air academy ASSOCIATES

Introduction to Lean Six Sigma

www.airacad.com

User Agreement and Copyright Information

- This recording and the accompanying guide contain copyrighted and proprietary content of Air Academy Associates, LLC. You are authorized to use this material for personal reference, but not for any commercial use. You may not modify, license, sub-license, distribute, copy, translate or create derivative works based on this guide, in part or in whole, without permission from Air Academy Associates.

- Other copyright information:

  – Six Sigma is a service mark of Motorola, Inc. Microsoft® and Excel® are registered trademarks of Microsoft Corporation in the United States and in other territories.

  – SPC XL™ and DOE Pro XL™ are copyright SigmaZone.com and Air Academy Associates, LLC. You may not copy, modify, distribute, display, license, reproduce, sell or use commercially any screen shots or any component contained therein without the express written permission of SigmaZone.com and Air Academy Associates, LLC. All rights reserved. SigmaZone.com may be contacted at www.SigmaZone.com. Air Academy Associates may be contacted at www.airacad.com.

Introduction to Lean Six Sigma

- In this session, we will discuss:
  - The What and Why of Lean Six Sigma (LSS)
  - Waste and Variation
  - The DMAIC roadmap / methodology
  - Key players and roles in LSS
  - Lean Six Sigma projects

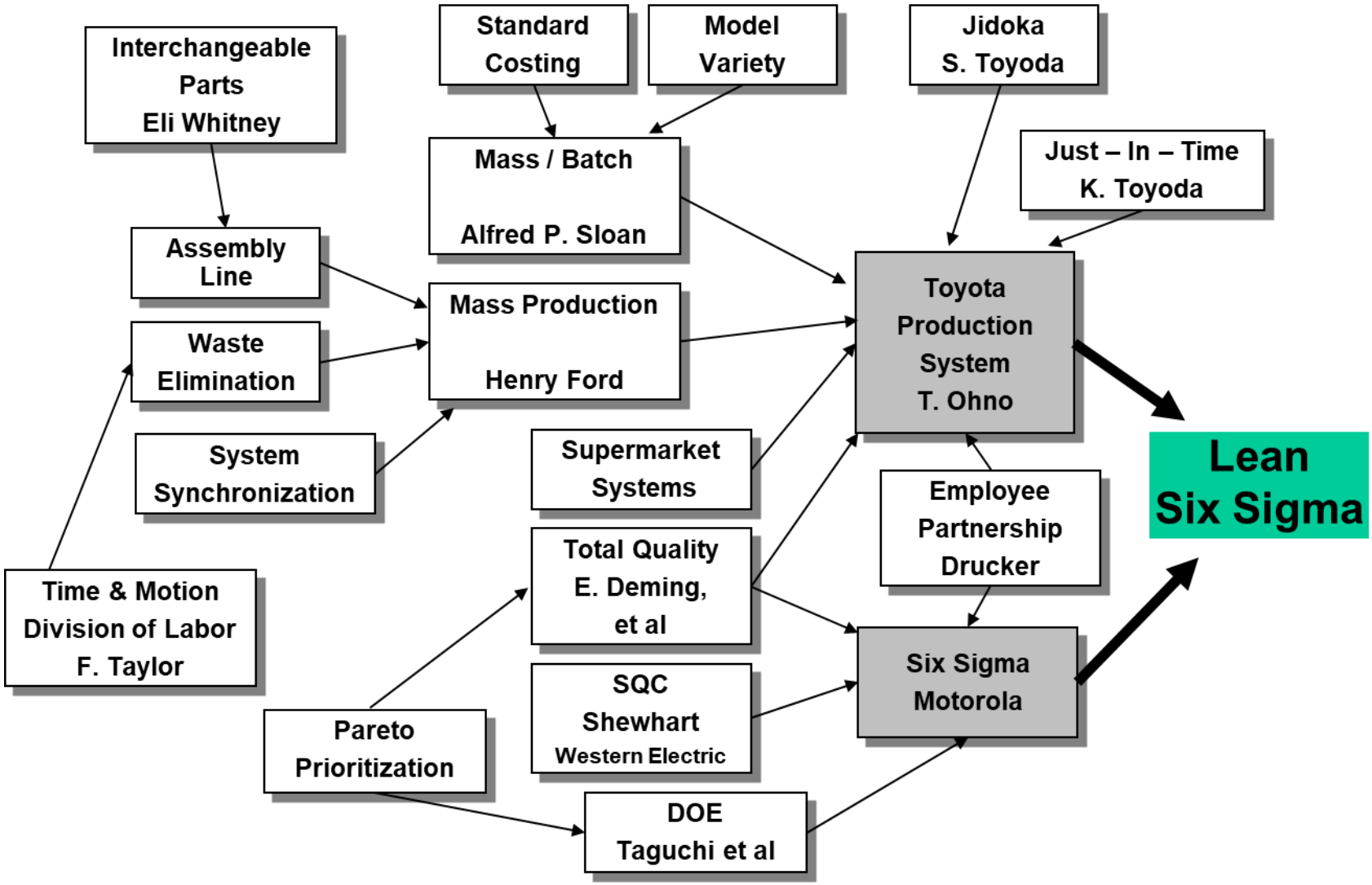
- A list of supplemental material and additional practice/review questions for this session are provided at the end of this presentation
- You can download the pdf of this presentation, along with any supporting data files, on the site where you are accessing this course

