

## Southwest WI Technical College

10-623-112 Lean Six Sigma

# Course Design

### Course Information

|  |  |  |
| --- | --- | --- |
|  | Description | In LEAN SIX SIGMA learners will examine two models of problem solving/continuous improvement (the PDCA/PDSA and the DMAIC models). Learners will utilize an A3 report to identify the current process condition, identify improvement goals, establish root causes, specify improvement activities, and confirm results. Learners will utilize the seven SPC (Statistical Process Control) tools and selected Quality Management Tools in the improvement process. Learners will examine the steps of planning and executing a Kaizen Event as well as supporting daily Kaizen activities. Metadata Tags:  Six Sigma,  Theory of Constraints,  Definitions of Quality, Voice of the Customer (VOC),  SIPOC Map,  CTQs (Critical to Quality), Statistical Calculations,  Process Index,  Sampling Distribution,  Calculating Confidence Intervals,  ANOVA,  PDCA,  Kaizen Event  |
|  | Instructional Level | A.A.S. - Associate in Applied Science  |
|  | Total Credits | 3.00 |
|  | Total Hours | 54.00 |

Types of Instruction

|  |  |
| --- | --- |
| Instruction Type | Credits/Hours |
| Online | 3 Credits |

Pre/Corequisites

|  |  |
| --- | --- |
|  | Prerequisite: Lean Concepts (10-623-110) |

Textbooks

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| --- |
| Evans & Lindsay. An Introduction to Six Sigma & Process Improvement. Cengage Learning (Publisher). 2nd Edition. 2015. ISBN13: 978-1133604587 ISBN10: 1133604587  |
| Dennis, Dennis. Lean Production Simplified. Productivity Press (Publisher). 2nd Edition. 2007. ISBN-13: 978-1563273568 ISBN-10: 156327356X  |

### Course Competencies

|  |  |
| --- | --- |
| 1. | Examine Lean |
|  | Assessment Strategies |
|  | 1.1. | Discussion Board |
|  | 1.2. | Worksheet Assignments |
|  | Criteria |
|  | Performance will be satisfactory when: |
|  | 1.1. | Participate in Discussion Boards-Rubric  |
|  | 1.2. | Complete Assignments correctly-Rubric |
|  | Learning Objectives |
|  | 1.a. | Create relationships with classmates |
|  | 1.b. | Define Lean |
|  | 1.c. | Define Theory of Constraints |
|  | 1.d. | Define the evolution of Six Sigma |
|  | 1.e. | Define the basic definitions of quality |
| 2. | Analyze the Principles of Six Sigma  |
|  | Assessment Strategies |
|  | 2.1. | Written Product |
|  | 2.2. | Project |
|  | Criteria |
|  | Performance will be satisfactory when: |
|  | 2.1. | Written Products meets rubric standards |
|  | 2.2. | Sigma Level Application Project meets rubric standards |
|  | Learning Objectives |
|  | 2.a. | Define the evolution of Six Sigma |
|  | 2.b. | Define the basic definitions of quality |
|  | 2.c. | Define customer requirements- Voice of the Customer (VOC) |
|  | 2.d. | Define a process |
|  | 2.e. | Define system thinking |
|  | 2.f. | Define a metric |
|  | 2.g. | Determine non-conformance |
|  | 2.h. | Calculate sigma level of a process |
| 3. | Select a Project  |
|  | Assessment Strategies |
|  | 3.1. | Written Product |
|  | 3.2. | Calculation Problems |
|  | 3.3. | Final Project Topic Submission |
|  | Criteria |
|  | Performance will be satisfactory when: |
|  | 3.1. | End of Chapter 3 Questions are correct |
|  | 3.2. | Chapter 3 Problems- Cost of Quality and Pareto are correct |
|  | 3.3. | Select Final Project Topic is approved for improvement project |
|  | Learning Objectives |
|  | 3.a. | Determine the cost of quality |
|  | 3.b. | Perform a pareto analysis |
|  | 3.c. | Create a SIPOC Map |
|  | 3.d. | Identify CTQs (critical to quality) |
|  | 3.e. | Determine root cause |
| 4. | Create a Charter to Define a Project  |
|  | Assessment Strategies |
|  | 4.1. | Project |
|  | 4.2. | Written Product |
|  | Criteria |
|  | Performance will be satisfactory when: |
|  | 4.1. | Submit Final Project Charter Project- rubric |
|  | 4.2. | Written Product for Charter Web Search-Rubric |
|  | Learning Objectives |
|  | 4.a. | Create a problem statement |
|  | 4.b. | Determine project objectives to include metrics |
|  | 4.c. | Define the scope |
|  | 4.d. | Determine the relevance |
|  | 4.e. | Identify the needs of the customers |
|  | 4.f. | Create a project team |
|  | 4.g. | Schedule milestones |
|  | 4.h. | Identify needed resources |
| 5. | Measure a Process  |
|  | Assessment Strategies |
|  | 5.1. | End of Chapter 4 Questions |
|  | 5.2. | Chapter 4 Problems- Statistical Calculations, Process Index |
|  | 5.3. | R & R Project |
|  | 5.4. | Create final project measurement plan |
|  | Criteria |
|  | Performance will be satisfactory when: |
|  | 5.1. | End of Chapter 4 Questions are answered correctly |
|  | 5.2. | Chapter 4 Problems- Statistical Calculations, Process Index are correct |
|  | 5.3. | R & R Project is submitted to rubric standards |
|  | 5.4. | Create final project measurement plan is submitted to rubric standards |
|  | Learning Objectives |
|  | 5.a. | Select process metrics |
|  | 5.b. | Create a check sheet |
|  | 5.c. | Apply sampling |
|  | 5.d. | Perform statistical calculations using Excel |
|  | 5.e. | Create a histogram using Excel |
|  | 5.f. | Conduct a repeatability and reproducibility study |
|  | 5.g. | Conduct a process capability study |
|  | 5.h. | Calculate process capability index |
| 6. | Analyze a Process  |
|  | Assessment Strategies |
|  | 6.1. | Chapter Questions |
|  | 6.2. | Case Study |
|  | 6.3. | Project |
|  | Criteria |
|  | Performance will be satisfactory when: |
|  | 6.1. | End of Chapter 5 Questions and Problems are submitted correctly |
|  | 6.2. | Root Cause Analysis Assignment is correct based on rubric |
|  | 6.3. | Analyze data for final project is correct based on rubric |
|  | Learning Objectives |
|  | 6.a. | Define probability distributions |
|  | 6.b. | Define sampling distribution |
|  | 6.c. | Calculate confidence intervals |
|  | 6.d. | Conduct hypothesis testing |
|  | 6.e. | Apply regression and correlation |
|  | 6.f. | Apply ANOVA |
|  | 6.g. | Create recommendations based on data analysis |
|  | 6.h. | Determine root cause |
| 7. | Improve a Process  |
|  | Assessment Strategies |
|  | 7.1. | Chapter Questions |
|  | 7.2. | Project |
|  | Criteria |
|  | Performance will be satisfactory when: |
|  | 7.1. | End of Chapter 6 Questions are submitted correctly |
|  | 7.2. | PDCA Project is submitted correctly by rubric standards |
|  | 7.3. | Kaizen Event Activity submitted correctly by rubric standards |
|  | 7.4. | Final project improvement plan submitted correctly by rubric standards |
|  | Learning Objectives |
|  | 7.a. | Implement PDCA |
|  | 7.b. | Analyze a process map |
|  | 7.c. | Plan a kaizen event |
|  | 7.d. | Implement lean tools into a Six Sigma project |
|  | 7.e. | Conduct a brainstorming session |
| 8. | Control a Process  |
|  | Assessment Strategies |
|  | 8.1. | Chapter Questions |
|  | 8.2. | Project |
|  | Criteria |
|  | Performance will be satisfactory when: |
|  | 8.1. | End of Chapter 7 Questions are answered correctly |
|  | 8.2. | Final Project Control Plan is submitted correctly based on rubric |
|  | Learning Objectives |
|  | 8.a. | Create a control system |
|  | 8.b. | Construct a control chart for variable data |
|  | 8.c. | Construct a control chart for attribute data |
|  | 8.d. | Analyze control chart patterns |
|  | 8.e. | Implement SPC |
| 9. | Implement Six Sigma  |
|  | Assessment Strategies |
|  | 9.1. | Chapter Questions |
|  | Criteria |
|  | Performance will be satisfactory when: |
|  | 9.1. | Chapter questions are submitted correctly |
|  | Learning Objectives |
|  | 9.a. | Manage effective projects |
|  | 9.b. | Create cultural change |
|  | 9.c. | Support leadership |

