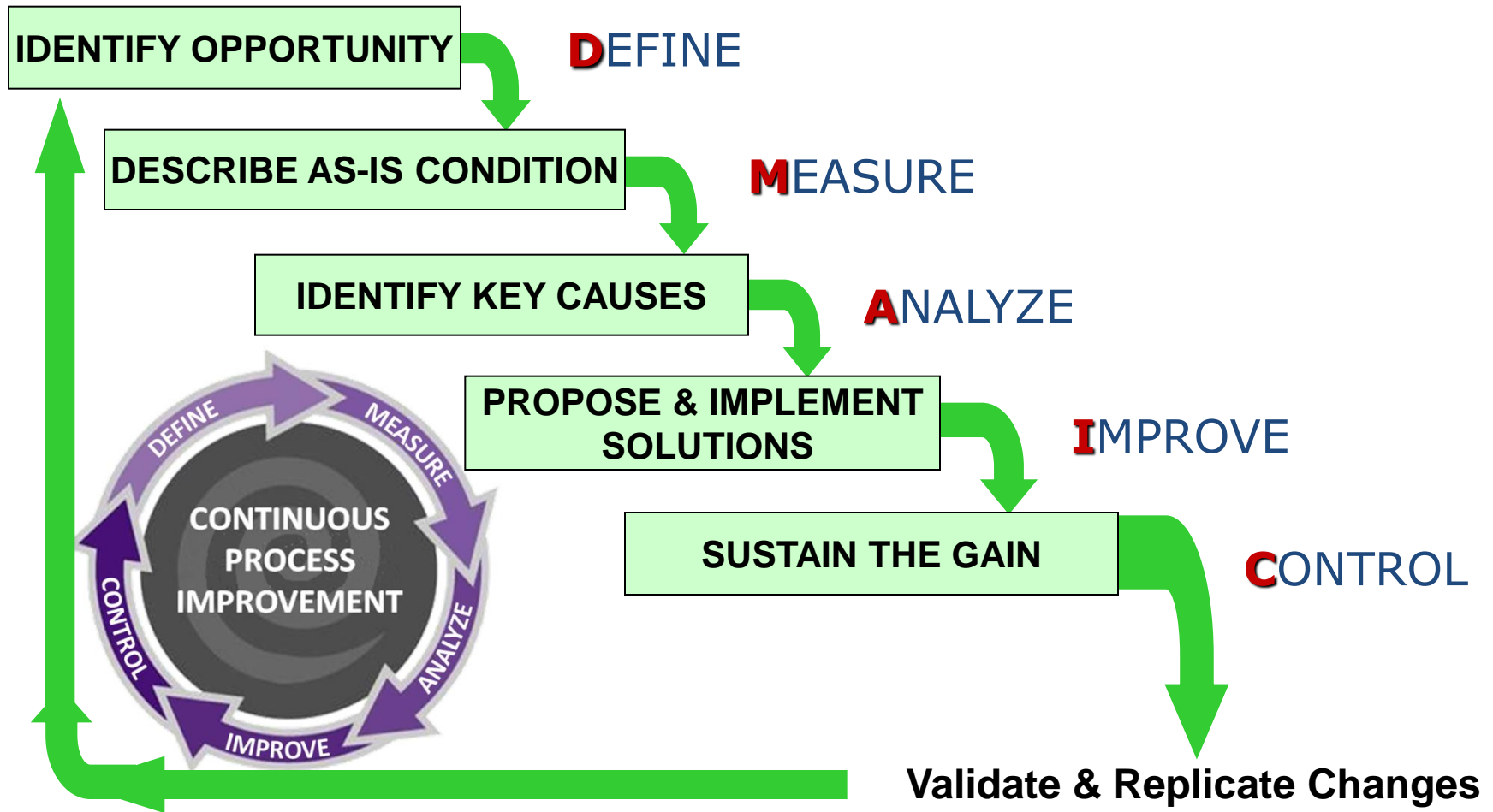


# CONTROL PHASE



# Course Structure: DMAIC



# Learning Objectives: Control Phase

***At the end of this lesson you will be able to:***

- Understand the tools necessary to complete the Control Phase.
- Develop a Control Plan to monitor and sustain implemented improvements.
- Properly document and follow-up on completed projects and events.
- Categorize and communicate project benefits.
- Explain Design for Six Sigma for new processes.



