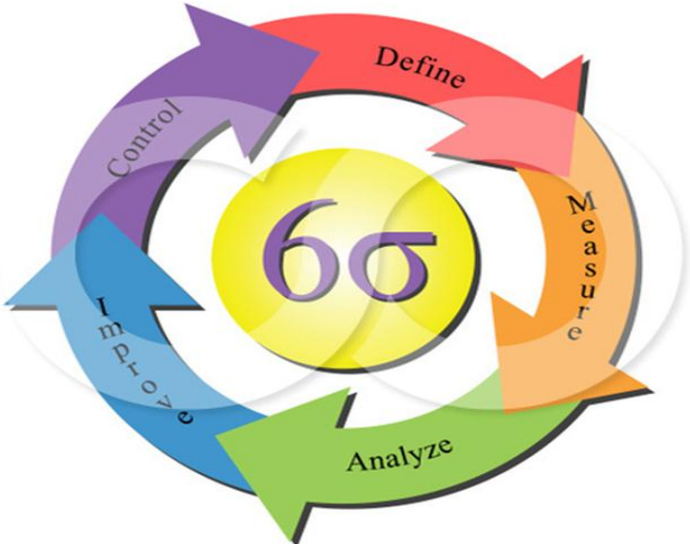
Six Sigma Yellow Belt Short Course



Presenters:
Victoria Jordan, PhD, MS, MBA
Diane Schaub, PhD, CQE, CMQ/OE

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- Director, Quality Measurement and Engineering
- PhD Industrial and Systems Engineering, Auburn University
- Joined M. D. Anderson in April 2008
- Previous work:
  - AU IE and Stats Faculty 2004-2007
  - Vanderbilt University Medical Center
  - Luftig and Warren Consulting (Alcoa, Anheuser Busch, Inland Steel, Molex)
  - General Electric
  - Ampex Corporation
- Founder of Cynthia Spooner Hankes Cancer Resource Center in AL

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- Sr. Statistical Applications Analyst
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- Joined M. D. Anderson in May 2011
- UF IE Faculty 1994-2011
- Worked at AlliedSignal Aerospace and Bethlehem Steel as a Quality Engineer

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Administrivia

- Restrooms
- Questions
- Break-out sessions
- Conduct request (silence cell phones)

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Section 1 - Introduction to Six Sigma

1. Introduction to Six Sigma

   1.1 General History of Quality and Six Sigma
   1.2 Meanings of Six Sigma
   1.3 The Problem Solving Strategy Y = f(x)
   1.4 Comparison of CS&E, Lean, and Six Sigma

2. Fundamentals of Six Sigma Implementation
3. The Lean Enterprise
4. Managing a Successful Six Sigma Effort

- Course Evaluation and Wrap-Up

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History of Quality and Six Sigma in US

- Pre-W.W.II
- During W.W.II
- After W.W.II
- 1980's awareness
  (Ford Batavia)

- From industry to government and service organizations
- Motorola – Six Sigma – 1981
- General Electric - 1995

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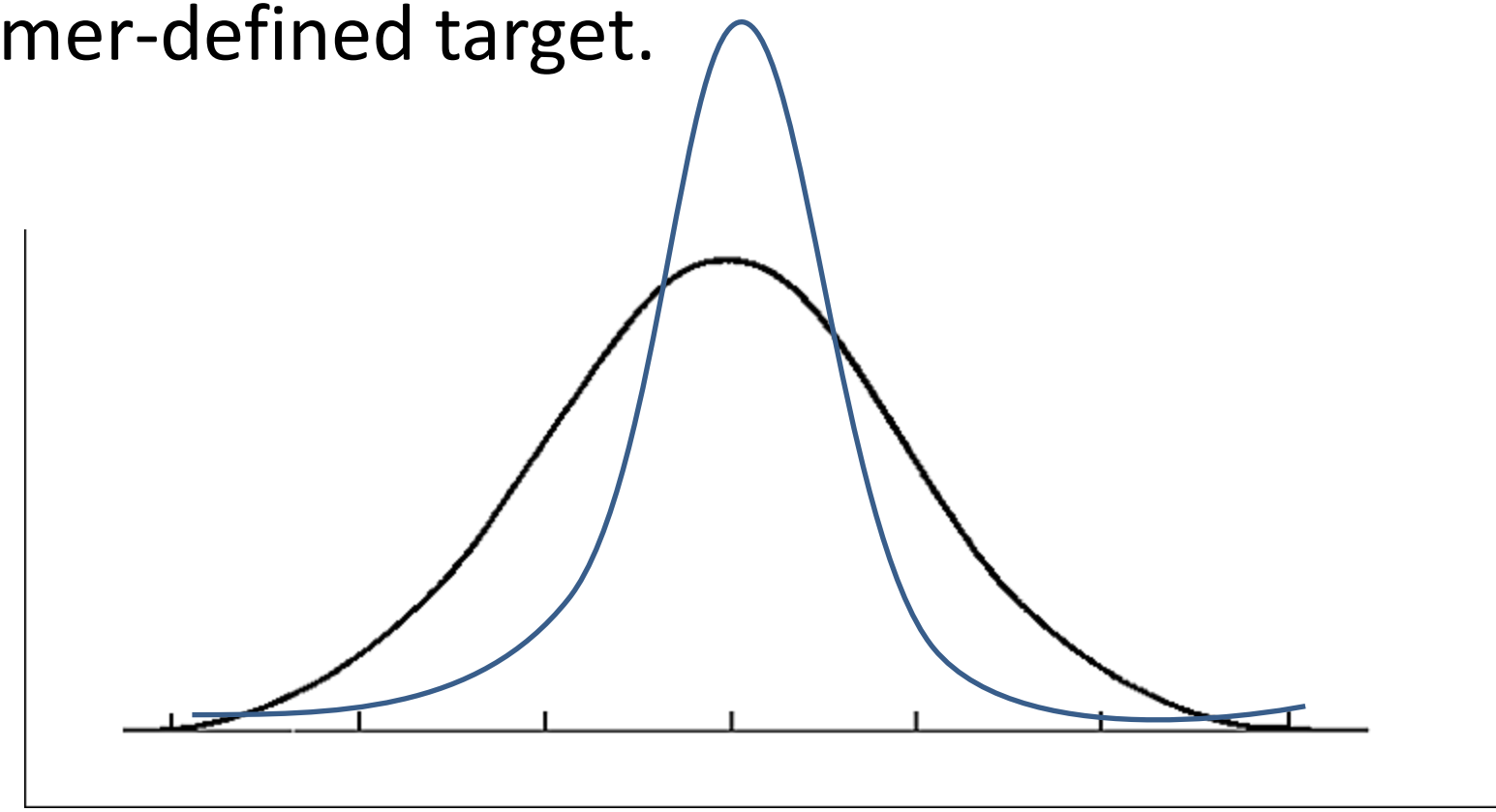
Ford – Batavia, Ohio