### Grading Information

See course syllabus or course schedule

### Course Learning Plans and Performance Assessment Tasks

|  |  |
| --- | --- |
| Type | Title |
| LP | Examine Lean |
| LP | Analyze the Principles of Six Sigma |
| LP | Select a Project |
| LP | Introduction to Creating a Charter |
| LP | Measure Process |
| LP | Analyze a Process |
| LP | Improve a Process |
| LP | Control a Process |
| LP | Implement Six Sigma |

Examine Lean

Overview/Purpose

There are a number of continuous improvement tools that people are talking about. It is good to take a moment to look how each are similar and different. This helps to select the appropriate tool for a given situation.

Target Competencies

|  |  |
| --- | --- |
| 1. | Examine Lean |
|  | Assessment Strategies |
|  | 1.1. | Discussion Board |
|  | 1.2. | Worksheet Assignments |
|  | Criteria |
|  | Performance will be satisfactory when: |
|  | 1.1. | Participate in Discussion Boards-Rubric  |
|  | 1.2. | Complete Assignments correctly-Rubric |
|  | Learning Objectives |
|  | 1.a. | Create relationships with classmates |
|  | 1.b. | Define Lean |
|  | 1.c. | Define Theory of Constraints |
|  | 1.d. | Define the evolution of Six Sigma |
|  | 1.e. | Define the basic definitions of quality |

