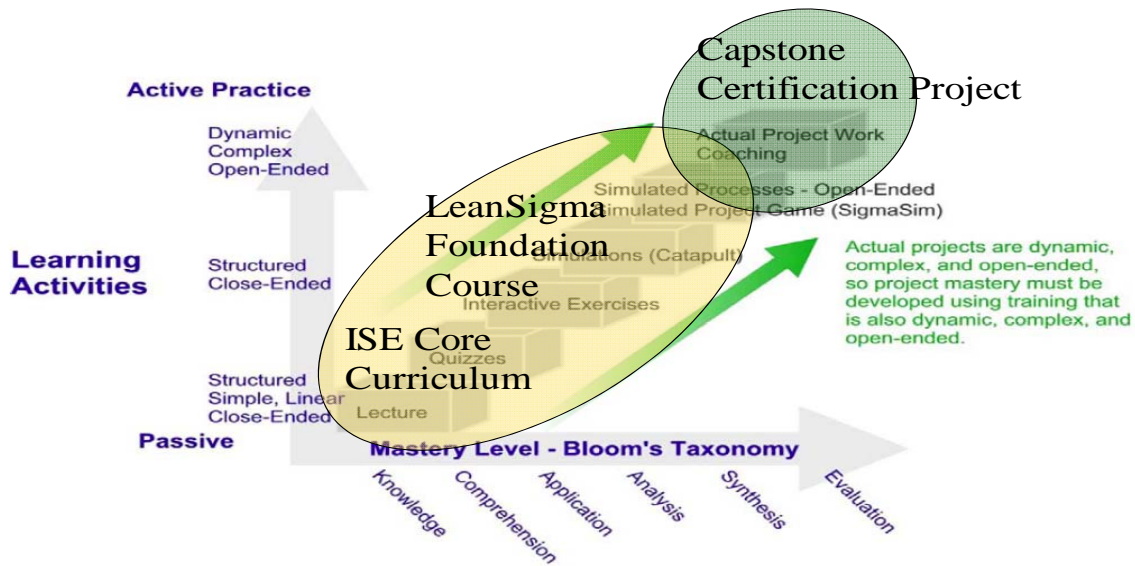
The **Approach** taken (highlights):

The approach was fairly straight forward. As mentioned, Scott had started a program from scratch in his 2004-2007 assignment in industry. The strategy was to simply replicate that model as much as possible in an academic setting, to include:

- Blended Training Model (web based curriculum, virtual and face-to-face coaching, case study approach, physical simulations for Lean and Six Sigma and Change Leadership and Management, etc.);
- Implement a pragmatic, disciplined project management emphasis designed to complete projects in a real-world competitive setting, through the realization phase, in less than 5 months (industry specifications for first Green Belt projects);
- Rapidly build up a business and industry sponsor base and earn their trust and continued support;
- Track program outputs and outcomes over time.

The graphic below depicts the developmental strategy relative to integration (topping off) ISE core curriculum with the LeanSigma Foundation Course and the Capstone Certification Project.

The Training Development Model'



INNOVATIVE AND UNIQUE FEATURES OF THE APPROACH:

A recent survey of CIEADH (Council of Industrial Engineering Academic Department Heads) suggests that a few ISE Departments are offering some form of LeanSigma training. Tight integration of those programs that do exist into the ISE curriculum, however, appears to be rare. In other words, many of the offerings are aimed at the continuing education market or are 'light' certifications or just certificate training. None appear to be as tightly integrated into the ISE UG process as this innovation.

We believe that this specific design is unique in the ISE Curriculum in a number of ways:

1. A conscious, intentional focus on Integrated Lean & Six Sigma and use of a blended training model that is employed at Ohio State is unique and considered to be best in class. It was developed by Scott from in his 2004-2007 industrial engagement, and it reflects benchmarking with Cardinal Health, ALCAN, MoreSteam, BMG, Quest Diagnostics, OSU Fisher College of Business, Rolls Royce, and others. This benchmarking clearly revealed that the integration of Lean and Six Sigma and blended models of training and certification is the cutting edge approach.
2. The integration of what we call the 'other four disciplines' (personal and professional mastery, mental models, shared visions, and team learning and development) with the fifth discipline (Senge, 1990) of systems and statistical thinking that we believe is both

unique and essentially captures the core curriculum for ISE. This component is extremely unique and is the piece that assures what we are calling 'seasoning'.