- Meeting specification is not good enough, we must work to reduce variation around a customer-defined target.



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But We Don't Make Cars…..

- Dr. Gary Kaplan, CEO of Virginia Mason Medical Center, on the need to increase value in healthcare

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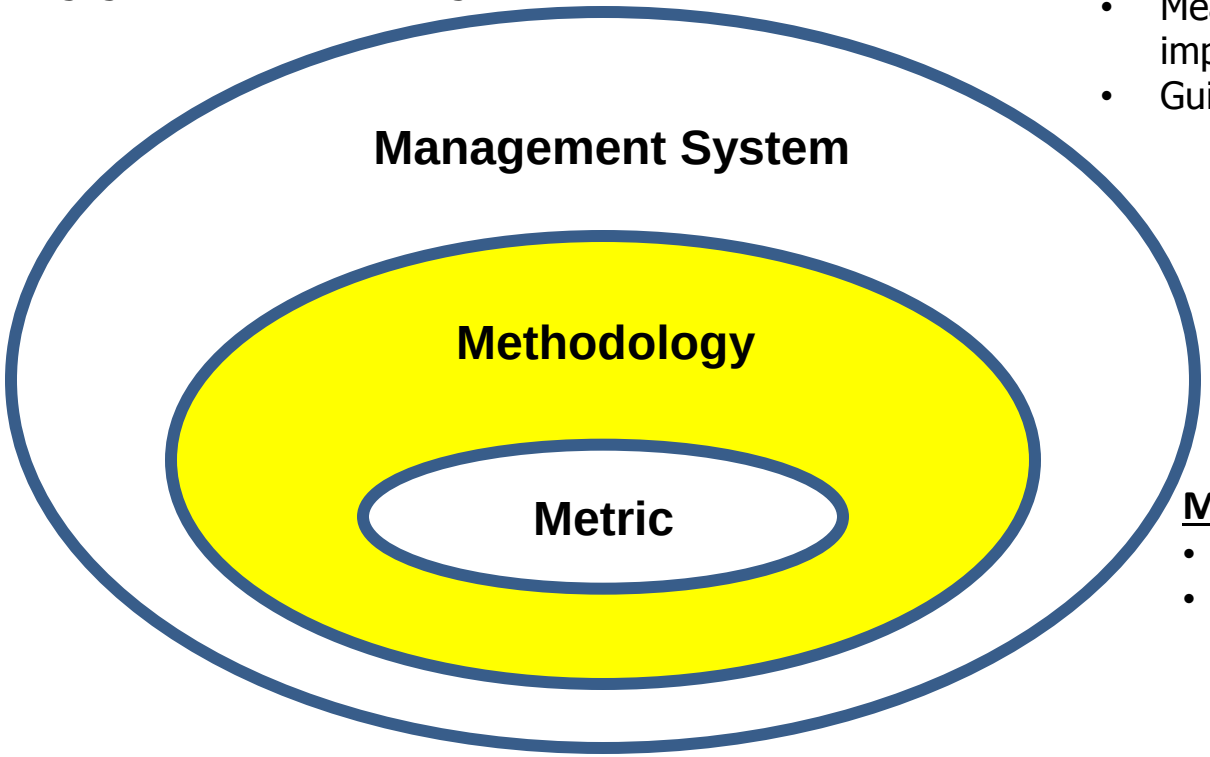
Six Sigma Defined

Management System
- Six Sigma drives strategy execution
- Leadership sponsorship and review
- Metrics driven governance process
- Engagement across the organization

Methodology
- Consistent use of DMAIC model
- Team-based problem solving
- Measurement-based process analysis, improvement, and control
- Guided by Black Belts, Green Belts