# Control Plan

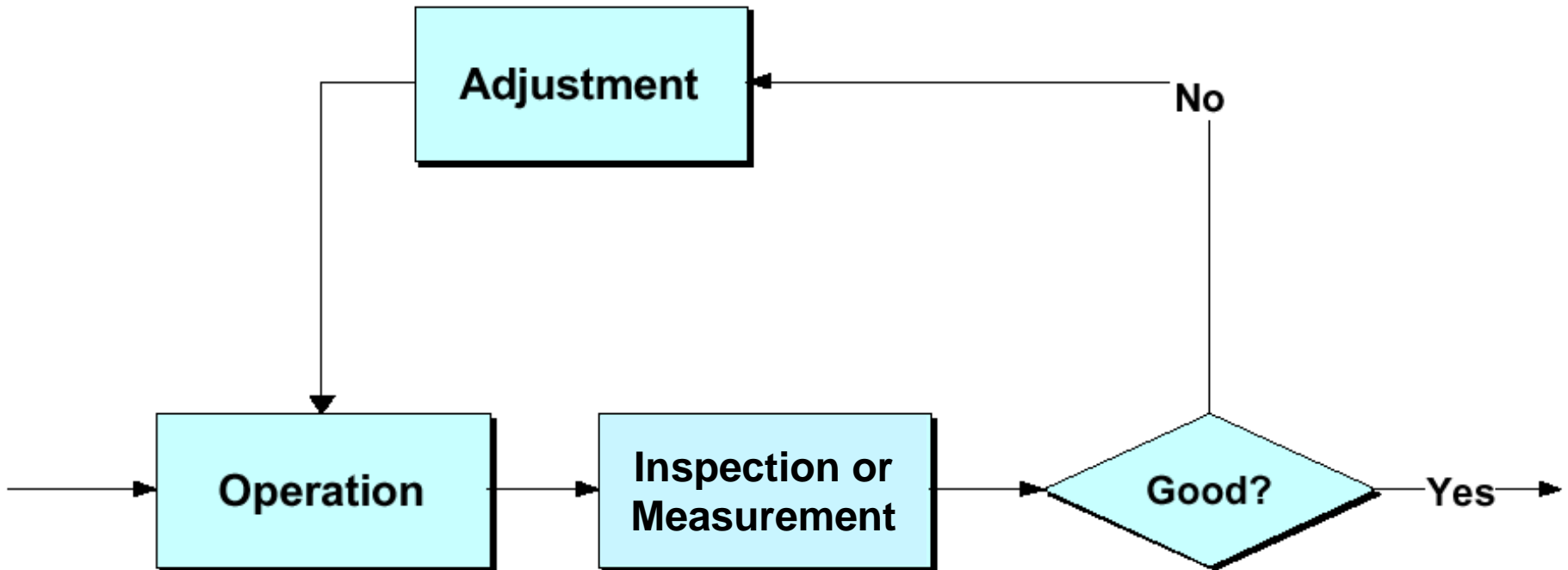


# Control System Contents

- Control Systems contain:
  - Critical inputs.
  - **Desired outputs / performance levels.**
  - Capture and report of **actual** process performance measures.
  - A feedback mechanism to report deviations in actual outputs from desired levels.
  - Adjustments to the process.
- Can be reinforcing (amplify the deviation) or balancing (bring back to equilibrium) - balancing is normally what gets implemented.



# A Basic Control System



Control Lag = Time between Operation and when any applied adjustment takes effect.

# What Is a Control Plan?

- Control Plans provide a written summary description of the systems used in minimizing variation in the improved process.
- Control Plans do not replace information contained in detailed instructions (SOPs).
- The Control Plan describes the actions that are required at each phase of the process to assure that all process outputs will be in a state of control.



# Control Plans Answer the Following Questions

1. What is the process that is being controlled?
2. What are the process outputs that are being monitored / controlled?
3. What are the inputs that are being monitored / controlled in order to keep the output at its target level?
4. How are the inputs and outputs being measured, monitored, and controlled?
5. How does someone react when the inputs or outputs are not in control?







# Control Plan Tips

- Establish controls to detect defects.
- Use illustrations.
- Use flow diagrams.
- Use work instructions that really work.
- Use reaction plans that really work.
- Focus on the quality of documentation, not the quantity.
- Use workers to help write the instruction.
- Clearly lay out authorities, roles, and responsibilities.



# Control Plan Tips (Cont.)

- Focus on the identification of nonconforming services.
- Ensure segregation by identification or location to prevent inadvertent use.
- Address the need for recall or previously provided service.
- Ensure the benefit of rework versus loss.
- Ensure that rework actually produces first quality service.
- Ensure that corrective actions are initiated whenever nonconforming services are provided.

**Include the Cause and Effect Diagram to help build the Control Plan, using it as a reference.**

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# Control Plans Summary

- Control Plans can be likened to sustainment in 5S.
- SPC is not successful without religious use of Control Plans.
- Control Plans are living documents. If processes change and a new variation cause develops, add it to the Control Plan.



# Exercise: Control Plan

Break into Simulation groups and create a Control Plan for your Statapult process.



**30 minutes**



# Knowledge Check: Control Plan

**What questions does a good control plan address?**



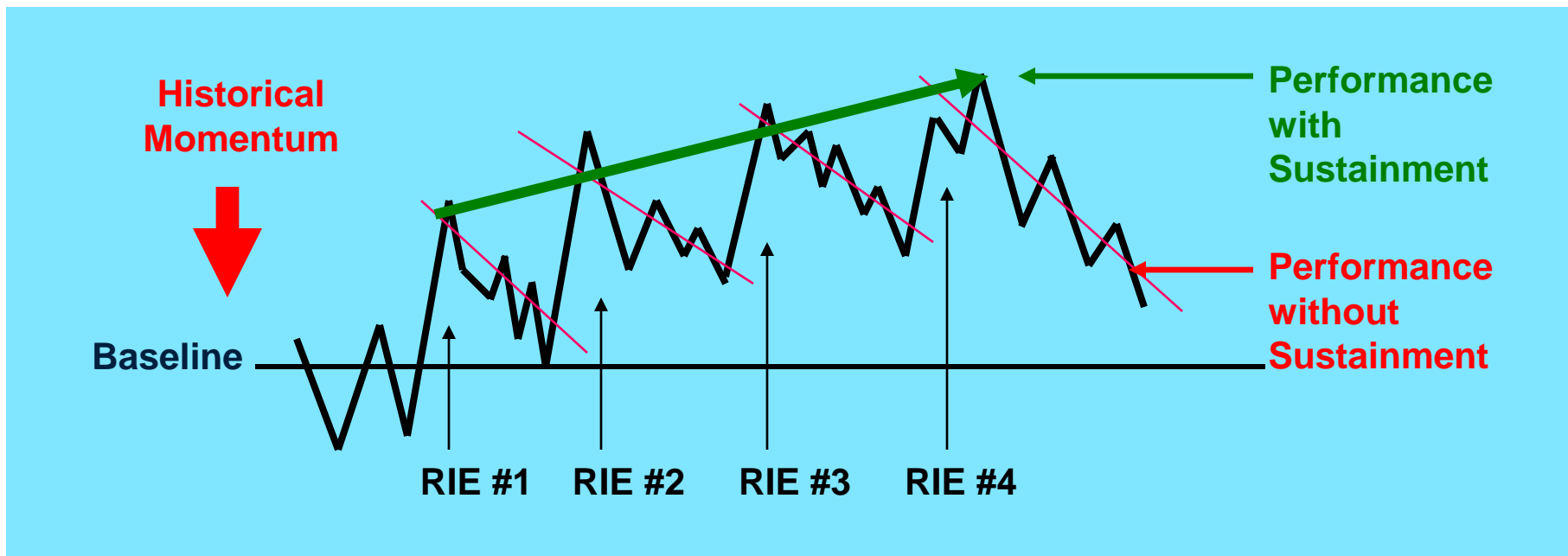
# Sustainment



# Definition of Sustainment

**Consistently adhere to process improvements, ensuring all benefits are fully realized.**

- The old way is gone, the new way is the way.
- Human nature resists change and reverts to old habits.