What is Lean Six Sigma

- Customer-Focused Business Improvement Strategy
- Driven by market requirements and business leaders
- Using a powerful methodology and
- Empowered teams with proven and powerful tools to
- Leverage talent and
- Deliver **greater value to the customer**

- **Better** products and services
- **Faster** to market
- **Lower cost**

Where Did It Come From?



The Major Reasons LSS Exists

…. to reduce the Cost of Poor Quality (COPQ) and the Cost of Waste (COW) …. to reduce

- Internal Failure Costs (incurred prior to reaching customer)
- External Failure Costs (incurred after reaching customer)
- Appraisal Costs
- Lost Opportunity Costs
- The usual suspects:

Waste & Variation

The 8 Wastes: D-O-W-N-T-I-M-E

1. Defects
2. Overproduction
3. Waiting
4. Non-productive assets
5. Transportation
6. Inventory
7. Motion
8. Extra processing

Variation and Sigma (σ)

- σ is called the standard deviation
- It is a measure of variation

σ Capability is a measure of process capability. It compares the Voice of the Process with the Voice of the Customer and is correlated to the defect rate. It is computed from DPMO.

Yield is the probability that whatever we are producing (manufactured part, PO, shipped part, etc.) will pass through the entire process without rework and without defects.

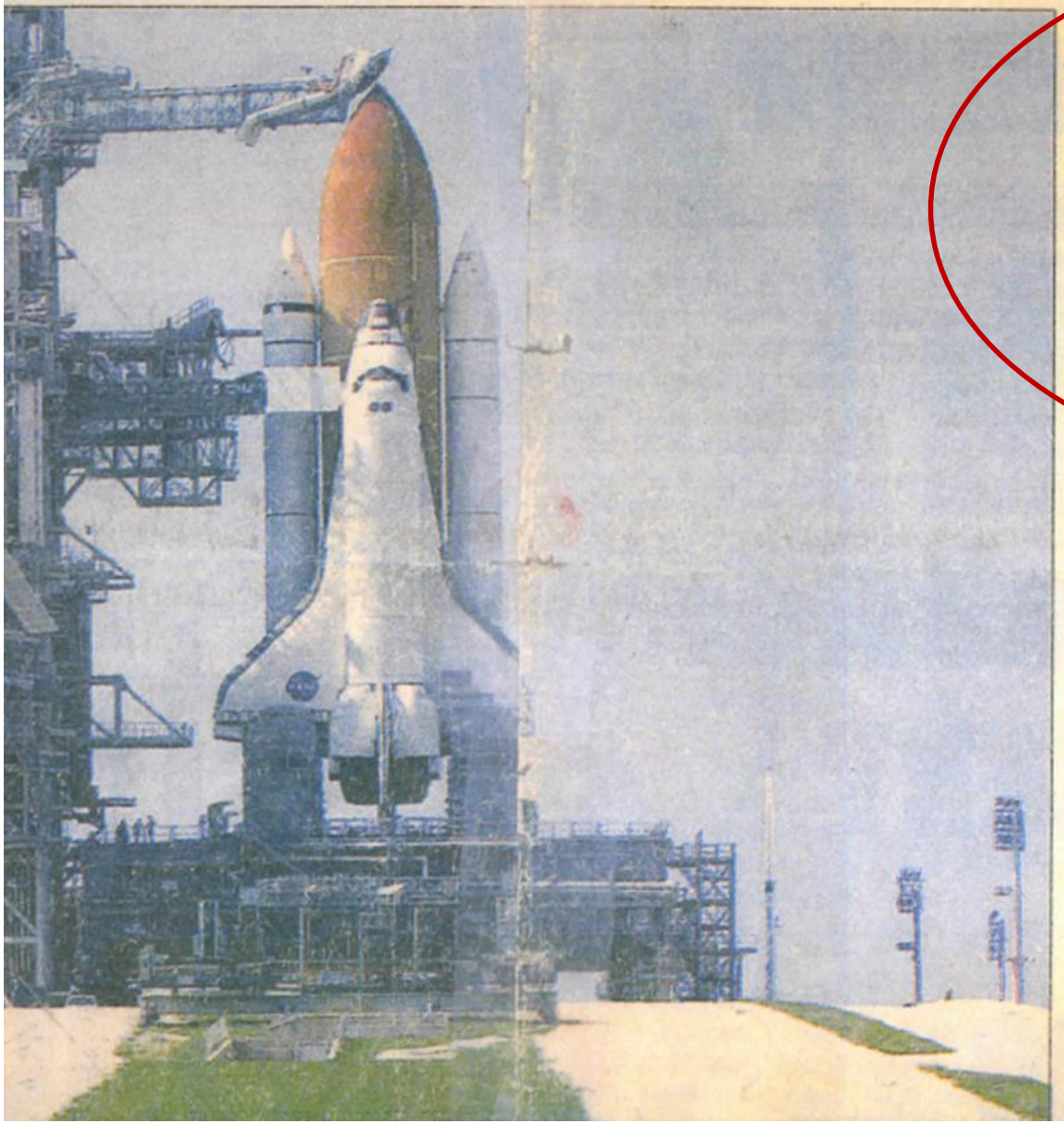
σ Capability	DPMO	RTY
2	308,537	69.1%
3	66,807	93.3%
4	6,210	99.4%
5	233	99.97%
6	3.4	99.99966%