3. There are three intensive Saturday Labs (9-4) that aid the candidates in transitioning from knowledge to skill acquisition, through early reduction-to-practice opportunities in a controlled learning environment. The labs consist of: a **LEANSigma** lab focusing on learning how to apply principles of Lean; a lean**SIGMA** lab focusing on learning how to apply principles of six sigma, process capability analysis, and Design of Experiments; and, a **Change Leadership and Management** Lab focused on getting into the 'affective domain' and having candidates experience various change leadership and management situations involving defensiveness, resistance, team development, cooperation, communication, building trust, etc.
4. This integration of tailored version of the Capstone Senior Design Course/Project in conjunction with the core curriculum has been successful and provided valuable insights.

IMPACT ON MEETING THE CHANGING NEEDS OF THE IE PROFESSION:

IIE's Council on Industrial Engineering (CIE) is comprised of 30 individuals who are ranking executives of industrial, commercial, or government organizations. CIE members have extensive experience in the management and practice of industrial engineering. Their current activities influence the image and practice of the profession, and their span of control includes the function of industrial engineering at the corporate level.

Scott is a member of the CIE and has been part of ongoing conversations regarding the potential value of innovations such as the LeanSigma Certification initiative in ISE at OSU. Increasingly, ISE graduates are being required to contribute in the context of Enterprise Transformations. (Note that IIE has launched a new conference and journal devoted to Enterprise Transformation) This curriculum innovation at OSU directly relates to and will impact the ability of our candidates to be able to rapidly come in and contribute to enterprise transformation initiatives.

DOCUMENTED EFFECTIVENESS AND SPECIFIC BENEFITS OF THE INNOVATION:

OBJECTIVE ACHIEVEMENT:

All four objectives mentioned in the description of the innovation have been achieved.

STUDENTS/CANDIDATES IMPACTED:

The table below depicts the participation in this 'option' from initiation to present. Note that ISE enrollment at OSU averages between 90 and 100 UG's per year so participation in this program involves approximately 30% of the total UG population. Enrollment in the Certification

Project Course appears to be leveling out at around 20 per year, roughly 20% of the ISE UG total population.

Due to the labor intensity of this offering in its current design format, these numbers represent the maximum program capacity. If demand were higher, some design modifications would be required.

Program Scorecard



	07-08	08-09	09-10	10-11	11-12
BB Foundation Training	28	31	31	31	TBD
Certification Project Course	12	15	27	17	20+
GB Certified	7	8	9/13 & 9/15		
BB Certified	0	1	2		
Sponsors	5	7	13	14	