# Bringing the Event to Completion

## 1. Ensure that:

- All feasible process improvement ideas have been implemented.
- The project sponsor / process owner and personnel from the affected work area have been adequately trained on the process changes.
- Event objectives have been met or exceeded (Validate).
- Processes are updated.
- Needed controls are instituted in the process.

## 2. Quantify event benefits Return on Investment (ROI)



# What's a Quad Sheet ?

- Prepared for each Kaizen / RIE by the Project Sponsor with the assistance of the Green Belt.
- Started at beginning of the Kaizen / RIE.
- A key document in the formal submittal of the event's results.
- Documents key Kaizen / RIE information, metrics, status & financial results as an executive summary on one page.
- A living document that is periodically updated during and after the event as results are validated.



# Quad Sheet - Template

Project / Event Title

---

Background

Results

---

Goals

Timeline / Benefits

Customize to fit your needs.



# Redeployment

- Redeployment
  - The movement of people from a process that has been improved either through attrition, reassigning them to another CPI event or to other critical work.
  - Ultimately, the key objective of a CPI Thinking organization is to reduce the amount of human effort required per unit of output, in other words increase productivity and capacity.
- When to use redeployment
  - To make up for current attrition.
  - Eliminate or reduce overtime.
  - Reduce contractor support.
  - Reduce work backlog.



## Green Belt

- Ensure standard work is implemented.
- Foster success – market results.
- Complete and submit documentation on event.
- Handoff to Event Sponsor at completion of event week.

# Kaizen/RIE Follow-Up Beyond the Event

## Event Sponsor / Process Owner

- Monitor (Control Charts, Control Plans, Gemba).
- Visit the area frequently for several weeks after the Improvement Event.
- Address stakeholder issues and concerns.
- Recognize participants of event and celebrate success.
- Is Takt Time being achieved?
- Keep up the pressure completing outstanding action items.



# Out Brief Tips

- Final Tollgate Review - clearly captures the results of the event.
- Should include:
  - Charter information
  - Tools utilized
  - Improvements made
  - Evidence of data driven decision making
  - Before / After process flows and metrics
  - ROI calculations
  - Other improvement opportunities

**Create a package that sums up everything.**



# Kaizen / RIE Follow-Up Beyond the Event

## Sustainment



### Daily Board Walk

**Critical element of post-event follow up**



# 3 Week RIE Follow-Up Checklist

RIE TEAM will use this Check List to ensure RIE gains are sustained

## RIE FOLLOW UP ACTIVITIES

By:  Date:  % Complete:

Team:

First Week After RIE.	% Complete:	Second Week After RIE	% Complete:	Third Week After RIE.	% Complete:
<input type="checkbox"/> 1. Ensure RIE documents are published on the appropriate knowledge sharing site. <input type="checkbox"/> 2. Assist VSC w/ completion of Cost Reduction Report <input type="checkbox"/> 3. Team Leader is responsible for the following: Notify VSC when final RIE Report Package is available Ensure Report shows the freed capacity Work with VSC in recommending FTEs redeployment Develop a 30 & 60 day action item list Develop a Plan to audit process every 30 days Update standard work to indicate touch & flow times, and VA, NVA, NVA(E) steps Collect Process Performance Measures ( <b>As identified in RIE TPR</b> ) Send Thank you email to all participants <input type="checkbox"/> 4. Ensure all workers are trained on new process <input type="checkbox"/> 5. Post Standard Work Documents in Work Space <input type="checkbox"/> 6. Address parking lot issues by assigning action items <input type="checkbox"/> 8. Schedule RIE outbrief to Leadership Team  <input type="checkbox"/> ** Team Leaders (TL) assign action items to specific people on the teams and require follow up reports on progress.		<input type="checkbox"/> 1. Review open action items <input type="checkbox"/> 2. Audit new process; Ensure standard sequences are being followed; Collect, review, and evaluate process performance measures ( <b>As identified in RIE TPR</b> ) <input type="checkbox"/> 3. Present performance results to VSC and Team (Via updated TPR) <input type="checkbox"/> 4. Team Lead and Black Belt address process issues. <input type="checkbox"/> 5. Brief Leadership on RIE Follow Up Progress (Using the status of this Check list)  <input type="checkbox"/> ** Team Leaders (TL) assign action items to specific people on the teams and require follow up reports on progress.		<input type="checkbox"/> 1. Review open action items <input type="checkbox"/> 2. Audit new process; Ensure standard sequences are being followed; Collect, review, and evaluate process performance measures ( <b>As identified in RIE TPR</b> ) <input type="checkbox"/> 3. Present performance results to VSC and Team (Via updated TPR) <input type="checkbox"/> 4. Team Lead and Black Belt address process issues. <input type="checkbox"/> 5. Brief Leadership on Progress. (Using the status of this Check list)  <input type="checkbox"/> ** Team Leaders (TL) assign action items to specific people on the teams and require follow up reports on progress.	



# Replication Opportunities

Identify key lessons learned and data from this project that may be useful in other areas of the business, or for other projects:

- Data about upstream process (input) measures.
- Data on problem areas outside your team's scope, but important to the business.
- Reduction of waste and non-value added activities.
- Better utilization of resources.
- Benchmarking information.
- Customer requirements.



# Lessons Learned

- Every improvement effort offers a lesson.
- It is what we do with these lessons that matters.
- For successful projects, we want to document our efforts and conclusions to repeat the success.
- If not successful, we want to document what went wrong to prevent repeating the same mistakes.
- The availability of this type of information can greatly accelerate future efforts.