### Learning Activities

|  |  |
| --- | --- |
| 1. | It is a good time to do a quick mention of the project for this course. Each student will create a Six Sigma project as they complete the course. Each module will have an assignment relating to this project. The final assignment will require the student to pull all of the assignments together to create a completed project. |
|  | Learning Materials |
|  | Rubric for Final Project Selection  | [Rubric for Final Project Selection Activity(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=e40078ab-0a99-4285-b53e-4ea3f3f5821a) |
|  | Rubric for Final Project Control Plan | [Rubric for Final Project Control Plan(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=84bb760b-b7bc-4649-99f8-9b3a3bf6aece) |
|  | Rubric for Final Project Analysis Plan | [Rubric for Final Project Analysis Plan(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=ab098541-c743-4228-aa81-2b9bdca1ad14) |
|  | Rubric for Final Project Implementation Plan | [Rubric for Final Project Implementation Plan(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=d80fa16d-fc30-45d0-bac6-bdf2f2f34dd5) |
|  | Rubric for Final Project Measurement Plan | [Rubric for Final Project Measurement Plan(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=00a0db83-bc21-4e95-a831-a064d2eadc6f) |
| 2. | Complete 'Class Introduction' discussion board to include one initial post and three responsesWelcome to Lean Six Sigma. I would like everyone to take a moment to introduce yourselves. Please consider including the following: •Name you prefer everyone to use when addressing you •Work experience •Experience with continuous improvement •Personal points of interest such as family, hobbies, interests and achievements This discussion board will be open for the first three weeks of class to give everyone an opportunity to create connections with other classmates. This is a graded item, and you are required to have an initial post and three responses on the board prior to the third week of class.  |
|  | Learning Materials |
|  | Rubric for Introductory Discussion Board | [Rubric for Introductory Discussion Board(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=e53c3c41-c4c2-4ac7-ba4c-b49dc017b18b) |
| 3. | Read pages 50-56 in text |
| 4. | Perform an Internet search on Lean, Six Sigma, and Theory of ConstraintsOutput: Definition of each of the three listed philosophies; Lean, Six Sigma, Theory of Constraints Directions: Write a paragraph for each of the three continuous improvement philosophies. Make sure to define each and discuss the underlying principles for each. Write a fourth paragraph discussing how the three are related. You may use the Internet as a resources as well as the 'What's Hot' reference sheet.(proprietary) Make sure to cite any sources used. Submission: Attach a Word document to this assignment that includes the four paragraphs. Use proper grammar to include complete sentences.  |
|  | Learning Materials |
|  | Rubric for Continuous Improvement | [Rubric for Continuous Improvement Methods Assignment(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=21d2d713-bf40-48f1-896f-f79b2efe0a26) |
| 5. | Review Final Project Description |

### Assessment Activities

|  |  |
| --- | --- |
| 1. | Discussion Board |
|  | Learning Materials |
|  | Rubric for Introductory Discussion Board | [Rubric for Introductory Discussion Board(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=e53c3c41-c4c2-4ac7-ba4c-b49dc017b18b) |
| 2. | Continuous Improvement Worksheet |
|  | Learning Materials |
|  | Rubric for Continuous Improvement | [Rubric for Continuous Improvement Methods Assignment(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=21d2d713-bf40-48f1-896f-f79b2efe0a26) |

Analyze the Principles of Six Sigma

Overview/Purpose

As discussed earlier, Six Sigma focuses on the reduction of variation. This first section will discuss the principles of Six Sigma and how the DMAIC steps can improve a process. Think about how Lean tools can help with a Six Sigma project. Where would each fit into the DMAIC model? How does the DMAIC problem solving model compare to the A3 model?

Target Competencies

|  |  |
| --- | --- |
| 1. | Analyze the Principles of Six Sigma  |
|  | Assessment Strategies |
|  | 1.1. | Written Product |
|  | 1.2. | Project |
|  | Criteria |
|  | Performance will be satisfactory when: |
|  | 1.1. | Written Products meets rubric standards |
|  | 1.2. | Sigma Level Application Project meets rubric standards |
|  | Learning Objectives |
|  | 1.a. | Define the evolution of Six Sigma |
|  | 1.b. | Define the basic definitions of quality |
|  | 1.c. | Define customer requirements- Voice of the Customer (VOC) |
|  | 1.d. | Define a process |
|  | 1.e. | Define system thinking |
|  | 1.f. | Define a metric |
|  | 1.g. | Determine non-conformance |
|  | 1.h. | Calculate sigma level of a process |

### Learning Activities

|  |  |
| --- | --- |
| 1. | Read Chapter 1 of text |
| 2. | Review Chapter 1 Power Point - Publisher Content |
| 3. | Complete 'End of Chapter 1 Questions' identified in the assignment |
|  | Learning Materials |
|  | Rubric for End of Chapter 1 Questions | [Rubric for End of Chapter 1 Questions(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=224e90f8-c83b-42cd-8a47-d8e206096626) |
| 4. | Read Chapter 2 of text |
| 5. | Complete 'End of Chapter 2 Questions and Problems' identified in the assignment |
|  | Learning Materials |
|  | Rubric for End of Chapter 2 Questions | [Rubric for End of Chapter 2 Question(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=ae0a91d8-dc4c-4ecc-ae5a-7c3a5151758f) |
| 6. | Complete Chapter 2 Application ProjectOutput: Project Description and Results Directions: Select product that allows you to count defects/non-conformances. Some examples could be broken chips in a bag, deformed M&M's in a bag, or over baked cookies in a batch of you have made. Do the following: Option 1: 1.Write a paragraph defining your project. 2. State the results of your data collection. . 3. Calculate the sigma level of your project. 4. Write a conclusion paragraph stated what this project taught you about the application of sigma levels. 5. Note: Pictures can be included to tell the story.. Option 2: Create a video of your project covering the 4 items from Option 1. Submission: A Word document or video can be attached to this assignment. Written work should be review for grammatical errors.  |
|  | Learning Materials |
|  | Rubric for Chapter 2 Applications Defects Project | [Rubric for Chapter 2 Applications Defects Project(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=4f2ef46e-287d-4f50-a401-62ebe63bbc13) |

### Assessment Activities

|  |  |
| --- | --- |
| 1. | End of Chapter 1&2 Questions |
|  | Learning Materials |
|  | Rubric for End of Chapter 1 Questions | [Rubric for End of Chapter 1 Questions(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=224e90f8-c83b-42cd-8a47-d8e206096626) |
|  | Rubric for End of Chapter 2 Questions | [Rubric for End of Chapter 2 Question(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=ae0a91d8-dc4c-4ecc-ae5a-7c3a5151758f) |
| 2. | Sigma Level Application Project |
|  | Learning Materials |
|  | Rubric for Chapter 2 Applications Defects Project | [Rubric for Chapter 2 Applications Defects Project(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=4f2ef46e-287d-4f50-a401-62ebe63bbc13) |

Select a Project

Overview/Purpose

Often we are overwhelmed by all of the possible improvement projects, and we do not know where to start. Companies need to have measurements that tell them how they are doing. These are often called KPI's (Key Performance Indicators) and measure things such as safety, quality, delivery, cost, productivity, and employee morale. Performance in these areas affect customer satisfaction which is the central focus of any organization trying to make a profit. A company needs to look at the measurements and determine where the most focus is needed. Identifying the greatest need and assigning valuable resources to those projects is what makes a continuous improvement program successful.

