Syllabus

Implementing Process Improvement

OPNS-932

Northwestern University
Kellogg School of Management

Contact Information

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Course Overview

Evaluating and improving operating processes is essential for the growth and health of any business. This course introduces a variety of frameworks for assessing performance as well as identifying and prioritizing improvement opportunities. It draws on the most frequently used tools from Six Sigma and Lean as well as project management techniques. The course also emphasizes organizational considerations in implementation. Students will have opportunities to apply these tools in visits to local firms as well as be expected to use them in a final project.

The emphasis of this course is on the practical application (vs. theory) of Six Sigma, Lean, and project management techniques as the best way to learn these techniques is to practice them. **So, in order for you to gain the most from this course, you are expected to identify an issue you want to analyze with these techniques, preferably a real problem encountered during your job.**

Please note that this is NOT a certification course, and completion of this course will not necessarily lead to certification. However, successful completion of your project can be used to demonstrate Six Sigma proficiency for any formal certification program, such as the one run by ASQ (American Society for Quality), the de facto industry standard for Six Sigma certification.

Approach

This class is grounded in the practical application of Six Sigma, Lean, Project Management, and Change Management. As such, there is typically at least one in-class exercise for each class.

There will be one mandatory opportunity to conduct observations. A second, optional, opportunity will also be offered.

The focus of the first half of the course is on some of the most frequently used tools in the Six Sigma toolset. While additional tools are introduced, the focus of the second half of the course is the practical application of the tools and in-depths reviews of the real-world problem you are attempting to solve. To help with the understanding of the material, there is an emphasis on student participation.

Student Feedback

- The course felt like a capstone to my operations major and a combo of MORs & Analytics.
- I have used many of your tools in order to guide novice project managers.
- Looking at the variety of projects on which we have been able to use these tools, it is clear to me that they are valuable even on 'non-process improvement' initiatives.

Prerequisites

- DECS 434
- OPNS 430

A working knowledge of Excel, PowerPoint, and Word, and Stata.

Course Materials

There is no required textbook for this course.

After the midterm, I will make available a list of recommended readings.

All material introduced will have one or more web references for your review.

However, there is required software – Stata. I have been told that all students have access to Stata and it is the analytical software used in DECS 434.

http://stata.com/

In the Six Sigma community, the primary statistical package is Minitab. We will be using it after the midterm.

Whenever Minitab is used to illustrate a tool, I will also show you what it looks like in Stata. Since Minitab only has a 30-day trial version, please do NOT download it until you are instructed to do so.

http://www.minitab.com/en-US/default.aspx

Attendance

Students are expected to attend all classes. An attendance sheet may be circulated to check attendance. Students who miss more than one class may lose a letter grade.

Grading

- 30% Class Participation & Attendance
- 30% Mid-Term Exam
- 40% Homework & Project Updates (Application of Tools on a Real-World Improvement Opportunity)

Class Participation

Class participation / discussion is a very important part of the learning process in this course. That said, grading class participation is necessarily subjective. You are evaluated on the quality of the contributions that you make to class discussion and not on the amount of "air time" you take up.

> Please note that you will not be evaluated on questions that you ask to clarify lecture or course material. If you have a question, chances are that the same question is on the minds of some of your classmates as well. Thus, you are doing the class a favor by asking it.
>
> Again, I am assuming that this material is new to most of you. So, please, ask questions. And yes, cold-calling is a possibility.

I will gauge / evaluate participation by class using the method outlined below.

- 0 = Not in attendance.
- 1 = In attendance, but little-to-no participation in the discussion.
- 2 = In attendance and moderate participation in the discussion.
- 3 = In attendance and active participation in the discussion.

Again, I understand that this scale is subjective.

A score of 2 is NOT bad. Your final grade is on a relative scale, not an absolute one.

- For example, if you receive a 2, that is "good" if the average class participation score for that class is a 1.625.
- Alternatively, if you receive a 2, that is "OK" if the average class participation score for that class is a 2.125.

At the start of class, everyone starts with a 2 – as I expect everyone to participate in some manner. If I deem your participation to be "active", you will likely be awarded a 3. Expect points to be deducted for:

- Arriving Late
- Nodding Off (or worse, sleeping) – if tired, I would prefer that you stand in the back of the room
- Disruptive Behavior
- Behavior not consistent with the Kellogg Code of Classroom Etiquette

Mid-Term Exam

The mid-term will have two components:

- An in-class exam (Class 5) – closed book, closed notes.
- A take-home Case Study – to be worked on individually; due the Sunday before Class 6 at 6:00 PM (CT).

The in-class exam will cover the concepts discussed in class to-date. It will be a mix of:

- Fill-in-the Blank
- Multiple Choice

Homework

In keeping with the previous scale:

- 0 = Not turned in.
- 0 = Turned in, but with more than one omission (e.g., you are asked for 3 items, but only turn in 1).
- 1 = Turned in, but with numerous errors and/or one omission.
- 2 = Turned in, but with several errors and no omissions.
- 3 = Turned in, but with a small number of errors and no omissions.