## Brainstorming Effective Sustainment Techniques



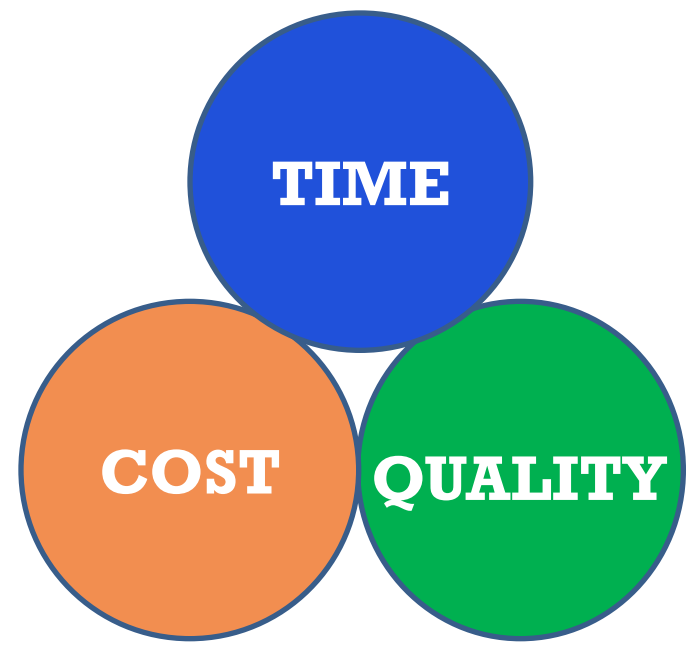
# Benefits



# Review: Triple Constraints of Projects

- Project Management Constraints

- Scope (Quality)
  - Clear and Specific
- Cost (Resources)
  - Money and Effort
- Schedule (Time)
  - Amount of Time to complete process tasks



- Prioritizing Constraints

- Should be based on the view of the customer.

# Benefit Categories

## Goal: Reduce Costs

- Metric: *Type I Benefits* – Cost Reductions to Budget Line Items.
- Example: Same work done with fewer resources.

## Goal: Increase Speed (Reduce Time)

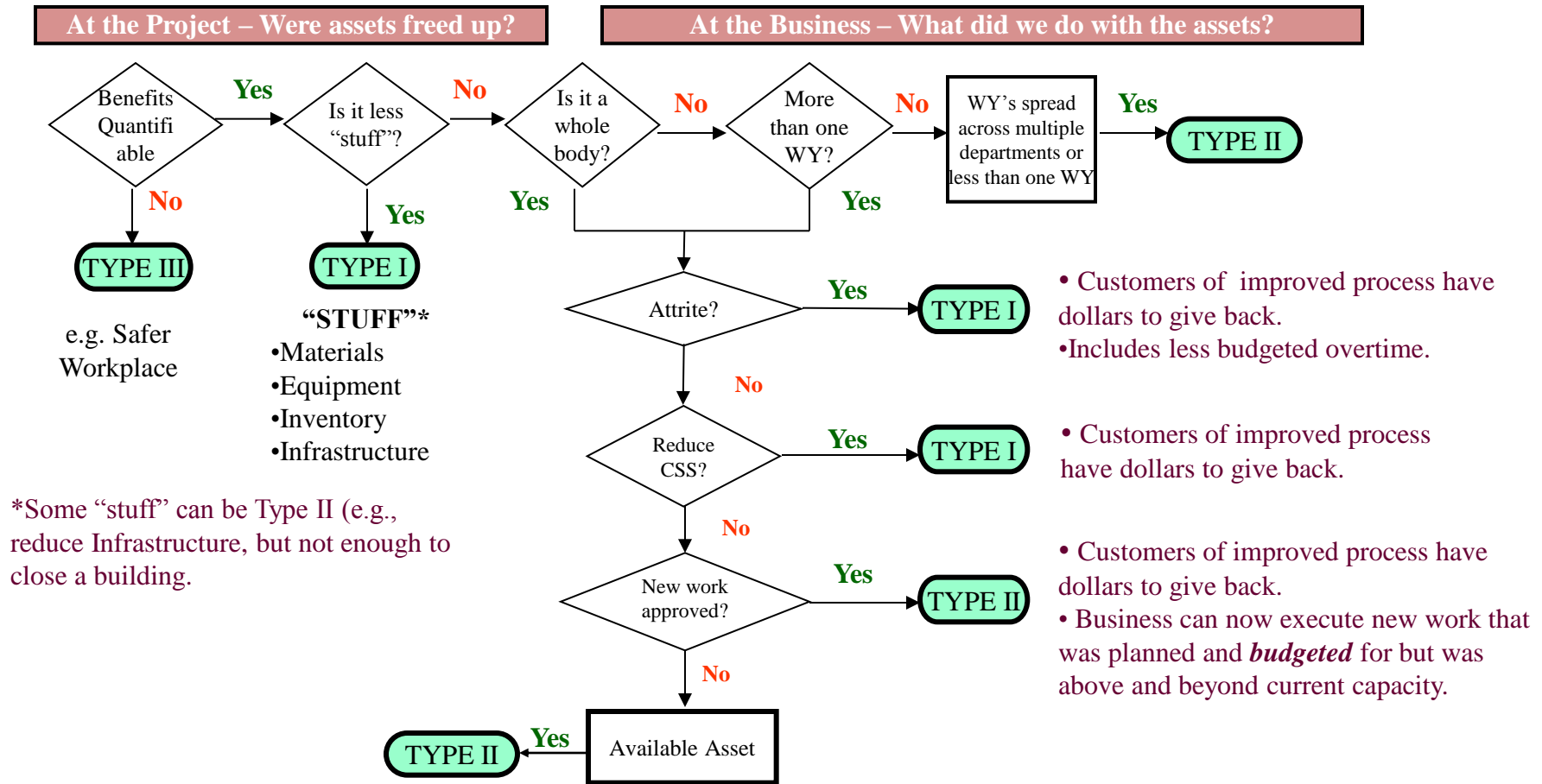
- Metric: *Type II Benefits* – Process Time Reduction / Improved Resource Utilization.
- Example: More done with same resources.

## Goal: Improve Safety and Quality of Life

- Metric: *Type III Non-Financial / Other Benefits*.
- Example: Risks to assets or personnel reduced.



# Benefit Categories Flow Chart



Don't get hung up on calculating benefits!



# Design for Six Sigma



# Design/Re-Design Approaches

**Design For Six Sigma (DFSS) methods would be the method of choice when:**

- There is no current process to fulfill customer requirements (need a brand new process).
- The process is incapable of producing quality products / services (better to start from scratch than to fix the process).



# Design For Six Sigma (DFSS)

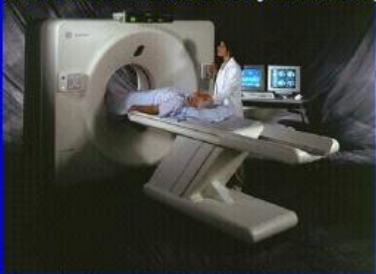
- DMADV: Define > Measure > Analyze > Design > Verify.
- Example: DFSS was used to develop the CT Scanner.