BENEFITS DERIVED: CANDIDATE PLACEMENT AND SPONSOR IMPACT

1.0 Candidate Placement Success

Candidates are earning great jobs



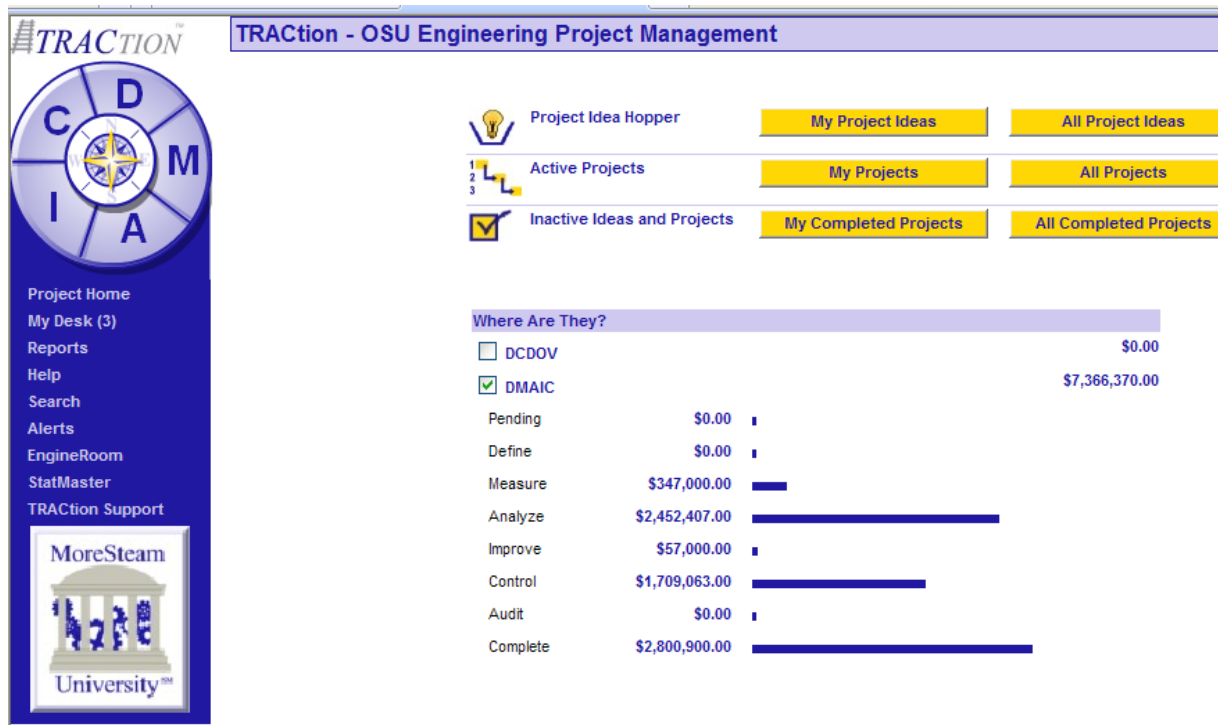
Feedback from Candidates:

- Performing and Progressing faster than I think I would have been able to;
- this first job is not typical entry level job, I've skipped 3-5 years of work in trenches;
- Disciplined presentation and meeting management practice is paying off;
- capacity building process worked!;
- the hard work and frustrations have paid off.



2.0 Impact to the Sponsors

The Program employs a project and program tracking and management system called TRACtion. This is similar to project and program management systems utilized in industry. Candidates manage their projects in this system. The image below is a screen shot of this system. Note that total, unaudited financial benefits in progress are in excess of \$7M. Audited (sponsor audited) benefits are depicted in the table below the screen shot.



	07-08	08-09	09-10	10-11
Certification Project Course Enrollment	12	15	27	17
Candidates GB Certified	7	8	9/13 & 9/15	
Candidates BB Certified	0	1	2	
Sponsors	5	7	13	14
Audited Program Audited	\$300,000	\$1.1M	\$1.5M	~\$1.8M

TRANSFERABILITY AND POTENTIAL FOR WIDER ADOPTION:

Scott is spearheading a Forum that will be held at the 2011 IIE Annual Conference in Reno on the topic of the role of Academic Departments in LeanSigma Certification. He will be reporting on the results of the survey with CIEADH and facilitating a panel comprised of selected CIE and CIEADH members, similar to a Sustainability Forum that he organized on behalf of CIE at the 2009 Conference in Miami. The intent of this Forum is to spark dialogue around the potential for wider adoption of this innovation.

RESOURCE REQUIREMENTS:

A certification program such as this would ideally require staffing by a full time IE who was also certified as a Master Black Belt. A few IE Departments (e.g. University of Pittsburgh) are employing this type of resource to lead and manage their programs. There are a reasonable number of Deployment Leaders (such as Scott) who are approaching retirement and who would be great fits for this role for an IE Department. If managed properly in a Department with access to reasonable industry base to provide/support projects, this type of program could be budget neutral.

APPLICABILITY AT OTHER INSTITUTIONS, PROFESSORS, OR COURSES:

Our survey of CIEADH interest speaks to this. We found that half felt this was something important and worthy of doing, the other half felt it was important but that somebody else should do it.

SUPPORT FOR THE NOMINATION:

Since the Department Chair is a co-applicant, the support for the nomination is implicit. A letter of support can be provided if required.