Target Competencies

|  |  |
| --- | --- |
| 1. | Select a Project  |
|  | Assessment Strategies |
|  | 1.1. | Written Product |
|  | 1.2. | Calculation Problems |
|  | 1.3. | Final Project Topic Submission |
|  | Criteria |
|  | Performance will be satisfactory when: |
|  | 1.1. | End of Chapter 3 Questions are correct |
|  | 1.2. | Chapter 3 Problems- Cost of Quality and Pareto are correct |
|  | 1.3. | Select Final Project Topic is approved for improvement project |
|  | Learning Objectives |
|  | 1.a. | Determine the cost of quality |
|  | 1.b. | Perform a pareto analysis |
|  | 1.c. | Create a SIPOC Map |
|  | 1.d. | Identify CTQs (critical to quality) |
|  | 1.e. | Determine root cause |

### Learning Activities

|  |  |
| --- | --- |
| 1. | Read Chapter 3 of text |
| 2. | Review Chapter 3 Power Point-Publisher Content |
| 3. | Review Root Cause Analysis Tools: Fishbone, 5 Whys  |
| 4. | Complete 'End of Chapter 3 Questions' identified in the assignmentOutput: Complete answers to include complete sentences for questions. Directions: Locate the end of chapter questions for Chapter 3 found on pg 86 of the textbook. Complete the following: 1.Reveiw Questions 16, 20. and 21. 2. Discussion Question 10. 3. Problems 2,6, and 10. Submission: Please attach the Word document with your responses to this assignment. Problems may be submitted as a Word or Excel file.  |
|  | Learning Materials |
|  | Rubric for End of Chapter 3 Questions | [Rubric for End of Chapter 3 Question(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=e84ab7d3-cad3-477e-9187-86e6c94ecd29) |
|  | Rubric for Final Project Selection Activity | [Rubric for Final Project Selection Activity(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=ff768741-a83d-47ff-a9b4-23333e3b0bf0) |
| 5. | Select Final Project TopicDirections: Select a project to follow through the course. A potential project at work would work well. Other possibilities could include: 1.Being late. 2. Running out of supplies. 3. Missed appointments. 4. Missed or late payments. Submission: Please attach the Word document with your responses to this assignment. It should include a paragraph defining the project, the scope, and why you have selected it.  |
|  | Learning Materials |
|  | Rubric for Final Project Selection Activity | [Rubric for Final Project Selection Activity(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=ff768741-a83d-47ff-a9b4-23333e3b0bf0) |

### Assessment Activities

|  |  |
| --- | --- |
| 1. | End of Chapter 3 Questions |
|  | Learning Materials |
|  | Rubric for End of Chapter 3 Questions | [Rubric for End of Chapter 3 Question(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=e84ab7d3-cad3-477e-9187-86e6c94ecd29) |
| 2. | Chapter 3 Problems- Cost of Quality and Pareto (publisher content) |
| 3. | Select Final Project Topic |
|  | Learning Materials |
|  | Rubric for Final Project Selection Activity | [Rubric for Final Project Selection Activity(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=ff768741-a83d-47ff-a9b4-23333e3b0bf0) |

Introduction to Creating a Charter

Overview/Purpose

The first step in the DMAIC model is Define. A project needs to be focused with a specific scope and expected outcome that feeds into a company's strategic direction. A charter is used to define the scope and purpose of a project. A charter is an important part of a Six Sigma project. It is the document that defines the purpose of the project, assigns the resources, determines the time line, and sets the boundaries. It is the contract that defines the work that will be done. Unlike a contract, it is a living document and will grow and change with the project. The project champion should take the time to create a strong charter using the input from the team

Target Competencies

|  |  |
| --- | --- |
| 1. | Create a Charter to Define a Project  |
|  | Assessment Strategies |
|  | 1.1. | Project |
|  | 1.2. | Written Product |
|  | Criteria |
|  | Performance will be satisfactory when: |
|  | 1.1. | Submit Final Project Charter Project- rubric |
|  | 1.2. | Written Product for Charter Web Search-Rubric |
|  | Learning Objectives |
|  | 1.a. | Create a problem statement |
|  | 1.b. | Determine project objectives to include metrics |
|  | 1.c. | Define the scope |
|  | 1.d. | Determine the relevance |
|  | 1.e. | Identify the needs of the customers |
|  | 1.f. | Create a project team |
|  | 1.g. | Schedule milestones |
|  | 1.h. | Identify needed resources |

### Learning Activities

|  |  |
| --- | --- |
| 1. | Read Creating an effective team charter online- or similar article. <http://www.processexcellencenetwork.com/lean-six-sigma-business-transformation/articles/applying-the-team-charter-to-a-department-of-publi/> |
| 2. | Review a six sigma project charter template found online. See an example for attached Google search <https://www.google.com/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=six%20sigma%20project%20charter%20template%20excel>  |
| 3. | Output: Recommendations for a Project Charter Directions: Complete the following: 1. Review web link discussing charters found in this module 2. Search and find at least 2 additional web sites that discuss what needs to be include in a good project charter 3. Discuss why each section is important and what is included in each 4. Create a final document that includes your personal recommendations of what to include Submission: Final Word document is to be attached to this assignment. Please remember to cite all resources.  |
|  | Learning Materials |
|  | Rubric for Charter Web Search | [Rubric for Charter Web Search Assignment(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=0a6372c6-2e60-4c8b-bd82-5a23a40b7012) |
| 4. | Output: Completed Project Charter Directions: Create a charter for the project you selected in the previous lesson. You may use the charter template included in this module or you may choose one that you have found or created. Submission: Attach the completed charter using a Word or Excel template to this assignment.    |
|  | Learning Materials |
|  | Rubric for Charter Project | [Rubric for Charter Project(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=5924e4ef-4ba1-46cc-9f37-64ce708d48c1) |