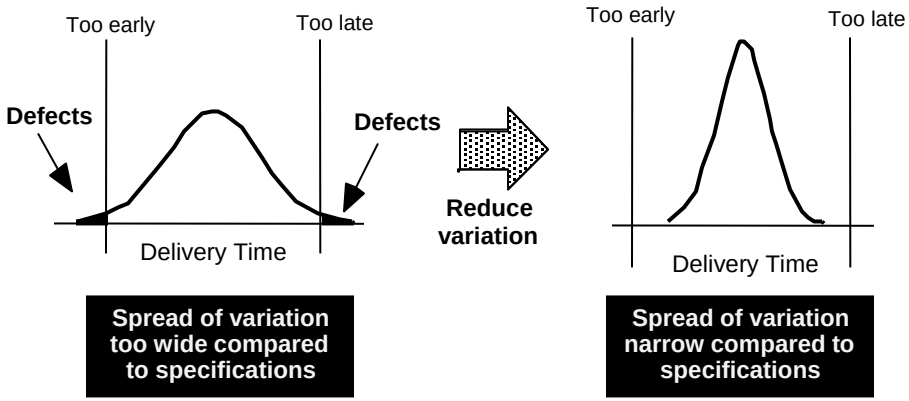


Metric
- Measure process variation
- Aim to minimize ***defects per million opportunities*** (DPMO), not percentages

© ***The Six Sigma Black Belt Handbook***, McCarty, Daniels, et.al, McGraw-Hill 2005.

Why Six Sigma?

To **INCREASE** process performance, you have to **DECREASE** variation



Less variation provides:

- Greater predictability in the process
- Less waste and rework, which lowers costs
- Products and services that perform better and last longer
- Happier customers

Every Human Activity has Variability

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Defects per Million Opportunities

- Since 99.9997% is a bit awkward to use, a new measurement scale was developed using defects per million opportunities.
- A process running with Six Sigma quality produces 3.4 defects per million opportunities.

$$\text{DPMO} = \frac{\text{Number of Defects}}{(\text{No. of Units})\,(\text{No. of Defect Opportunities/Unit})} \times 1{,}000{,}000$$

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Examples of Six Sigma Quality

- A process that operates at *4.6 Sigma* is operating at a 99.9% quality level. This means annually we have*:
  - 1281 errors in outpatient treatments
  - 11,620 mistakes in pathology or lab procedures
  - Nearly 4000 surgical errors

- If we were to maintain *6 Sigma* performance, this would be a 99.9997% quality level. Annually this is:
  - 4 errors in outpatient treatments
  - 35 mistakes in pathology or lab procedures
  - 12 surgical errors

*based on FY12 clinical activity at MDACC

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Six Sigma Methodology for Process Improvement (DMAIC)