GE Medical Systems

## LightSpeed™ CT Scanner



GEs First DFSS System ('98):  
Full Use of Six Sigma/DFSS Tools

- Key customer CTQs identified
  - Image quality
  - Speed
  - Software reliability
  - Patient comfort
- Disciplined systems approach: 90 system CTQs
- 33 Six Sigma (DMAIC) or DFSS projects
- Scorecard-driven
- Part CTQs verified before systems integration



Leading-Edge Technology

- World's first 16-row CT detector
- Multi-slice data acquisition
- 64-bit RISC computer architecture
- Long-life Performix™ tube



Results

- Better image quality
  - Earlier, more reliable diagnoses
  - New applications: vascular imaging, pulmonary embolism, multi-phase liver studies, ...
- Much faster scanning:
  - Head: from 1 min to 19 sec (9 million/ yr)
  - Chest/abdomen: from 3 min to 17 sec (4 million/yr)
- Clinical productivity up 50%
- 10x improvement in software reliability
- Patient comfort improved - shorter exam time
- Development time shortened by 2 years
- High market share; significant margin increase

**"Biggest breakthrough in CT in a decade," Gary Glazer, Stanford**

# DMADV Defined

D	<i>Define</i> the goals of the design activity. What is being designed? Why? Use QFD or the Analytic Hierarchical Process to assure the goals are consistent with customer demands and enterprise strategy.
M	<i>Measure</i> customer input to determine what is critical to quality from the customer's perspective. Translate customer requirements into project goals.
A	<i>Analyze</i> innovative concepts for products and services to create value for the customer. Determine performance of similar best-in-class designs.
D	<i>Design</i> the new product, service or process. Use predictive models, simulation, prototypes, pilot runs, etc. to validate the design concept's effectiveness in meeting goals.
V	<i>Verify</i> the design's effectiveness in the real world.



# What We Have Covered: Control Phase

- General tools used within the Control Phase.
- Control Plans to monitor and sustain implemented improvements.
- Documentation to follow-up on completed projects and events.
- Categorized and communicated project benefits.
- Framework for the design of new products.



# Training Closeout



# Continuous Process Improvement

- Continuous Process Improvement (CPI) = Incremental Improvement.
- CPI is a proven method for improving processes, products, and logistics and has now proven useful across the full spectrum of operational, administrative, support, and R&D functions.
- Process Improvement will always be present in successful organizations regardless of the label associated with it.
- Greenbelts are on the frontlines of CPI.



# Lean Six Sigma Summary

- Lean is about flow.
  - Increase process flow by eliminating waste.
  - Waste is anything – effort, costs, or work that adds no value in the eyes of the customer.
- Six Sigma is about quality and variation.
  - Reducing defects by eliminating mistakes.
  - Reducing differences in similar or identical processes.





# Expectations of Green Belt

- Understand and be able to apply the basic concepts of Lean Thinking and Six Sigma.
- Have the ability to lead a team through a Kaizen / RIE Event.



# Continuous Improvement for Your Career in CPI

- First step – finishing GB training.
- Next steps
  - Get involved in a CPI event next week!
  - Pursue Green Belt Certification (Lead a Project).
  - Pursue Black Belt Training and Certification.



**“A certificate does not make you certified. Attitude, performance, commitment to self and team — these and a certificate make you certified.” - Anonymous**

# Green Belt Certification Requirements

- Lead a Project / Event or significant support of Black Belt Project
- Project/Event requirements:
  - Black Belt Mentor (P&I approved)
    - Approves project/event
    - Mentors Green Belt during project/event
    - Provides P&I with recommendation for certification
  - Demonstrated use of Lean Six Sigma Tools
    - Must be a benefit to the Marine Corps
    - Belt determines tools based on project/event
    - Required tools - all projects/events



# Green Belt Mentoring Requirements

- Mentors provide the following services:
  - Review and provide guidance on project charters prior to signing.
  - Provide event/project coaching and assistance with meetings (as needed).
  - Provide project assistance (tool identification and utilization).
  - Review and provide guidance for tollgate and final out briefs prior to presentation.

# Mentor Support Availability

- CPI mentoring is based on the following:
  - Command needs always have priority.
  - Availability – First come, first serve.
  - On a “demand pull” basis; you must arrange it.
  - Attend scheduled periodic meetings as arranged.
  - Mentors are to enable the project teams; teams still must be prepared to work.



# Out Brief Format

- Final Out Brief sections should include:
  - Define Phase
    - **Charter**, SIPOC, Communication Plan, POA&M, etc.
  - Measure Phase
    - Summary of Data Collected, **Current State Map**, etc.
  - Analyze Phase
    - **Root Cause Analysis** (Fishbone), Statistical Analysis, SPC, etc.
  - Improve Phase
    - **List of Improvements**, Statistical Analysis (of Improvements) **Future State Map**, 5S, Mistake Proofing, etc.
  - Control Phase
    - **Control Plan**, Standard Work, Replication, Transition Plan, etc.

• Required Items

**Make Final Out Brief Visual. Use Pictures.**



# Green Belt Resources

- Green Belt Course Training Material
- Templates
  - P&I External Site  
(<http://www.quantico.marines.mil/Offices-Staff/Performance-Innovation/>)
  - Useful templates uploaded as requested.
- Gemba Academy
  - [www.gembaacademy.com](http://www.gembaacademy.com)
    - Login: OSD
    - Password: DoDLean



# What We Have Covered: Course Goals

Understand Lean Six Sigma (LSS) / Continuous Process Improvement (CPI) tools and how to apply them to your workplace.

Understand the impacts of the Triple Constraints on processes.

Facilitate small Projects or Events to attack and solve current day problems.

Assist Black Belts on Command-wide Projects and Events.