    At my discretion, I may award an additional ½ point if there are no errors or I consider your work to be a model for the other students. Under such circumstances, I may ask you to present your solution to the rest of the class.

Note – there may be homework assignments (i.e., case studies) that are worth more points. In those cases, the same scale will be used, but a multiplier used to determine the final score.

Observations are to be considered as homework.

Again, there will be two opportunities to conduct observations – both will be on a Saturday. Doing one is mandatory; it does not matter which one. Doing both of them is an extra credit opportunity.

Homework is due two days before class.

In other words, if class is on Wednesday, homework is due Monday at 6:00 PM.

This will enable me to provide you with more immediate ("real-time") feedback.

Project Updates (Application of Tools on a Real-World Improvement Opportunity)

Similar to the Homework scale:

- 0 = Not turned in.
- 0 = No update from the previous week.
- 1 = Turned in, but with numerous errors and/or omissions, or a just a nominal (i.e., insignificantly small; trifling) update from the previous week.
- 2 = Turned in with minor updates from the previous week (such as evidence that you are moving the project forward, providing new analysis, and/or use of new tools).
- 3 = Turned in with a major updates from the previous week (such as evidence that you are moving the project forward, providing new analysis, and/or use of new tools).

    Again, at my discretion, I may award an additional ½ point if you used a tool in a manner that I would consider it to be a model for the other students. Under such circumstances, I may ask you to present your solution to the rest of the class.

Project Updates are due every week, except Week 1, Week 5 (Mid-Term), Week 7 (observation), and Week 11.

And since you will be granted one (1) "free pass" (to be used at your discretion), really only six (6) updates are required.

As with the Homework, Project Updates are due two days before class.

Classroom Etiquette

Students will abide by the Kellogg Code of Classroom Etiquette in interaction with their fellow students and with the instructor.

Laptops – please leave them off unless we are using them in an exercise.

Cell phones – please turn them off or on vibrate.
And no texting, please.

Nameplates – please bring & display them (thank you).

"Vegas Rules" – class discussion stays in class, please.

Honor Code

The student experience at the Kellogg School is unique because, among other reasons, students trust that their classmates will behave with honesty, integrity, and respect in all academic, professional, and social matters.

Kellogg's Honor Code plays a critical role in engendering this trust. The Honor Code requires that a student not to seek an unfair advantage over other students, including but not limited to giving or receiving unauthorized aid during completion of academic requirements; to truthfully represent fact and self at all times; and to respect the property and personal rights of all members of the Kellogg community.

Students' willingness to abide by this Code serves as the lubricant that allows faculty and students at the Kellogg School to interact with a minimum of rules, regulations, and bureaucracy, which in turn allows all of us to focus on creating an engaging and challenging academic environment.

For each formal course requirement, I will attempt to be clear about my expectations and standards. If you have questions about whether behavior is within the bounds of honorable behavior, please ask. Your mantra should be: when it doubt, ask!

One final word / request – students will not disseminate course materials or their course notes beyond other members of the course.

Sanity Check

This course is grounded in published "best practices".
Please be wary of anyone pushing (selling) proprietary approaches to improvement.

Creating a culture of engaged problem solvers in your business is not nearly as difficult as it may sound. So, don't leave the tools of process improvement only in the hands of a few "experts". Become familiar with the basics, as they will help you become part of the solution to any business problem.

Course Outline

A detailed week-by-week agenda is below.

Class	Topic	In-Class Exercises	Tools Introduced	Homework Assignments
0	black font = lecture			Identify an Improvement Opportunity
	green font = student participation/exercise			Survey
1	Introductions		Project Risk Assessment	Project Update - Quadrant 1 of A4 --> DEFINE
	Expectations - Survery Results		A4	Case Study - Excel Logistics Services (Pareto Diagram)
	Icebreaker & "Quick Wins"		Pareto	Create "Real World" Pareto
	Course Overview		5 Whys	Gemba Walks
	Break		Voice of the Customer (VoC)	Conduct Stakeholder Analysis
	A Basic Problem Solving Framework DMAIC --> DEFINE	Pareto	Process Maps (overview)	Start Daily Tracking of your (a) Commute Time or (b) Weight
	Homework Assignment		Gemba Walks	Form 3-4 member groups
			Spaghetti Diagrams	
			Stakeholder Analysis	
			Consensus / Voting	
			Action Item Tracking	
2	Icebreaker & "Quick Wins"		Histograms	Project Update - Quadrant 2 of A4 --> MEASURE
	Review of Case Study Pareto		Box Plots	- Quadrant 4 of A4 --> Project Mgt
	Review of "Real World" Pareto (2-3 students)		Scatter Diagrams	Watch Video of Deming's Red Bead Experiment
	Review of Gemba Walk		Run Charts	REMINDER - Continue Daily Tracking
	Review of Quadrant 1 of A4 --> DEFINE (2-3 students)		Control Charts	