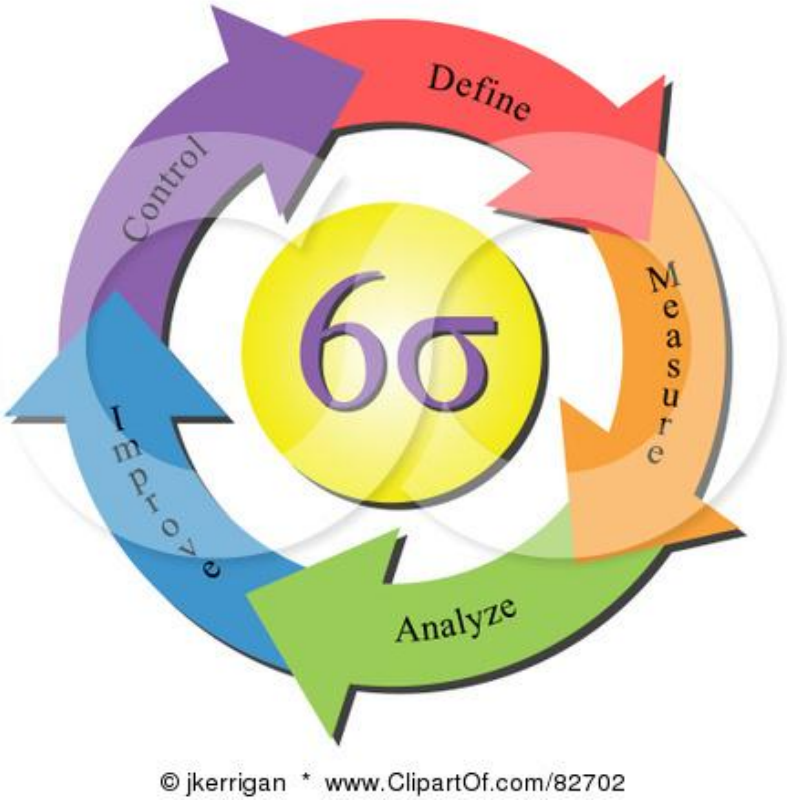
Define

Measure

Analyze

Improve

Control



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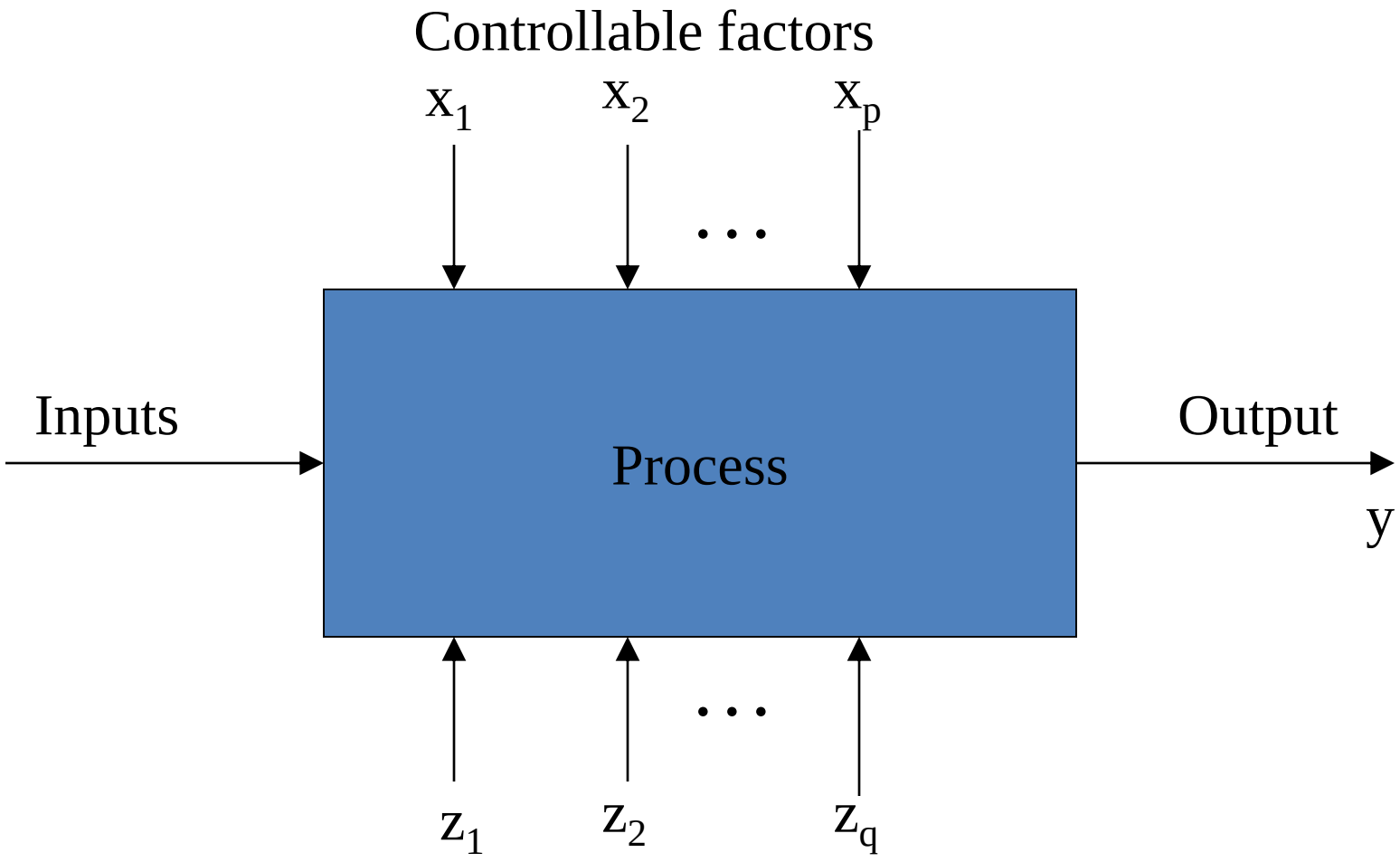
General Model of a Process $y=f(x)$