**Review Goals & Expectations  
from 1<sup>st</sup> day of the course.**



## Project Development Exercise *(Brainstorm/Develop Project Charter)*

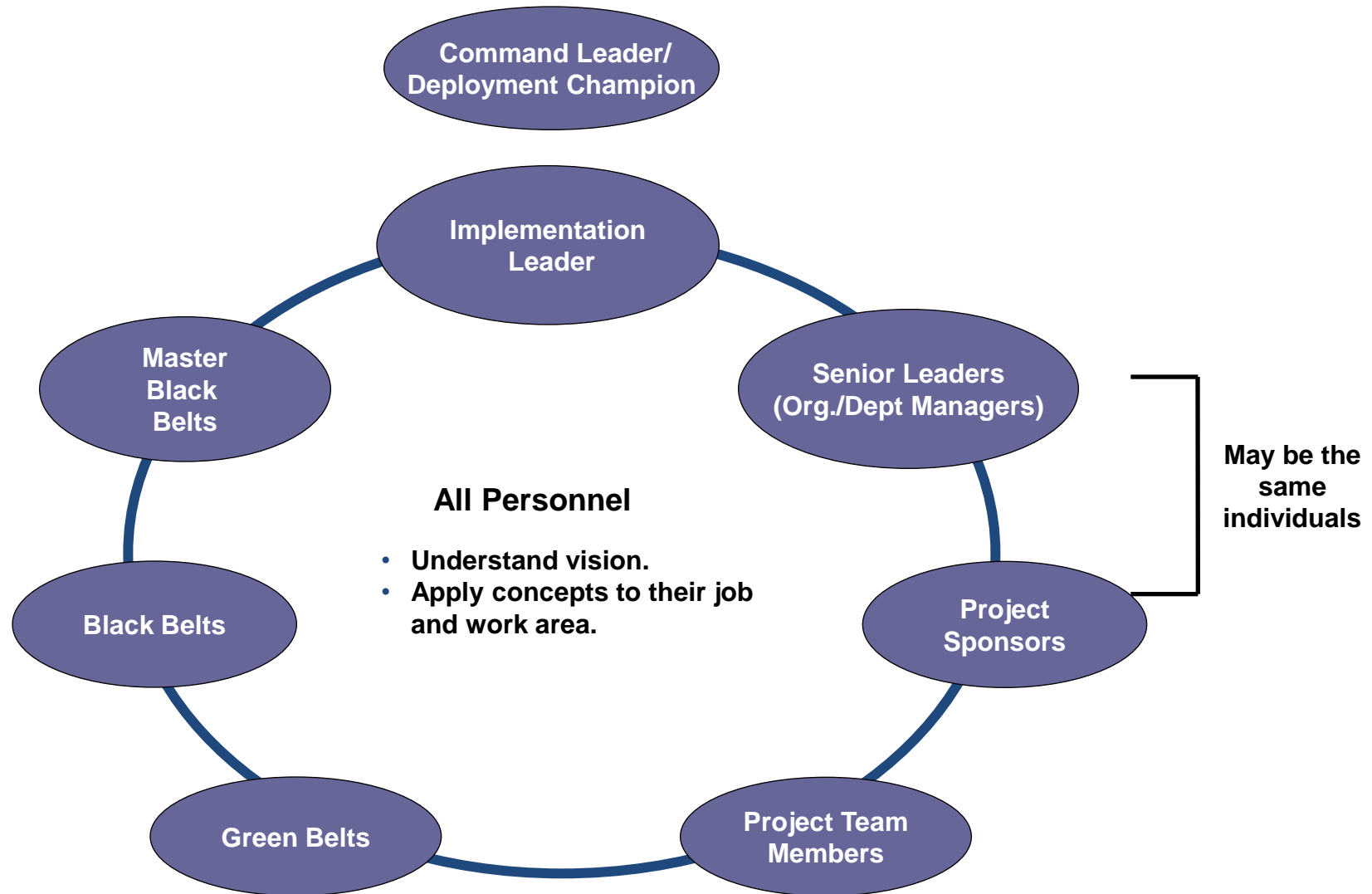


**45 minutes**

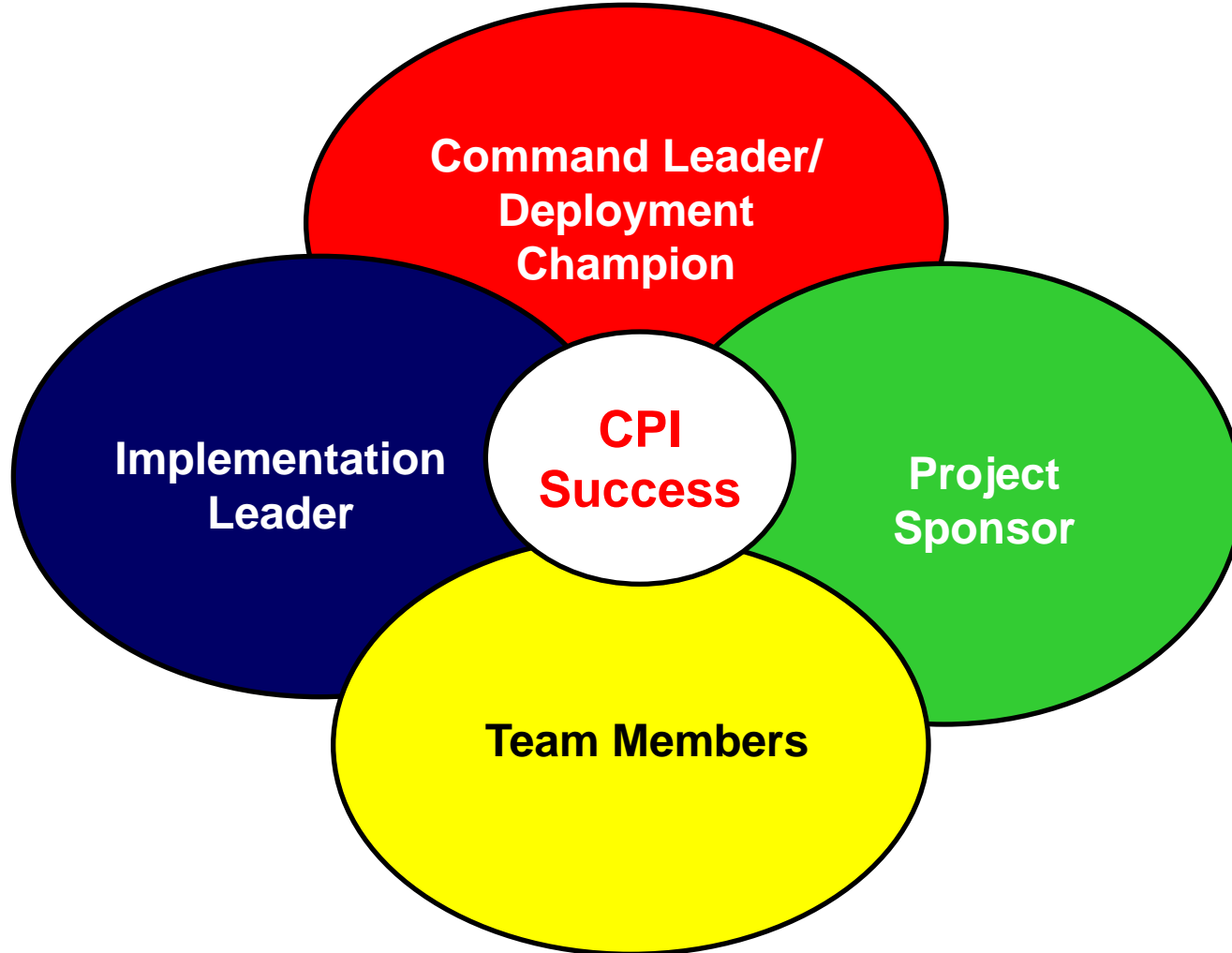
# Back Up Slides



# CPI Roles and Responsibilities



# Key Roles for CPI Implementation



**Effective communication and relationships are key to successful CPI implementation.**

# Command Leader/Deployment Champion

## Senior Leader at any level of the organization.

- Executive Leaders (CMC, ACMC, MROC, MARFOR Commanders).
- HICVS Owners (DC of M&RA; DC of P&R, etc.).
- Value Stream Owners (CG of MCRC; CG of MCI, etc.).
- Organizational Commanders/Leaders (Commanding Officer, Executive Director, Division Head).

## Roles:

- Inspire and drive the initiative.
- Identify strategic priorities, associated high-impact project opportunities, and success metrics.
- Support Project Sponsors.
- Provide resources (people, \$) and remove barriers.
- Select the best people to work on CPI efforts (leaders of the future).
- Hold organizations and people accountable for results.
- Tie CPI to individual performance elements.
- Communicate, communicate, communicate.



# Implementation Leader

Dedicated position reporting to Command Leader/Deployment Champion to coordinate and support the implementation of organizational CPI efforts.

## **Roles:**

- Assist leaders with selection of projects and project sponsors.
- Maintain project portfolio.
- Support Project Sponsors.
- Communicate standards and guidelines.
- Develop supporting implementation plans.
- Support selection, training and assignment of project participants.
- Coordinate benefits reporting.
- Communicate, communicate, communicate.



# Project Sponsor

A leader or manager at any level of the organization accountable for project results. A Department Champion or Value Stream Owner may also be a Project Sponsor.

## Roles:

- Identify and define scope of projects.
- Write charters.
- Identify project team members.
- Manage project execution in tollgate reviews.
- Remove barriers and provide resources.