Class	Topic	In-Class Exercises	Tools Introduced	Homework Assignments
	Review of Stakeholder Analysis (2-3 students)			
	Tollgate Review - Define			
	Break	Card Drop Game		
	DMAIC --> MEASURE - Card Drop Game	Demining Funnel Experiment (Variation)		
	- Deming Funnel Experiment			
	Homework Assignment			
	Review of Quadrant 1 of A4 --> DEFINE (1-2 students)			
3	Icebreaker & "Quick Wins"		Process Mapping	Project Update- Quadrants 2 & 3 of A4 --> ANALYZE
	Review of Deming's Red Bead Experiment		Affinity Diagram	- Other A4 Quadrants (as needed)
	A4 Review (2-3 students)		Fishbone (Cause & Effect)	Process Map
	DMAIC --> MEASURE (continued)		ANOVA (overview)	Case Study - Samsung Electronics: Using Affinity and Pareto Diagrams
	Tollgate Review - Measure			REMINDER - Continue Daily Tracking
	DMAIC --> ANALYZE - Qualitative Data			
	- Process Mapping	Process Mapping		
	Break			
	- Afinity Diagram - Manager's Meeting (Individual)	Affinity Diagram (2)		
	- Fishbone Diagram - Quantitative Data			
	- Afinity Diagram - AT&T Wireless Complaints (Group)			
	Plan / Expectations for Observation #1			
	Homework Assignment			
	A4 Review (1-2 students)			

Class	Topic	In-Class Exercises	Tools Introduced	Homework Assignments
4	Icebreaker & "Quick Wins"		Multi-Voting	Prepare for Class 5 Lessons Learned Discusssion
	Review of Samsung Case Study		Criteria Selection Matrix	REMINDER - Continue Daily Tracking
	Review Process Maps (1-2 students)		DOE (overview)	
	A4 Review (2-3 students)		Lessons Learned	
	DMAIC --> ANALYZE - Multi-Voting	Multi-Voting		*Take-home portion of Mid-Term assigned*
	Tollgate Review - Analyze			
	Break			
	DMAIC --> IMPROVE			
	Tollgate Review - Improve			
	DMAIC --> CONTROL			
	Tollgate Review - Control			
	Exam Expectations			
	Homework Assignment			
	A4 Review (1-2 students)			
4a	REAL-LIFE Observation #1(will take place on a Saturday either before Class 4 or Class 5)			Write-Up Observations
				Update A4
5	Icebreaker & "Quick Wins"			REMINDER - Continue Daily Tracking
	Process Improvement Resources			
	Lessons Learned - Review of Expectations from Class 1			
	Q&A			
	Homework Assignment			
	Break			
	Exam			
6	Icebreaker & "Quick Wins"		VSA	REMINDER - Continue Daily Tracking

Class	Topic	In-Class Exercises	Tools Introduced	Homework Assignments
	Review of Herzog Hospital Case Study			
	Review of Observation #1			
	Break			
	Plan / Expectations for Observation #2			
	Lean Revisted			
	Lean Simulation - 5S Game	Lean - 5S		
	Lean Revisted (continued)			
	Lean Simulation - Dot Game	Lean - Dot		
	Homework Assignment			
	A4 Review (1-2 students)			
7	REAL-LIFE Observation #2 (no class - as observation will take place on a Saturday)			Update A4 Write-Up Observations Download & Install Trial Version of Minitab
8	Icebreaker & "Quick Wins"		Minitab	Update A4
	Review of Observation #2			REMINDER - Continue Daily Tracking
	Break			Submit Special Topics for Review
	Minitab Overview	Minitab		
	Homework Assignment			
	A4 Review (2-3 students)			
9	Icebreaker & "Quick Wins"		SIPOC	Update A4
	A4 Review (6-8 students)			Submit Special Topics for Review
	Control Charts Revisited			Control Charts - Excel Logistics Case Study
	Break			Update Stakeholder Analysis
	Control Charts Exercise	Weight Control Chart		Communication Plan
	Control Charts Homework			Prepare for Class 5 Lessons Learned Discusssion

Class	Topic	In-Class Exercises	Tools Introduced	Homework Assignments
	Measurement Systems Analysis (MSA)			
	MSA Exercise #1	MSA		
	SIPOC			
	Class Critique Prep			
	Homework Assignment			
	A4 Review (1-2 students)			
10	Kellogg Class Critique (by Students)			
	Icebreaker & "Quick Wins"			
	Review Control Charts Homework			
	Review Stakeholder Analysis			
	A4 Review (2-3 students)			
	MSA Exercise #2	MSA		
	Break			
	Project Management – Process to Develop a Workplan			
	Lessons Learned - Review of Expectations from Class 1			
	SIPOC Exercise #1	SIPOC		
	Homework Assignment			
11	Class #11 to be conducted if special topics are requested by the students			