Process Capability	Defects per Million Opportunities	Rolled Throughput Yield

Six Sigma is a standard of Excellence.
It means less than 4 Defects per Million Opportunities.

1/100 = 0.01 = 10,000 DPMO = 3.8 Sigma Capability

RETURN TO SPACE | DISCOVERY'S LAUNCH



NASA puts risk of failure at 1 in 100

THE NEW YORK TIMES

With new realism born of disaster, NASA says the risk of catastrophic failure during the Discovery's mission to the International Space Station is about 1 in 100 — more than twice as great as an upbeat estimate issued before the loss of the Columbia in 2003.

Discovery's launch from Cape Canaveral, Fla., is scheduled for 8:39 a.m. MDT today.

Although NASA is still working on an official estimate, said spokesman Allard Beutel, it has devised a rough one that will be refined by insights from the investigation of the Columbia disaster, in which seven astronauts died as the ship re-entered the Earth's atmosphere Feb. 1, 2003.

The rise in estimated danger, Beutel said, came about "be-

ABOUT THE LAUNCH

Launch: Scheduled for 8:39 a.m. MDT today.

Weather: 40 percent chance of conditions unfavorable for a launch.

Mission: A 12-day supply and repair mission to the International Space Station

Lean + Six Sigma ... A Powerful Combination

Traditional Lean
(Flow + Speed)

- Goal - remove wasted efforts and increase process speed
- Focus - identify non-value added activities and causes of delays, to improve the flow of value at the pull of the customer
- Method – value stream tools, teams, gemba walks

Traditional Six Sigma
(Quality + Culture)

- Goal - improve performance and quality
- Focus - eliminate defects and reduce variation; data-driven
- Method – DMAIC methodology and tools, teams, leadership engagement, Green and Black Belts, Project Champions / Sponsors

Lean Six Sigma Combines the Proven and Powerful Elements of Both Lean and Six Sigma