### Assessment Activities

|  |  |
| --- | --- |
| 1. | Charter Web Search |
|  | Learning Materials |
|  | Rubric for Charter Web Search | [Rubric for Charter Web Search Assignment(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=0a6372c6-2e60-4c8b-bd82-5a23a40b7012) |
| 2. | Final Project Charter Project |
|  | Learning Materials |
|  | Rubric for Charter Project | [Rubric for Charter Project(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=5924e4ef-4ba1-46cc-9f37-64ce708d48c1) |

Measure Process

Overview/Purpose

The second step in the DMAIC model is Measure. Data is so important in making decisions and determining root cause so a project needs a strong plan that includes what data is needed and how it will be collected accurately and efficiently. There is an infinite amount of data so it is important to narrow it down to just want is needed to make the project successful. The data can then be used to determine root cause and set a baseline to measure the success of the project in the future.

Target Competencies

|  |  |
| --- | --- |
| 1. | Measure a Process  |
|  | Assessment Strategies |
|  | 1.1. | End of Chapter 4 Questions |
|  | 1.2. | Chapter 4 Problems- Statistical Calculations, Process Index |
|  | 1.3. | R & R Project |
|  | 1.4. | Create final project measurement plan |
|  | Criteria |
|  | Performance will be satisfactory when: |
|  | 1.1. | End of Chapter 4 Questions are answered correctly |
|  | 1.2. | Chapter 4 Problems- Statistical Calculations, Process Index are correct |
|  | 1.3. | R & R Project is submitted to rubric standards |
|  | 1.4. | Create final project measurement plan is submitted to rubric standards |
|  | Learning Objectives |
|  | 1.a. | Select process metrics |
|  | 1.b. | Create a check sheet |
|  | 1.c. | Apply sampling |
|  | 1.d. | Perform statistical calculations using Excel |
|  | 1.e. | Create a histogram using Excel |
|  | 1.f. | Conduct a repeatability and reproducibility study |
|  | 1.g. | Conduct a process capability study |
|  | 1.h. | Calculate process capability index |

### Learning Activities

|  |  |
| --- | --- |
| 1. | Read Chapter 4 of text |
| 2. | Review Chapter 4 Power Point--Publisher Content |
| 3. | Review included online web sites that show Animated Processes   |
| 4. | Complete 'End of Chapter 4 Questions' identified in the assignmentOutput: Complete answers to include complete sentences for questions. Directions: Locate the end of chapter questions for Chapter 4 found on pg 127 of the textbook. Complete the following: 1.Reveiw Questions 1,5,7,16, and 17. 2. Discussion Question 3,4. Submission: Please attach the Word document with your responses to this assignment. Problems may be submitted as a Word.  |
|  | Learning Materials |
|  | Rubric for Chapter 4 Questions | [Rubric for End of Chapter 4 Question(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=3e427064-088a-4f5d-b440-16eead94aaa7) |
| 5. | Complete Chapter 4 ProblemsOutput: Completed problems Directions: 1.Complete Problems 1,8,12 using Student Champion Site Data. Submission: Please attach the Excel file for problem solutions.  |
|  | Learning Materials |
|  | Rubric for Chapter 4 Problems | [Rubric for Chapter 4 Problems(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=70e795d1-49c6-4a28-8a80-e227cdc7d1cc) |
| 6. | Complete Gage R&R projectOutput: Personal R&R Project Directions: 1.Select an item (must have at least 10 samples). 2. Enlist two additional operators to help you (you being the third operator). 3. Select a measuring tool and have each operator measure the samples. 4. Enter the data in the R&R spreadsheet provided. 5. Write a summary paragraph on your findings. Submission: Please attach the Excel Spreadsheet and summary paragraph to this assignment. Excel spreadsheet--Publisher Content |
|  | Learning Materials |
|  | Rubric for R and R Individual Project | [Rubric for R and R Individual Project(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=190916df-bc71-4a7c-8a39-e623d2762472) |
| 7. | IMPORTANT: Begin to use the tools selected to start collecting data for your final projectOutput: Complete measurement plan for final project. Directions: Create a measurement plan to support the final project you have select. Possible tools could include: 1.Checklists. 2. Data collection tools. 3. Gage R&R. 4.Process maps. 5. Before graphics. 6. Sampling. 7. Histograms. 8. Statistical Tools. Submission: Please attach the Word document with your plan. Include a detailed plan of what tools you will use and how the data will be collected.  |
|  | Learning Materials |
|  | Rubric for Final Project Measurement Plan | [Rubric for Final Project Measurement Plan(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=dd8a54d5-23ba-4f12-ba59-246c7880ad41) |

