

Six Sigma Courses at Michigan Tech

Enhancing Student Learning and Career Preparation in Continuous Improvement

Michigan Tech Lean Showcase

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Defining Success



Michigan Technological University

Outline

- Motivations
- Six Sigma in Two Slides!
- Course Highlights
- Student Impact & Feedback
- Future Work/Next Steps
- Q&A

Motivations for Developing Six Sigma Courses

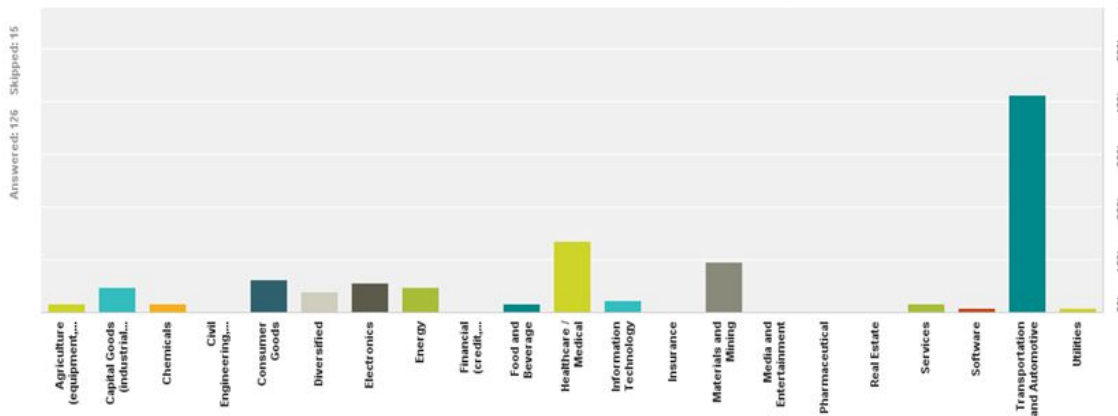
1. **Personal** - Career Impact
2. **Employers** - Market Need
3. **Students** - Enhanced Skills +
Fragmented Course Offerings
@ MTU



“Voice of the Customer”: 2015 Employer Survey

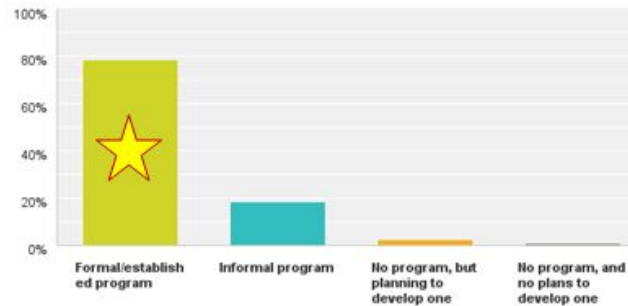
Respondents (n=126)
represent a broad range
of industrial sectors

Primary Sector



Q4 Please choose the statement that best describes your company's continuous improvement program

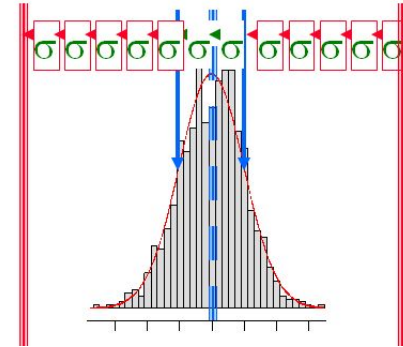
Answered: 130 Skipped: 11



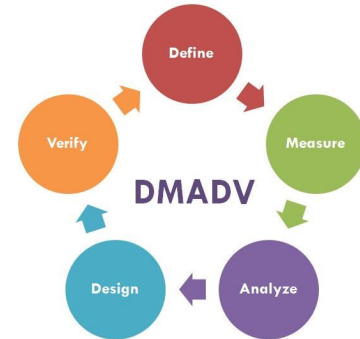
78% have a formal continuous improvement program, 19% have an informal program (n=130)

Six Sigma is a:

1. **Measure:** A statistical measure of quality that strives for near perfection
 - a. 3.4 defects per million opportunities
2. **Methodology:** A disciplined, data-driven, customer-centered approach for eliminating defects
 - a. DMAIC - “improve the current process”
 - b. DMADV - “design it right the first time”
3. **Mindset:** A way of doing business, organizational culture



Source:
<https://www.6sigma.us/six-sigma-articles/back-basics-dmaic-use/>



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Lean + Six Sigma = Continuous Improvement!