Lean SPEED Enables Six Sigma Quality

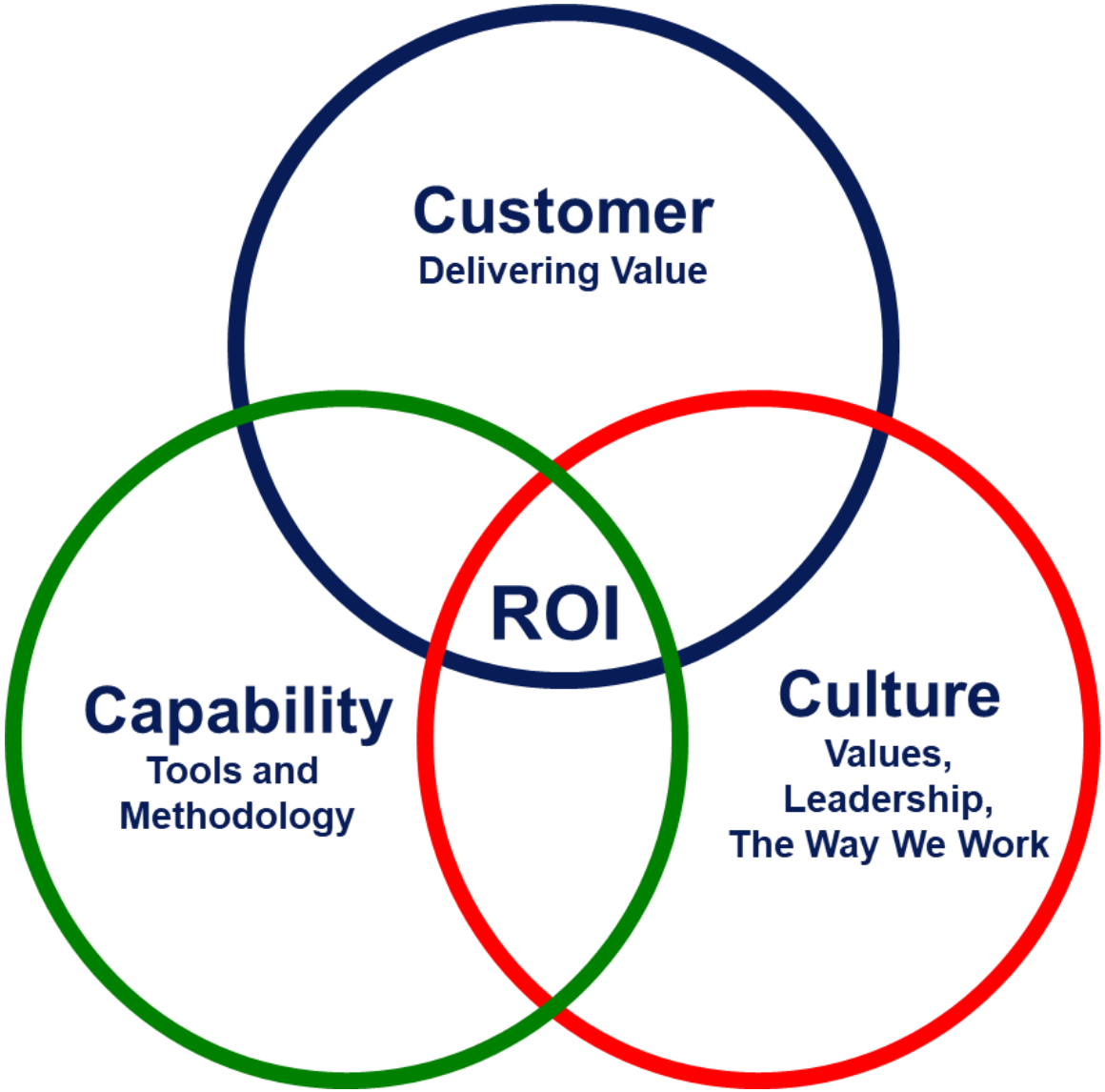
Six Sigma QUALITY Enables Lean Speed

Reduced COST ($$$$)