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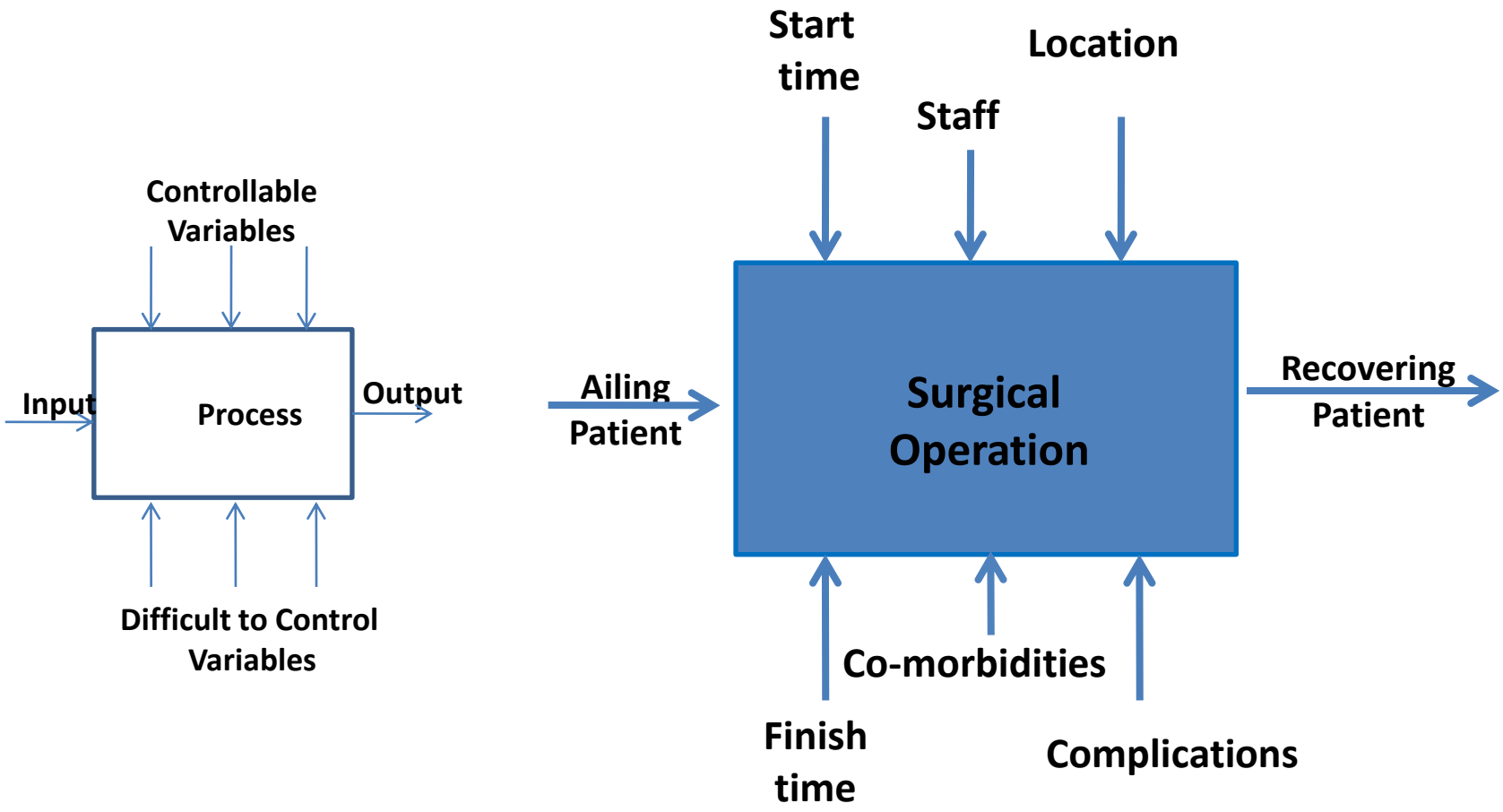
Specific Example of a Process



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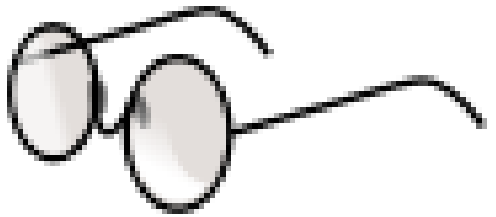
Six Sigma is a New Way of Seeing…

- It is helpful to look at important aspects of your practice, job, business as **processes**
- There will be **some variables that you can readily affect**, others that are **difficult to control**
- Your task will be to optimize the ones that you can, and to mitigate the ones that you can't



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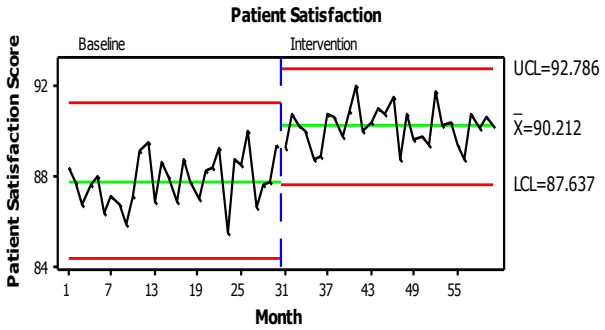
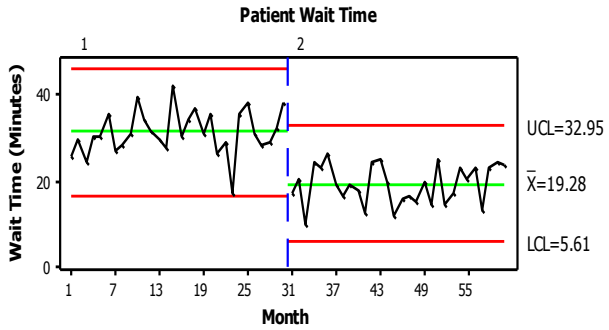
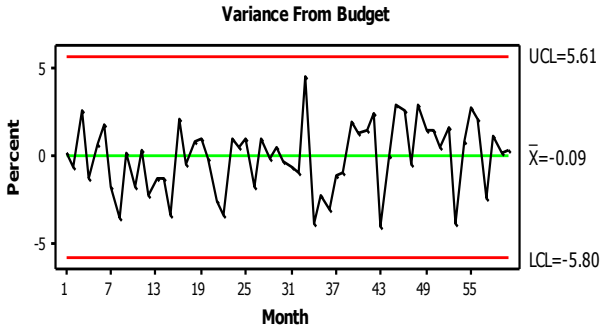
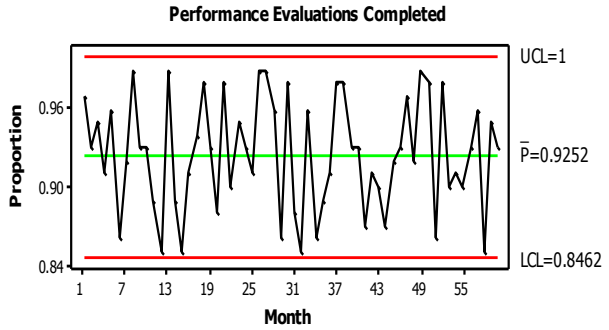
Quality Improvement