### Assessment Activities

|  |  |
| --- | --- |
| 1. | End of Chapter 4 Questions |
|  | Learning Materials |
|  | Rubric for Chapter 4 Questions | [Rubric for End of Chapter 4 Question(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=3e427064-088a-4f5d-b440-16eead94aaa7) |
| 2. | Chapter 4 Problems- Statistical Calculations, Process Index |
|  | Learning Materials |
|  | Rubric for Chapter 4 Problems | [Rubric for Chapter 4 Problems(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=70e795d1-49c6-4a28-8a80-e227cdc7d1cc) |
| 3. | R & R Project |
|  | Learning Materials |
|  | Rubric for R and R Individual Project- | [Rubric for R and R Individual Project(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=190916df-bc71-4a7c-8a39-e623d2762472) |
| 4. | Create final project measurement plan |
|  | Learning Materials |
|  | Rubric for Final Project Measurement Plan | [Rubric for Final Project Measurement Plan(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=dd8a54d5-23ba-4f12-ba59-246c7880ad41) |

Analyze a Process

Overview/Purpose

The third step in the DMAIC model is Analyze. Six Sigma is based on data and depends on data based decisions. This section has a lot of statistical tools covered so make sure to contact the instructor with any questions.

Target Competencies

|  |  |
| --- | --- |
| 1. | Analyze a Process  |
|  | Assessment Strategies |
|  | 1.1. | Chapter Questions |
|  | 1.2. | Case Study |
|  | 1.3. | Project |
|  | Criteria |
|  | Performance will be satisfactory when: |
|  | 1.1. | End of Chapter 5 Questions and Problems are submitted correctly |
|  | 1.2. | Root Cause Analysis Assignment is correct based on rubric |
|  | 1.3. | Analyze data for final project is correct based on rubric |
|  | Learning Objectives |
|  | 1.a. | Define probability distributions |
|  | 1.b. | Define sampling distribution |
|  | 1.c. | Calculate confidence intervals |
|  | 1.d. | Conduct hypothesis testing |
|  | 1.e. | Apply regression and correlation |
|  | 1.f. | Apply ANOVA |
|  | 1.g. | Create recommendations based on data analysis |
|  | 1.h. | Determine root cause |

### Learning Activities

|  |  |
| --- | --- |
| 1. | Read Chapter 5 of text |
| 2. | Review Chapter 5 Power Point--Publisher Content |
| 3. | Complete 'End of Chapter 5 Questions' identified in the assignment – publisher contentOutput: Complete answers to include complete sentences for questions. Directions: Locate the end of chapter questions for Chapter 5 found on pg 193 of the textbook. Please complete: 1. Review Questions 2,5,7,10,11,13 and 16 Submission: Please attach the Word document with your responses to this assignment using complete sentences.  |
|  | Learning Materials |
|  | Rubric for End of Chapter 5 Questions | [Rubric for End of Chapter 5 Questions(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=9ef20bdc-d804-4db9-ad79-4bef7cfdcbc8) |
| 4. | Complete Chapter 5 ProblemsOutput: Completed Excel Files Directions: Locate the end of chapter questions for Chapter 5 found on pg 193 of the textbook. Please complete: 1. Problems 1,3,6,8,9,10,13,16, and 19 Submission: Attach the Excel files for completed problems  |
|  | Learning Materials |
|  | Rubric for Chapter 5 Problems | [Rubric for Chapter 5 Problems(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=9c10a1af-d378-45a7-b18f-7757c80ca038) |
| 5. | Output: Fishbone Diagram and 5 Why Analysis Directions: Review the Fishbone Power Point and the 5 Why link and create the following: 1.Construct a Fishbone Diagram. 2. Select a 'bone'/cause from your fishbone diagram to complete a 5 Why analysis. Include a paragraph at the end that discusses the difference between a fish bone diagram and a 5 Why anaylsis. Discuss when each would be used and the relationship between the two.. Submission: Please attach the Word document with your responses to this assignment. Fishbone diagram may be handwritten, scanned and attached.    |
|  | Learning Materials |
|  | 5 Why DMAIC Tools | https://www.dmaictools.com/dmaic-analyze/5-why/ |
| 6. | IMPORTANT: Continue to use the tools selected in the previous section to collect data for your final project.Output: Completed final project analysis. Directions: Create an analysis plan for the final project. Use appropriate tools to analyze data collected in the measurement plan for your final project. This assignment can be submitted later if data collection has not been completed due to time required to collect data. Submission: Please attach the Word document with your methods used to analyze and the results.  |
|  | Learning Materials |
|  | Rubric Final Project Analysis | [Rubric for Final Project Analysis Plan(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=ae9a427b-414b-4cbf-ae36-90f82104a283) |

### Assessment Activities

|  |  |
| --- | --- |
| 1. | Chapter 5 Questions |
|  | Learning Materials |
|  | Rubric for End of Chapter 5 Questions | [Rubric for End of Chapter 5 Questions(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=9ef20bdc-d804-4db9-ad79-4bef7cfdcbc8) |
| 2. | Chapter 5 Problems |
|  | Learning Materials |
|  | Rubric for Chapter 5 Problems | [Rubric for Chapter 5 Problems(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=9c10a1af-d378-45a7-b18f-7757c80ca038) |
| 3. | Analyze data for Final Project |
|  | Learning Materials |
|  | Rubric Final Project Analysis | [Rubric for Final Project Analysis Plan(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=ae9a427b-414b-4cbf-ae36-90f82104a283) |

Improve a Process

Overview/Purpose

Improvement is the fourth step in the DMAIC model. It is the step when a countermeasure is implemented, and the team starts to see the results of their hard work. It is important to use the information from the prior steps so that the plan implemented addresses the root cause. It is very important to have a strong implementation plan that includes the “who will do what and when”.