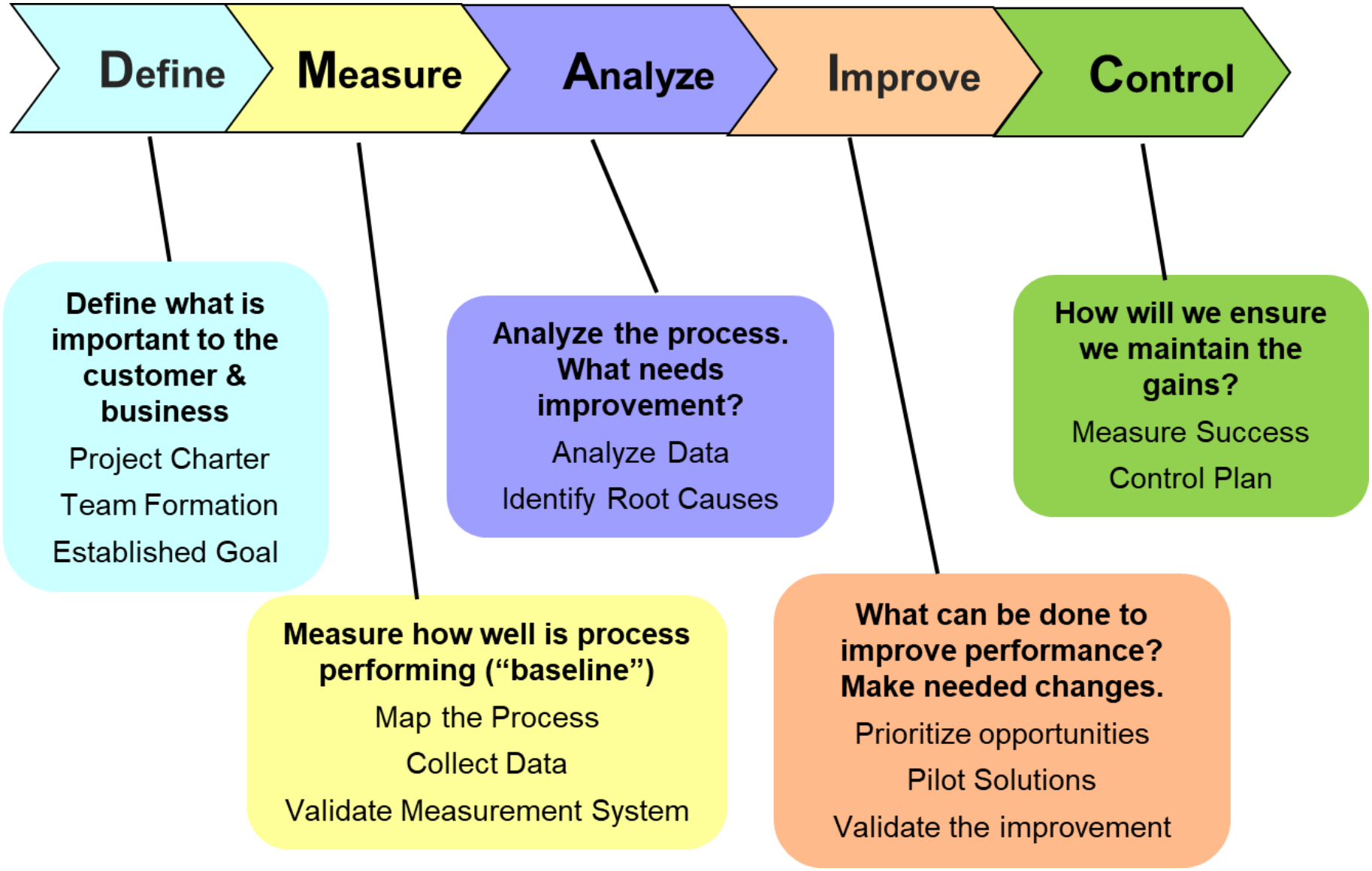
The 5 Guiding Principles of Lean Six Sigma

1. Specify value in the eyes of the Customer
   - Learn to see your processes from the perspective of your customer
2. Identify the value stream and eliminate waste/variation
   - Look at the combination of processes, not just a single process in isolation (how value is created for the customer), and remove waste and variation
3. Make value flow smoothly at the pull of the customer
   - Wait until you know what the customer wants before you start, and eliminate bottlenecks and impediments
4. Involve, align, and empower employees
   - Develop solutions using the people who are currently working in the process
5. Continuously improve knowledge in pursuit of perfection
   - Constantly challenge the organization to continue to learn more and more about their processes

The Impact Zones of Lean Six Sigma



DMAIC: A Powerful Problem Solving Methodology / Roadmap



DMAIC: Tools and Techniques

Define	Measure	Analyze	Improve	Control
Benchmarking	Data Template	Affinity Diagram	DOE	Benefits Capture
Gemba Walks	Variables Data	Brainstorming	Pairwise Comparison	Control Charts
Ohno Circles	Attribute Data	Cause & Effect Diagram	Multi-Voting	Control Plan
Interviews	Histogram	Constraint Analysis	Nominal Group Technique	Standard Work
IPO Diagram	Pareto Diagram	e-test	High Throughput Testing	Reaction Plan
Thematic Content Analysis	Measurement System Analysis	F-test	Kaizen	Run Charts
Kano's Model	Physical Process Flow	5 Whys	Kanban	
Knowledge Based Mgt	Process Capability Analysis	Fault Tree Analysis	Line Balancing	
SIPOC Model	Process Flow Diagram	Reality Tree	PF/CE/CNX/SOP	
Quality Function Deployment	Process Observation	FMEA	Mistake Proofing	
Voice of Customer	Time Value Map	Force Field Analysis	Setup Reduction	
8 Wastes	Waste Analysis	Histogram	Strategic Inventories	
Value Stream Mapping	Work Sampling	Historical Data Analysis	Takt Time	
		Regression Analysis	Theory of Constraints	
		Scatter Diagram	Total Productive Maintenance	
		t-test	TRIZ	
		Thematic Content Analysis	5S	
		Tukey End Count Test	Workplace Organization	