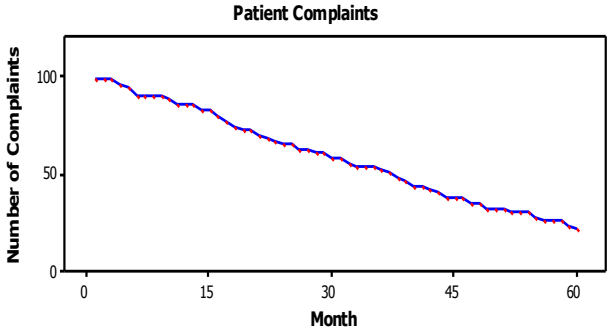
- Strategic Improvement Objective
  - Increase/decrease in key metric seen following team intervention
- Maintenance Objectives
  - Maintain performance on key metrics
- Kaizen Incremental Continuous Improvement
  - Many small improvements made by many people over time

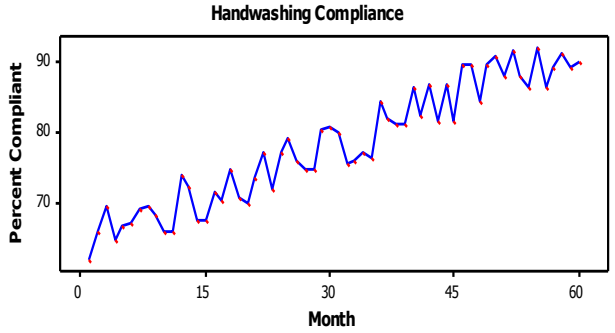












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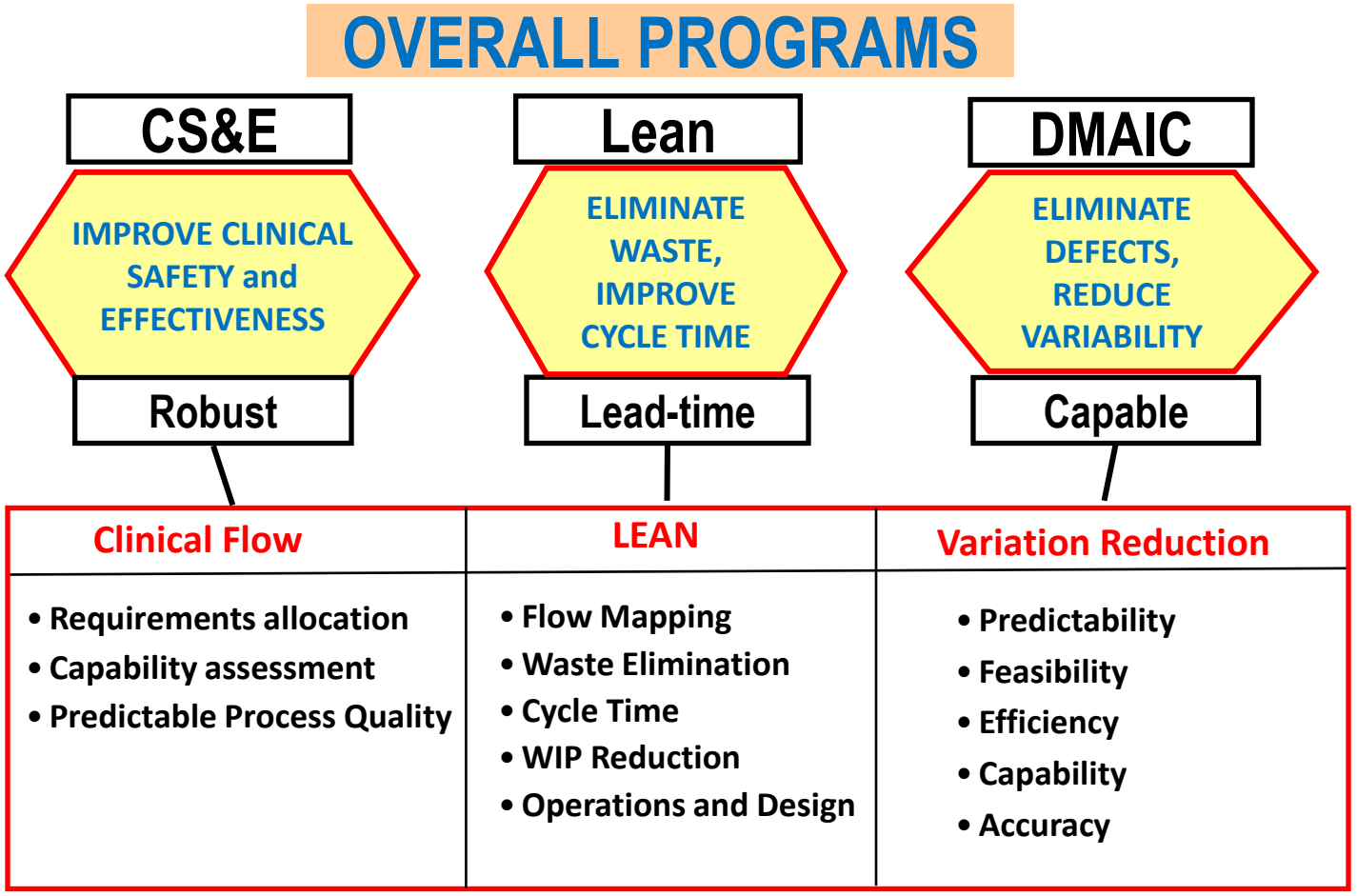
The Process Improvement Triad: CS&E, Lean, and DMAIC