- Ensure right people attend meetings.
- Implement/own process improvements.
- Report results.
- Monitor/sustain improved process performance.
- Tie CPI to individual performance elements.
- Communicate, communicate, communicate.





# Project Sponsor

## Responsibilities:

- Must have process authority.
- Empowers team.
- Breaks down barriers.
- Responsible for project charter.
- Must commit to active support.
  - Helps kick off project.
  - Meets regularly with team to review progress.
  - Attends the final out-brief.



# Black Belt Responsibilities

Black Belts should be assigned to process improvement for at least 2 years.

## **Responsibilities:**

- Lead complex projects.
- Assist Project Sponsor and Teams in leading, scheduling, planning and facilitating CPI events and projects.
- Train Green Belts and Team Members (Yellow Belts).
- Mentor Green Belts.



# Selecting Black Belts

The Black Belt role is leadership focused. Black Belt candidate characteristics include:

- Interest in Continuous Process Improvement.
- Excitement about being part of the CPI culture change.
- Business acumen – Understanding of how different functions work together and influence the organization.
- Zeal to learn new tools and techniques.
- Knowledge of / experience in a variety of CPI tools.
- Technical aptitude in statistics is beneficial.
- Problem-solving skills.
- Customer advocacy.
- Team player / leader.
- Ability to train / mentor.
- Project management skills.
- Ability to spend required time – 100% dedicated preferred.



# Selecting Green Belts

- The Green Belt role requires candidates to demonstrate a skill set that includes starting and completing projects and using a data-based approach to solving practical problems.
- Green Belt candidate characteristics include:
  - Interest in Continuous Process Improvement.
  - Excitement about being part of the CPI culture change.
  - Willingness to understand the process view of the organization.
  - Knowledge of the functional areas within the organization.
  - Zeal to learn new tools and techniques.
  - Team player.
  - Customer orientation.
  - Ability to spend required time.