Note: Tools May Be Used In Multiple Phases

DMAIC Quick Reference.pdf

Lean Six Sigma Infrastructure … Roles and Responsibilities

Deployment Champion (Leader)	The Deployment Champion (Leader) is responsible for deploying and implementing LSS throughout an organization. This Champion will coach the Leadership team and project Champions in the deployment.
Project/Study Champions	Project champions ("sponsors") are responsible for chartering and supporting a LSS project or study, ensuring that it crosses the finish line.
GREEN BELT	Green Belts are competent in the core competency areas of LSS and can apply these tools and methods within their functional areas on a daily basis. Green Belt projects are typically smaller in scope, and may involve studies supporting Black Belt projects.
BLACK BELT	The Black Belt is a key resource for LSS projects. They are competent in a broad spectrum of the LSS tools and methods, and thus can be assigned to technically mentor (coach) Green Belts. They typically lead larger-scoped projects. They should be people targeted for future leadership roles.
MASTER BLACK BELT	A Master Black Belt is a technical mentor and resource for BBs and GBs. MBBs provide coaching and may also provide training. A Master Black Belt is an experienced Black Belt who has completed several significant projects as well as received additional training in LSS and advanced techniques.

The Role of a Green Belt or Black Belt is to …

- Develop required competency to support DMAIC improvement process - Proficient in the basic Lean Six Sigma tools
- Lead Lean Six Sigma project team through the process
- Assist management in identifying key performance issues to measure, set goals, improve, document, and sustain gains
- Take charge in areas of needed improvement identified by their Sponsor. Rigorously analyzes the causes of problems and helps develop strong and lasting countermeasures
- Provide leadership within their area of expertise plus the use of Lean Six Sigma philosophies and methodologies
- Promote out-of-the-box and critical thinking
- Motivate others to set and accomplish stretch goals using Lean Six Sigma philosophies and methodologies

The Role of a Project Sponsor (Champion)

- Knows the basic what and why of Lean Six Sigma
- Identifies and defines key projects that can best benefit the organization
- Helps identify belt candidates and aligns them with the projects
- Provides financial and organizational resources to train and equip belts to accomplish project goals
- Reviews and discusses project progress
- Helps create and maintain project momentum
- Breaks down barriers to project completion and helps push the project over the finish line
- Recognizes and rewards success
- Propagates and communicates success stories to generate cultural change

Lean Six Sigma Projects

- Projects play a vital role
  - Gain confidence with DMAIC and put the tools learned into practice
  - Generate verifiable business benefits and deliver customer value
  - They provide the focus and accountability needed to get the job done

- Project opportunities – Where to Find Projects?
  - “Burning issues” in the organizations (bottlenecks, problems, etc.)
  - Customer needs, issues, complaints
  - Processes with long cycle times, high rework and/or defect rates
  - Business needs, strategic goals
  - Key metrics (operating costs, revenue, inventory, etc.) moving in the wrong direction or needing improvement

Lean Six Sigma Project Charter

- Every LSS project should have a project charter. The belt candidate and the project sponsor/champion should work together on this
- Prepare a draft Project Charter to help organize your thoughts and gather initial information
- The charter communicates key information about the project such as the problem statement, business benefit, and project goals and measures
- The following file provides an electronic format for completing a project charter:

Lean Six Sigma Project Charter.xlsx

Lean Six Sigma Project Charter

Project Name:		**Project Start Date:**	
Your name:		**Target Completion Date:**	
Division/Location:			
Project Sponsor:			
1. Product / Process	Describe the product or process involved		
2. Problem Statement	Describe the current pain. Why are you working on this project?		
3. Business Benefit (Impact)	Describe the importance to the business. What is cost of doing nothing or the estimated return?		
4. Project Goal(s)	List the specific goals of this project.		
5. Project Measure(s)	What are the primary and secondary metrics? Note baseline data for each (if available) and goal.	**Primary Measure(s)**	**Secondary Measure(s)**
6. Customers and Suppliers	Who are the customers and suppliers? What are their critical requirements or concerns?		
7. Project Team	List your team members and their department/function/role.		
8. Percent of Time Dedicated to Project	For planning purposes, indicate what % of time you will devote to this project		

Concurrence:	*Initiation (signature/date)*	*Completion (signature/date)*
Green / Black Belt:		
Project Sponsor/Champion:		