Target Competencies

|  |  |
| --- | --- |
| 1. | Improve a Process  |
|  | Assessment Strategies |
|  | 1.1. | Chapter Questions |
|  | 1.2. | Project |
|  | Criteria |
|  | Performance will be satisfactory when: |
|  | 1.1. | End of Chapter 6 Questions are submitted correctly |
|  | 1.2. | PDCA Project is submitted correctly by rubric standards |
|  | 1.3. | Kaizen Event Activity submitted correctly by rubric standards |
|  | 1.4. | Final project improvement plan submitted correctly by rubric standards |
|  | Learning Objectives |
|  | 1.a. | Implement PDCA |
|  | 1.b. | Analyze a process map |
|  | 1.c. | Plan a kaizen event |
|  | 1.d. | Implement lean tools into a Six Sigma project |
|  | 1.e. | Conduct a brainstorming session |

### Learning Activities

|  |  |
| --- | --- |
| 1. | Read Chapter 6 of text |
| 2. | Review Chapter 6 Power Point-Publisher Content |
| 3. | Complete PDCA Activity |
|  | Learning Materials |
|  | PDCA Exercise | [PDCA Exercise.docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=09ba0ec2-f31f-4dd8-a4cc-4bd9602f3460) |
|  | Rubric for PDCA Activity | [Rubric for PDCA Activity(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=1ac9cd84-fe0c-425c-8db0-25d664541828) |
| 4. | Complete Process Map ExerciseOutput: Completed Process Map and Improvement Plan Directions: Complete Problem 2 Textbook page 214 Submission: Please attach the Word document with improvement plan and flow chart.  |
|  | Learning Materials |
|  | Rubric for Analyze a Process Map | [Rubric for .Analyze a Process Map.Activity(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=88a74a82-3f76-4144-a39d-cd83af367fa1) |
| 5. | Complete Kaizen Planner by Productivity Press—Copyright itemOutput: Completed Kaizen Planner Directions: 1.Reveiw the attached Kaizen Planner. 2.Select a Lean Tool options include 5S, TPM, Mistake Proofing, Standard Work, Kanban, Value Stream Mapping (Review Lean tools if required). 3.Create a Kaizen Planner to implement your selected tool. Submission: Attach the completed the Kaizen Planner  |
|  | Learning Materials |
|  | Rubric for Kaizen Planner Assignment | [Rubric for Kaizen Planner Assignment(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=f133be57-224e-43d4-bc6e-9a3c1f1fee46) |
| 6. | Complete Brainstorming ResearchOutput: Brainstorming Research Paper- 250 words or more Directions: 1.Research Brainstorming 2.Select a tool 3.Write a paper that includes: definition of the tool, how it is used, the best application, and how it can be used in an improvement project. 4.Include sources and required citations Submission: Please attach the Word document with your responses to this assignment  |
|  | Learning Materials |
|  | Rubric for Brainstorming Activity | [Rubric for Brainstorming Activity(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=1aa8630c-0e48-4818-a1cf-ac38bee226e4) |
| 7. | Final Project Implementation PlanOutput: Implementation plan that includes the Who, What, and When to address final project. Directions: Complete the following: 1. Determine tool(s) to be used 2. Create a plan for implementing the tools selected Submission: Please attach Word document that includes tool selected and why, and a complete implementation plan that includes who will do what when  |
|  | Learning Materials |
|  | Rubric for Final Project Implementation Plan | [Rubric for Final Project Implementation Plan(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=e176b729-7d7f-4592-a450-a0241a1ba358) |

### Assessment Activities

|  |  |
| --- | --- |
| 1. | PDCA Project |
|  | Learning Materials |
|  | Rubric for PDCA Activity | [Rubric for PDCA Activity(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=1ac9cd84-fe0c-425c-8db0-25d664541828) |
| 2. | Kaizen Event Activity |
|  | Learning Materials |
|  | Rubric for Kaizen Planner Assignment | [Rubric for Kaizen Planner Assignment(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=f133be57-224e-43d4-bc6e-9a3c1f1fee46) |
| 3. | Brainstorming Activity |
|  | Learning Materials |
|  | Rubric for Brainstorming Activity | [Rubric for Brainstorming Activity(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=1aa8630c-0e48-4818-a1cf-ac38bee226e4) |
| 4. | Final Project Improvement Plan |
|  | Learning Materials |
|  | Rubric for Final Project Implementation Plan | [Rubric for Final Project Implementation Plan(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=e176b729-7d7f-4592-a450-a0241a1ba358) |

Control a Process

Overview/Purpose

The fifth and final step in the DMAIC model is control. This is a very important step because it monitors and controls the new process to insure it continues to maintain the improvements as well as giving the team feedback. This step also helps to identify future projects.

Target Competencies

|  |  |
| --- | --- |
| 1. | Control a Process  |
|  | Assessment Strategies |
|  | 1.1. | Chapter Questions |
|  | 1.2. | Project |
|  | Criteria |
|  | Performance will be satisfactory when: |
|  | 1.1. | End of Chapter 7 Questions are answered correctly |
|  | 1.2. | Final Project Control Plan is submitted correctly based on rubric |
|  | Learning Objectives |
|  | 1.a. | Create a control system |
|  | 1.b. | Construct a control chart for variable data |
|  | 1.c. | Construct a control chart for attribute data |
|  | 1.d. | Analyze control chart patterns |
|  | 1.e. | Implement SPC |