# Team Member (Yellow Belt) Responsibilities

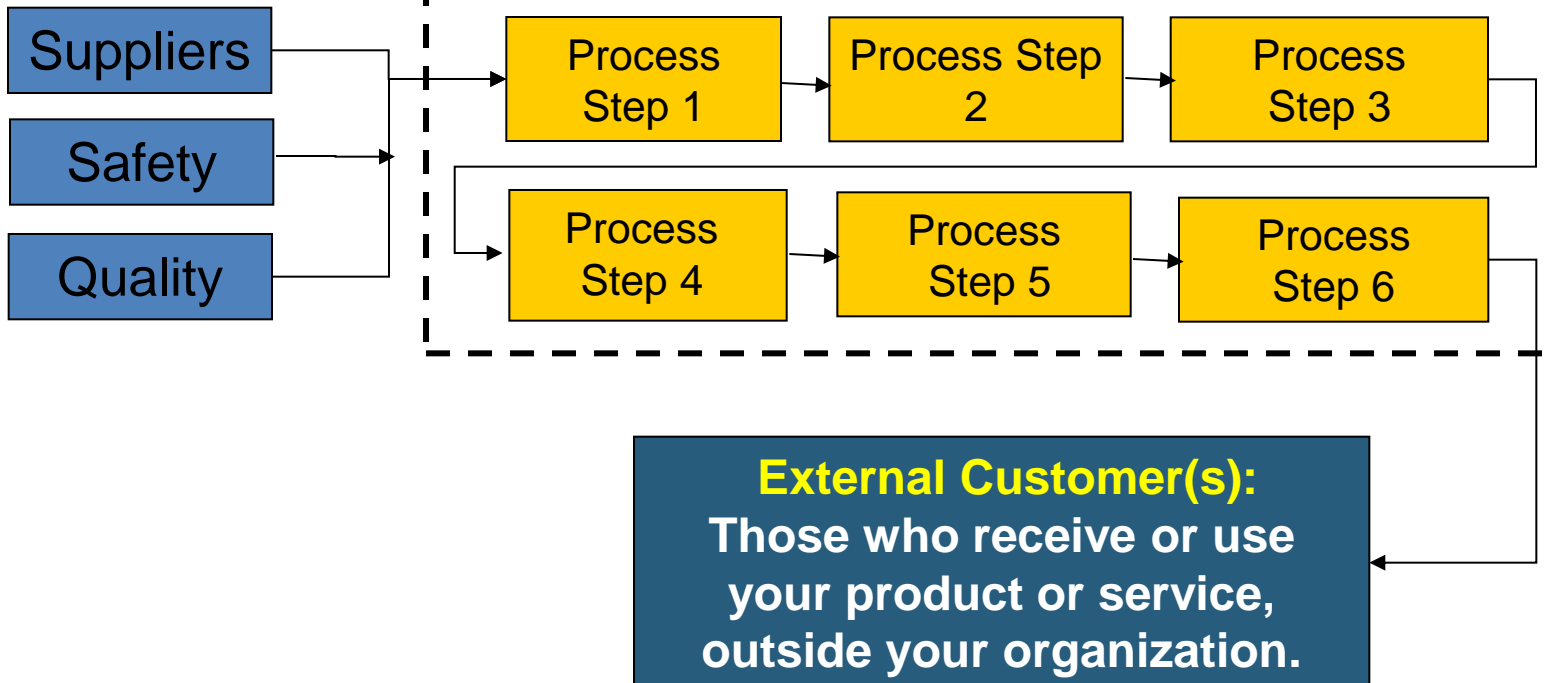
- Project teams may include:
  - Members from the work area (inside eyes – minimum 1/3).
  - Members from outside work area (outside eyes willing to question non-value added activities).
  - Customers (internal / external) voice.
  - Suppliers / Partners / Safety Rep / Quality Rep.
- Project Team member (Yellow Belt) responsibilities include:
  - Assist in executing projects / RIEs.
  - Collect data.
  - Sustain results.
  - Leverage / replicate opportunities.



# Where to Find Team Members

**Outside Stakeholders: Regulatory Agencies, etc.**

**Process**



# Roles and Responsibilities (DC/LC and PS/VSC)

## Deployment Champion (DC)/ Lean Champion (LC) [Gate Approver]

- Identifies and scopes LSS projects for execution.
- Enters projected Benefits into the CPIMS.
- Ensures tollgate deliverables and requirements are met and that financial reviews are conducted prior to Control Tollgate.
- Approves tollgates.
- Ensures final Project Close-Outs and financial validations are conducted after the Validation Phase.

## Project Sponsor/Value Stream Champion (PS/VSC)

- Ensure Financial Subject Matter Expert (FSME) identified during Charter Development to assist Team with identification of costs and funding sources.
- Ensure key customers/stakeholders are aware of the project and it's potential benefits.
- Ensure financial benefits are tracked throughout project validation phase based on Control Plan.
- Contact Financial Representative / Independent Reviewer (FR/IR) \_\_\_ week(s)\* prior to Project Close-Out to review and validated 'Actual' Benefits.
- Update Metrics and Financial Supporting Documentations at Project Close-out.

\*TBD locally



# Roles and Responsibilities of FRs/ IRs and FSMEs

## Financial Representative/ Independent Reviewer (FR/IR)

- Provides independent assessment of project's estimated and actual benefits to PS/VSC, Project Lead/Belt, SFL, and DC/LC.
- Review all financial documentation and approve estimate Metrics (1– 5) prior to Control Tollgate.
- Review and approval actuals Metrics (2-5) prior to Project Close-out.

## Financial Subject Matter Expert (FSME)

- Is a part-time member of team.
- Understands the process under review and its associated funding/costs and is familiar with appropriation law.
- Assists Belt/Project Lead with obtaining financial data such as cost information and metrics, as well as identifying BLI(s) associated with Type I Benefits.





# Roles and Responsibilities of SFL and CLFR

## Site Financial Lead (SFL) \*

- Assigns FRs/IRs to LSS/CPI Projects during Improve phase when requested by Belt.
- Teaches Financial Review Process to LSS/CPI classes when on location.
- Ensures FRs/IRs receive training or assistance necessary to perform the financial review process, and assist with complex financial issues and questions.
- Tracks relevant workload statistics (i.e., avg. time spend by FRs/IRs in financial review process).

## Command Level Financial Representative (CLFR) \* \*

- Tracks Validated Type I Benefits against BLI(s) for Type IA and IB (for efficiency targets and potential reprogramming).
- Coordinates with the BSO to assist and/or ensure that the Type IA & IB Program Budget Information System (PBIS) process is executed.
- Notifies Comptroller of BLI(s) with applicable Benefits.
- Reports all “Estimated” and “Actual” Type I and II Benefits for the Command.

\* SFL is a coordinating role that is recommended but not required.

\* \*CLFR may be full or part-time.



# The Roles of Change

- **Process Owners/Project Sponsors:**
  - The individual or group who has the power to sanction or *legitimize* change.
  - Responsible for creating an environment that enables the necessary changes to be made on time and within budget.
- **Change Agents:**
  - The individuals or groups who are responsible for actually making the change.
  - Responsible to understand and diagnose the problem, develop a plan to address the problem and execute the change effectively. (Green Belts and Black Belts)

SOURCE: Daryl C. Conner "Managing at the Speed of Change"



# Reposition

- Systems operate in an environment of cause and effect. Visible problems are usually indicators (undesirable effects or UDE) of some critical root cause(s) that must be addressed.
- An optimal solution deteriorates over time. Improvement must be continuous.
- Policy constraints are the most common and most difficult to break. Policy constraints offer the most opportunity for system improvement.