Characteristics of a Good LSS Project

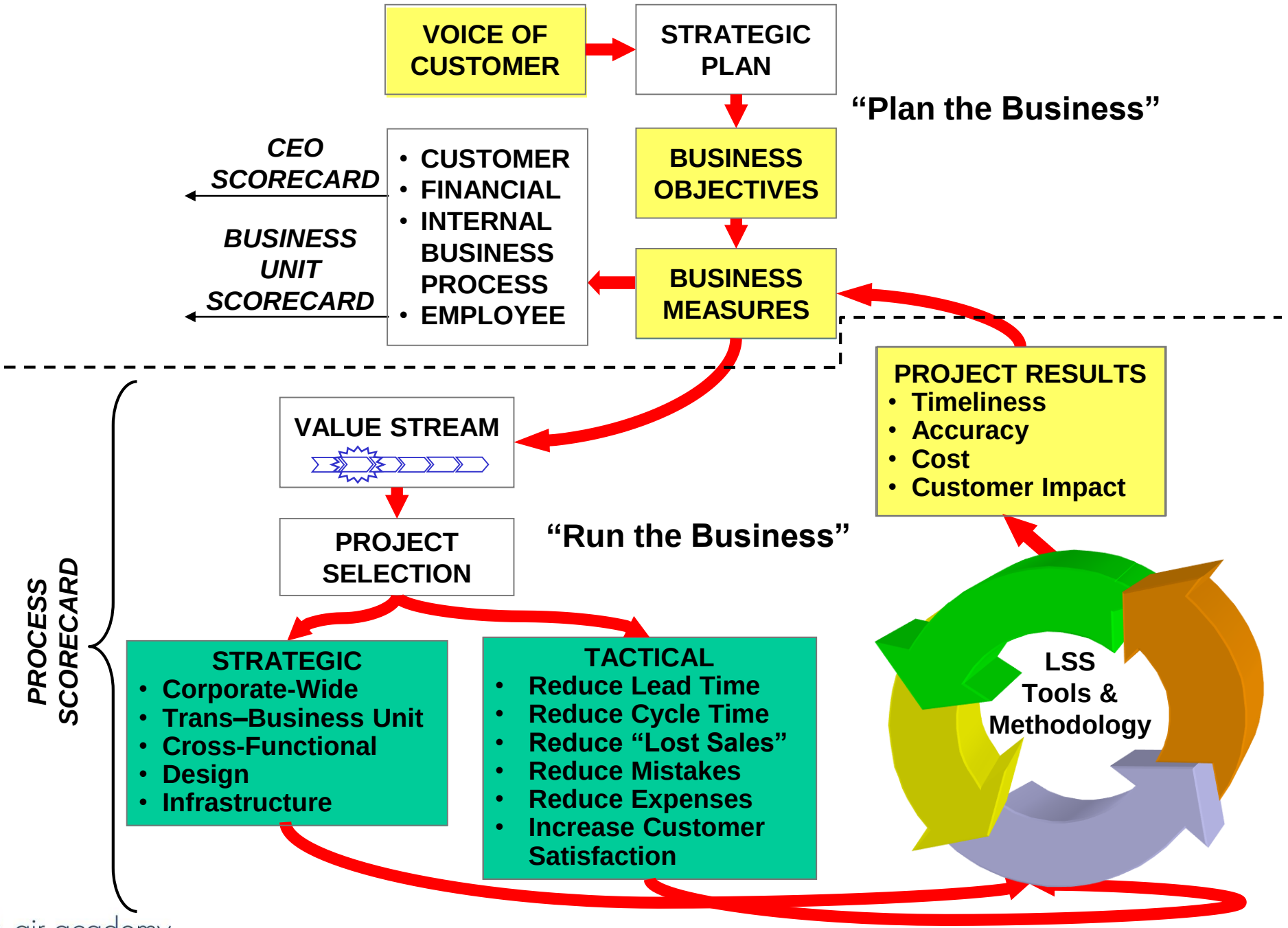
- Has no known or preferred solution in advance
- Is aimed at making a process better, faster, and/or lower in cost
- Is focused on business profitability and/or customer value
- Makes use of the DMAIC roadmap for focus and discipline
- Has a strong business case with clearly understood and defined project goals and scope
- Scope is doable in 2-4 months for GB and 4-6 months for BB. Rapid Improvement Events are faster
- Has measurements and data readily available or able to be gathered
- Has resources, management support, and proper reviews
- Makes use of a team that is provided adequate coaching and mentoring

Project Mentoring and Coaching

- Increases the likelihood of timely project completion and greater benefits
- Accomplished before, during, between, and after training sessions
- Mentoring is the role of a Champion and it is a continuous activity
- Coaching is performed by a Certified Black Belt/Master Black Belt
  - Ultimately by an internal resource
  - May need external resources to start with
- Coaching must be scheduled – if it is not on the schedule, it won't get done
- Everyone needs a lifeline!!*

* Note: Even professional athletes, like Tom Brady and Lebron James, have coaches. Employees who undergo training will need out-of-class coaching on their projects or studies. Without adequate coaching, projects oftentimes drift in and out of the various DMAIC phases seemingly at random. A strong disciplined approach is needed, and expert coaching will ensure that the right tools are used correctly, and that the project is scoped properly. Without expert coaching for those practitioners working on their initial projects, the blind will be leading the blind.