Course Highlights

ENT3959: Fundamentals of Six Sigma

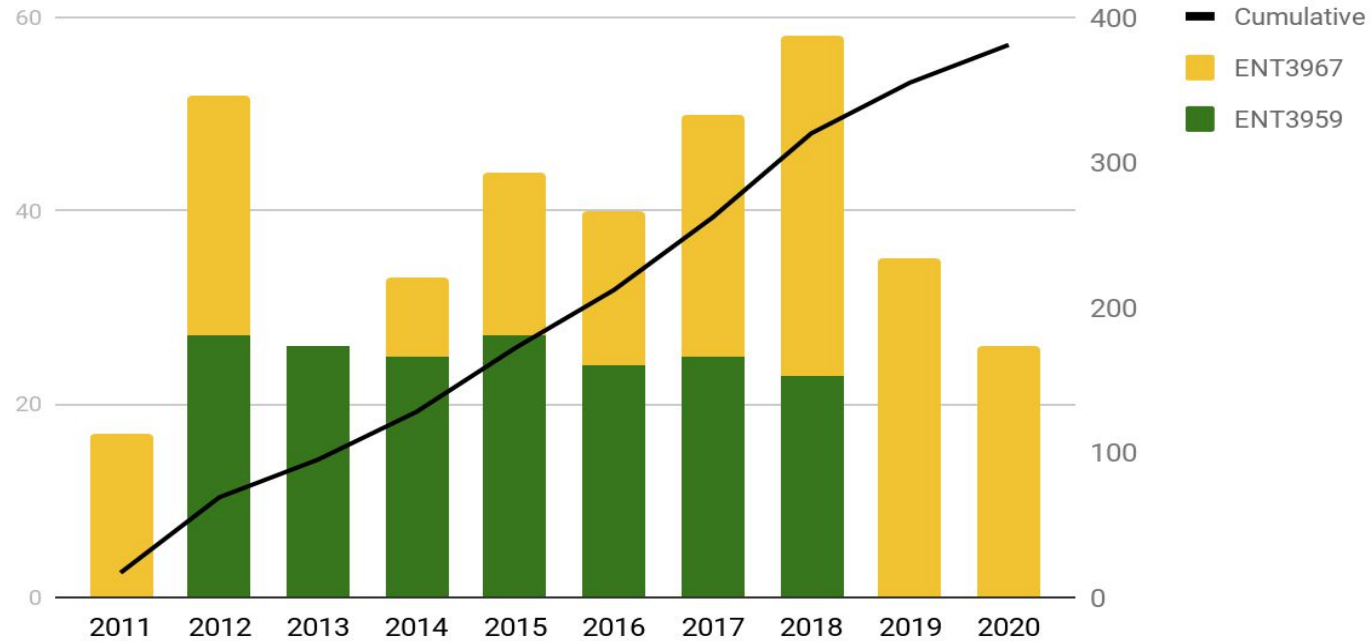
- 1-credit course, developed in Fall 2012
- **DMAIC** (Define>Measure>Analyze>Improve>Control) methodology
- **Industry Examples** - case studies, guest speaker
- **Application** - team-based process improvement w/ campus stakeholders:
 - Michigan Tech IT
 - Campus Bookstore
 - Catering and Dining Services
 - Career Services
 - Library
 - Transportation Services
 - Enterprise Program Office
- **Key Tools** - charter, process mapping, PPM/DPMO estimation, hypothesis testing, cause and effect matrix/Fishbone diagram, decision matrix, control plans

ENT3967: Design for Six Sigma

- 1-credit course, developed in Spring 2011
- **ICOV** (Identify>Characterize>Optimize>Verify) methodology
- **Industry examples** - case studies, guest speaker
- **Application** - team-based new product development
 - a. 'Payload Delivery System'
 - b. Concurrent Product/Process Development
 - c. Design Optimization
 - d. Customer Proposal
 - e. Performance Demonstration/Friendly Competition
- **Key Tools** - quality function deployment (QFD), Pugh matrix, design of experiments (DOE), statistical tolerancing, capability analysis

Student Impact

Course Enrollment to Date



Student/Stakeholder Feedback

*"The **actual project (on campus)** is great! So many classes like this use a theoretical project, but content is always lost with this. Here, we actually were able to meet up with our stakeholder and could get real feedback. The course was just demanding enough."*

*"I really enjoyed this class, it also **helped me get my job** after graduation because one of the hiring managers saw it on my transcripts and even though it was only a 1 credit class they were still impressed, so thanks for having it!"*

Student Feedback, ENT3959 Course Evaluations

*"Your teams did a really great job today - I unfortunately wasn't able to stay for the second presentation but was **sincerely impressed and thankful** for the first. Thank you to everyone involved with this process."*

Project Stakeholder, Michigan Tech IT

*"The delivery system project was a **perfect way to have students put the material we learned in class to work.**"*

*"The **team approach** definitely help me understand the material better."*

*Keep everything, I felt it was all **valuable to the learning** of the material."*

Student Feedback, ENT3967 Course Evaluations

Future Work/Next Steps:

- Existing Course Improvements:
 - a. Leverage virtual/remote tools - flipped classroom, active learning
 - b. More/new project stakeholders (off campus?)
 - c. Taguchi methods (ENT3967)

- Expansion/New Courses:
 - a. 3-credit option?
 - b. Professional Development Courses/Workshops
 - Target market: working professionals - alumni, local community, industry
 - c. Six Sigma Green Belt Certification Program

Questions?