Adapted from: Introduction to Statistical Quality Control, 5th Edition
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Section 2 – Fundamentals of Six Sigma Implementation

1. Introduction to Six Sigma
2. Fundamentals of Six Sigma Implementation
   - **2.1 Understanding the Voice of the Customer (VOC)**
   - **2.2 Critical to Quality Characteristics (CTQ's)**
   - **2.3 DMAIC Methodology**
   - **2.4 Case Studies**
3. The Lean Enterprise
4. Managing a Successful Six Sigma Effort

- Course Evaluation and Wrap-Up

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What is a Process?

- Business Processes are designed to **add value** for the customer and should not include unnecessary activities
- The outcome of a well designed business process is **increased effectiveness** (value for the customer) and **increased efficiency** (less costs for the company) (Wikipedia)
- A business process should listen to the Voice of the Customer (VOC)

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The Customer

- We have many customers… both external and internal.
- One external customer is obviously the patient, however, insurance companies, CMS JCAO are also external customers
- Our internal customers are the ones who are downstream from us. Physicians, RNs are customers of diagnostic imaging, labs, pharmacies, etc.

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The internal customer

- Along with viewing our work as a process, we should understand that our output leads to the input of our internal customer. This is viewed by our external customers as the output of our hospital.
- By adopting this view, we can find ways to improve our outcomes.
- For example, efficiently admitting a patient results in fewer insurance payment issues and yields a happier patient.

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The external customer

- More information is readily available to our external customer.
- USNWR rankings
- Hospitalcompare.hhs.gov
- Metrics reported to agencies
- HCAHPS Surveys

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Translate Customer Needs (VOC) to CTQs

Verify Customer Needs

- Most often, we will need to translate a customer need into a quantified requirement for the product or service
- This quantified requirement is termed a **CTQ**
  - **C**ritical **T**o **Q**uality
- Project goals needs to be based on:
  - A Target Value
  - Specifications or Tolerance Limits
  - Defect levels

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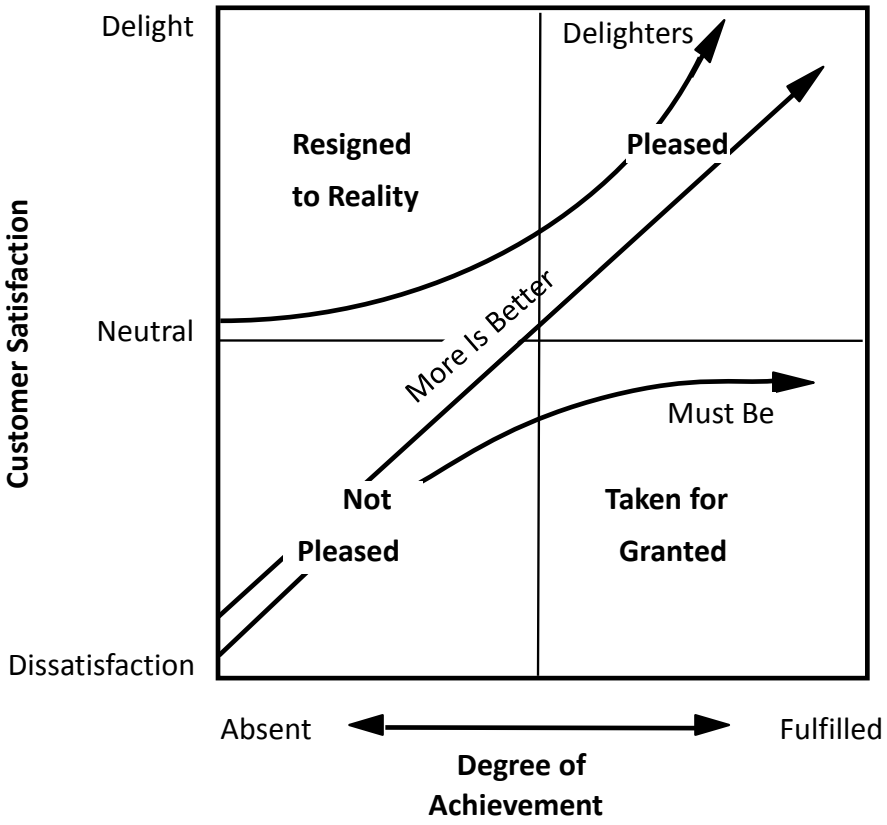
Translate VOC to CTQs

Kano Model

- Describes which needs, if fulfilled, contribute to customer dissatisfaction, neutrality, or delight
- **"Must Be" needs**
  - Those the customer expects
  - Generally taken for granted—unless they are absent!
- **"More is Better" needs**
  - Have a linear effect on customer satisfaction
  - Customers generally discuss or bring up issues related to More Is Better characteristics
- **"Delighter" needs**
  - Do not cause dissatisfaction when not present, but satisfy the customer when they are
  - Can be differentiators between you and the competitor