Linking LSS to the Business Strategy



Lean Six Sigma Training

- Air Academy courses use a **K**eep-**I**t-**S**imple-**S**tatistically (**KISS**) approach
  - Statistics is not presented as an "end," but rather the means to gaining knowledge for making good decisions

- The "**P**resent/**P**ractice/**A**pply/**R**eview" instructional strategy is used
  - **Present** a tool or method
  - **Practice** the tool or method
  - **Apply** the tools on your project
  - **Review** the results of the application to your project (final report and presentation, to document your success story and its impact to the company's bottom line)

Top 5 Deployment Best Practices

(taken from *Reversing the Culture of Waste: 50 Best Practices for Achieving Process Excellence*)

- Coaching and mentoring on all projects and studies
- A Keep-It-Simple-Statistically (KISS) approach with easy-to-comprehend materials and easy-to-use software
- The use of rapid improvement events and studies to gain quick-hitting, impactful results
- Getting leadership and management on board and continuously aligning and re-invigorating them
- Developing a culture of continuous and breakthrough improvement: **LSS is about both continuous improvement and breakthrough improvement (innovation).**

The Vision and Focus for Lean Six Sigma

- Empowers a *best-in-class* business improvement strategy
- Provides a *disciplined improvement and innovation methodology and language* that can be shared and used by all
- Promotes *teamwork* and *rewards* success
- Combines *aggressive goals* with a *method* and a set of *tools*
- Requires the *application* of *tools* throughout *entire lifecycle* of a product or service
- Produces knowledge for *improved cycle time*, *reduced defects*, and *lower cost and risk*

Better products and services
delivered _faster_ at _lower cost and lower risk_
=
Improved Customer Value and Business Success

Key Takeaways

- As a review, you may want to pause the video at this point and summarize the key learnings from this session, at least from a high-level view. When you are finished, you may resume the video and complete the session.

Key Takeaways

- Lean Six Sigma means all of the following:
  - A measure of process capability
  - A powerful methodology (DMAIC)
  - A set of tools
  - A knowledge-gaining philosophy and activity
  - A business improvement strategy
  - A framework for systematic improvement and innovation
  - A vision

Are you ready to learn and apply the details of Lean Six Sigma?

Supplemental Material

- Suggested Reading:
  - ***Lean Six Sigma: A Tools Guide*** by Adams, Kiemele, Pollock and Quan (pp. 1-7)
  - ***Knowledge Based Management*** by Kiemele, Pollock and Murrow (pp. 145-174)
  - ***Design for Six Sigma: The Tool Guide for Practitioners*** by Reagan and Kiemele (pp. 173-176)
  - ***Reversing the Culture of Waste: 50 Best Practices for Achieving Process Excellence*** by Pollock and Kiemele (pp. 130-133).
  - Air Academy's app: ***Six Sigma Quick Tools***

- SPC XL™ software training tutorials:
  - https://airacad.com/our-insights/training-videos/spc-xl/, specifically
  - https://airacad.com/our-insights/training-videos/spc-xl/1-intro-to-spc-xl/

- The data files for this session can be downloaded from the site where you are accessing this course.

Additional Practice / Review Questions

1) What are the two major reasons why Lean Six Sigma exists?

2) Explain the synergy of Lean and Six Sigma.

3) Name some of the benefits of Lean Six Sigma?

4) What are the 5 major elements of the Lean Six Sigma Roadmap or Methodology?

5) Name some of the key roles and their responsibilities in building the infrastructure for Lean Six Sigma.

6) Why are Lean Six Sigma projects important?

7) Provide one word describing what must be involved in every Lean Six Sigma project.

We can help…
Connect With Us

Remote Project Coaching

There are times when help outside your organization is needed. When that time comes, benefit from a partner that is experienced, tested, and trusted.

Expert coaching is one of the Top Five Best Practices for generating step change in project execution, as well as enhanced return on investment. We can work remotely with your organization to provide coaching support.

Air Academy Associates
Phone: (719) 531-0777
Email: aaa@airacad.com
https://airacad.com/
https://sixsigmaproductsgroup.com/

Download on the App Store

There's an app for that!
Six Sigma Quick Tools