### Learning Activities

|  |  |
| --- | --- |
| 1. | Read Chapter 7 of text |
| 2. | Review Chapter 7 Power Point-Publisher Content |
| 3. | Review 'Choosing a Control Chart' website |
|  | Learning Materials |
|  | Which Control Chart Should You Use? | <http://www.pqsystems.com/qualityadvisor/DataAnalysisTools/controlchartselection.php>  |
| 4. | Complete 'End of Chapter 7 Questions Output: Complete answers to include complete sentences for questions. Directions: Locate the end of chapter questions for Chapter 7 found on pg 261 of the textbook. Please complete: 1. Review Questions 1,4. and 5 2. Discussion Question 1 Submission: Please attach the Word document with your responses to this assignment using complete sentences.  |
|  | Learning Materials |
|  | Rubric for Chapter 7 Questions | [Rubric for End of Chapter 7 Question (SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=eb5a8ec5-5c73-4107-bd48-4f70f23f6aa8) |
| 5. | Output: Complete the activity to include complete sentences when required. Directions: Locate the end of chapter questions for Chapter 7 found on pg 261 of the textbook. Please complete: 1. Things to Do #3 Submission: Please attach the Word document with your responses to this assignment using complete sentences. Attach the Excel files for completed problems.  |
|  | Learning Materials |
|  | Rubric for Things to Do | [Rubric for Things to Do Chapter 7(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=618647f3-446d-48d4-83f9-7f535a2c1e0e) |
| 6. | Output: Completed problems with attached Excel files. Directions: Locate the end of chapter problems for Chapter 7 found on pg 263 of the textbook. Please complete: 1. Problems 2,7, and 10 Submission: Attach the Excel files for completed problems.  |
|  | Learning Materials |
|  | Rubric for Chapter 7 Problems | [Rubric for Chapter 7 Problems(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=c727f71d-b4ed-4a5a-9f43-e64408d03765) |
| 7. | Output: Completed control plan Directions: Create a control plan for maintaining your improvement. It should include audits, control charts, and metrics as required. Submission: Please attach the Word document with your plan to this assignment.  |
|  | Learning Materials |
|  | Rubric for Final Project Control Plan | [Rubric for Final Project Control Plan(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=291b36fb-806d-4f87-9e17-5390b262c1d2) |

### Assessment Activities

|  |  |
| --- | --- |
| 1. | End of Chapter 7 Questions |
|  | Learning Materials |
|  | Rubric for Chapter 7 Questions | [Rubric for End of Chapter 7 Question (SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=eb5a8ec5-5c73-4107-bd48-4f70f23f6aa8) |
| 2. | Chapter 7 Things to Do #3 |
|  | Learning Materials |
|  | Rubric for Things to Do | [Rubric for Things to Do Chapter 7(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=618647f3-446d-48d4-83f9-7f535a2c1e0e) |
| 3. | Chapter 7 Problems |
|  | Learning Materials |
|  | Rubric for Chapter 7 Problems | [Rubric for Chapter 7 Problems(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=c727f71d-b4ed-4a5a-9f43-e64408d03765) |
| 4. | Final Project Control Plan |
|  | Learning Materials |
|  | Rubric for Final Project Control Plan | [Rubric for Final Project Control Plan(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=291b36fb-806d-4f87-9e17-5390b262c1d2) |

Implement Six Sigma

Overview/Purpose

The main focus of the final lesson is to pull together your Six Sigma project. Each section has already been evaluated so any feedback received should be incorporated into the final project. Make sure the final project submission is very professional, easy to follow, and flows nicely from one section to another. Make sure that you continue to monitor the project and use the tools from the control step. Congratulation on completion of a Lean-Six Sigma project.

Target Competencies

|  |  |
| --- | --- |
| 1. | Implement Six Sigma  |
|  | Assessment Strategies |
|  | 1.1. | Chapter Questions |
|  | Criteria |
|  | Performance will be satisfactory when: |
|  | 1.1. | Chapter questions are submitted correctly |
|  | Learning Objectives |
|  | 1.a. | Manage effective projects |
|  | 1.b. | Create cultural change |
|  | 1.c. | Support leadership |

### Learning Activities

|  |  |
| --- | --- |
| 1. | Read Chapter 9 of text |
| 2. | Review Chapter 9 Power Point-Publisher Content |
| 3. | Complete 'End of Chapter 9 Questions' identified in the assignment (publisher content)Output: Complete answers to include complete sentences for questions. Directions: Locate the end of chapter questions for Chapter 9 found on pg 337 of the textbook. Please complete: 1. Discussion Question 7 Submission: Please attach the Word document with your responses to this assignment using complete sentences.  |
|  | Learning Materials |
|  | Rubric for Chapter 9 Question | [Rubric for Chapter 9 Question(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=afc0cf03-5142-4a81-8ea0-d9539c4bf6c6) |
| 4. | Submit Final ProjectOutput: Final Project Directions: Pull together all assignments to create a complete project. Make any changes and improvements prior to submitting. 1. Selection. 2. Charter. 3. Measurement. 4. Analysis. 5. Implementation Plan. 6. Control Plan.. Note: Each section has already been evaluated so any feedback received should be incorporated into the final project. Make sure the final project submission is very professional, easy to follow, and flows nicely from one section to another. Make sure that you continue to monitor the project and use the tools from the control step. Submission: Please attach the final project to this assignment.  |
|  | Learning Materials |
|  | Rubric for Competency 9 Final Project | [Rubric for Competency 9 Final Project Submission(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=bdfee135-7866-4e80-b527-5ee423b549f3) |

### Assessment Activities

|  |  |
| --- | --- |
| 1. | Chapter 9 Questions |
|  | Learning Materials |
|  | Rubric for Chapter 9 Question | [Rubric for Chapter 9 Question(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=afc0cf03-5142-4a81-8ea0-d9539c4bf6c6) |
| 2. | Final Project |
|  | Learning Materials |
|  | Rubric for Competency 9 Final Project | [Rubric for Competency 9 Final Project Submission(SWTC).docx](https://swtc.wids.org//PublicDocuments.axd?DocumentID=bdfee135-7866-4e80-b527-5ee423b549f3) |

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