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Translate VOC to CTQs

Verify Customer Needs:

Quality	Features, Attributes, Dimensions, Accuracy, Accessibility, Effectiveness - Defect free
Cost	Prices to Customer, Price to Insurer, HMO, or Hospital, Payment Terms
Delivery	Lead Times, Delivery Times, Turnaround Times, Setup Times, Cycle Times, Delays
Service & Safety	Service Requirements, Service Responsiveness, Database Maintainability, Records Maintenance & Retention, Customer-Required Maintenance, Product Liability, Product/Service Safety
Compliance	Ethical Business Conduct, Environmental Impact, Regulatory and Legal Compliance (this area tends to be a Business non-negotiable)

The key is to understand how your customers define and prioritize the various needs and expectations they have of your products and services

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Translate VOC to CTQs

Critical to Quality Requirements

Signify importance to the customer
- The customer "cares about it"
- Value proposition

Specify a requirement
- "Must have" attributes
- Ultimately satisfies
- Potentially delights

Establishes a basis for targets
- Customer specifications
- Acceptable range of performance

Can be measured

If CTQs are not defined to the point that a clear ***target with specifications*** is established, the team will not be able to determine the baseline level of performance.

Effective process improvement requires that we understand and quantify the cause and effect relationship of every element of our business operation

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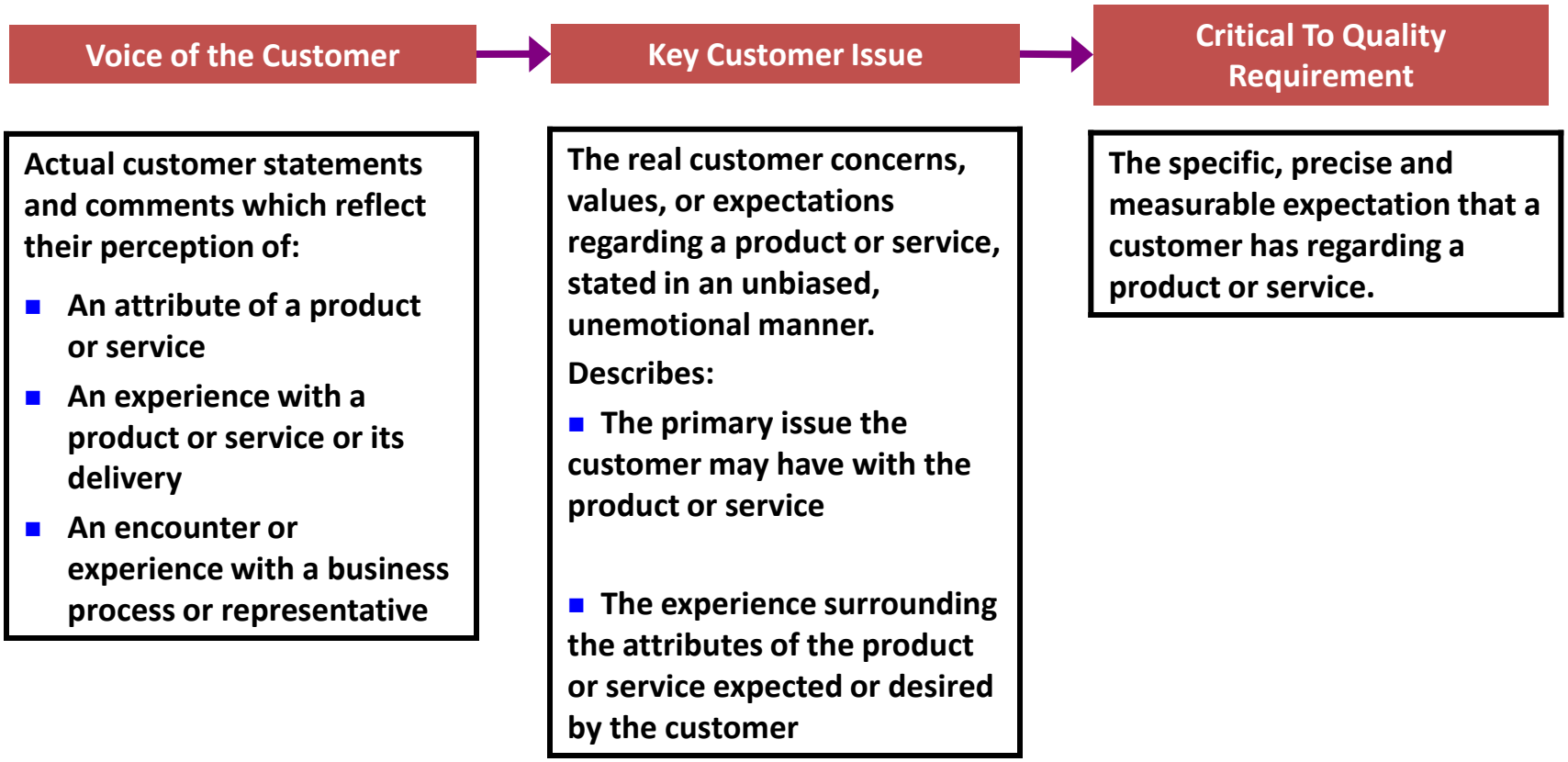
Translate VOC to *Measurable* CTQs



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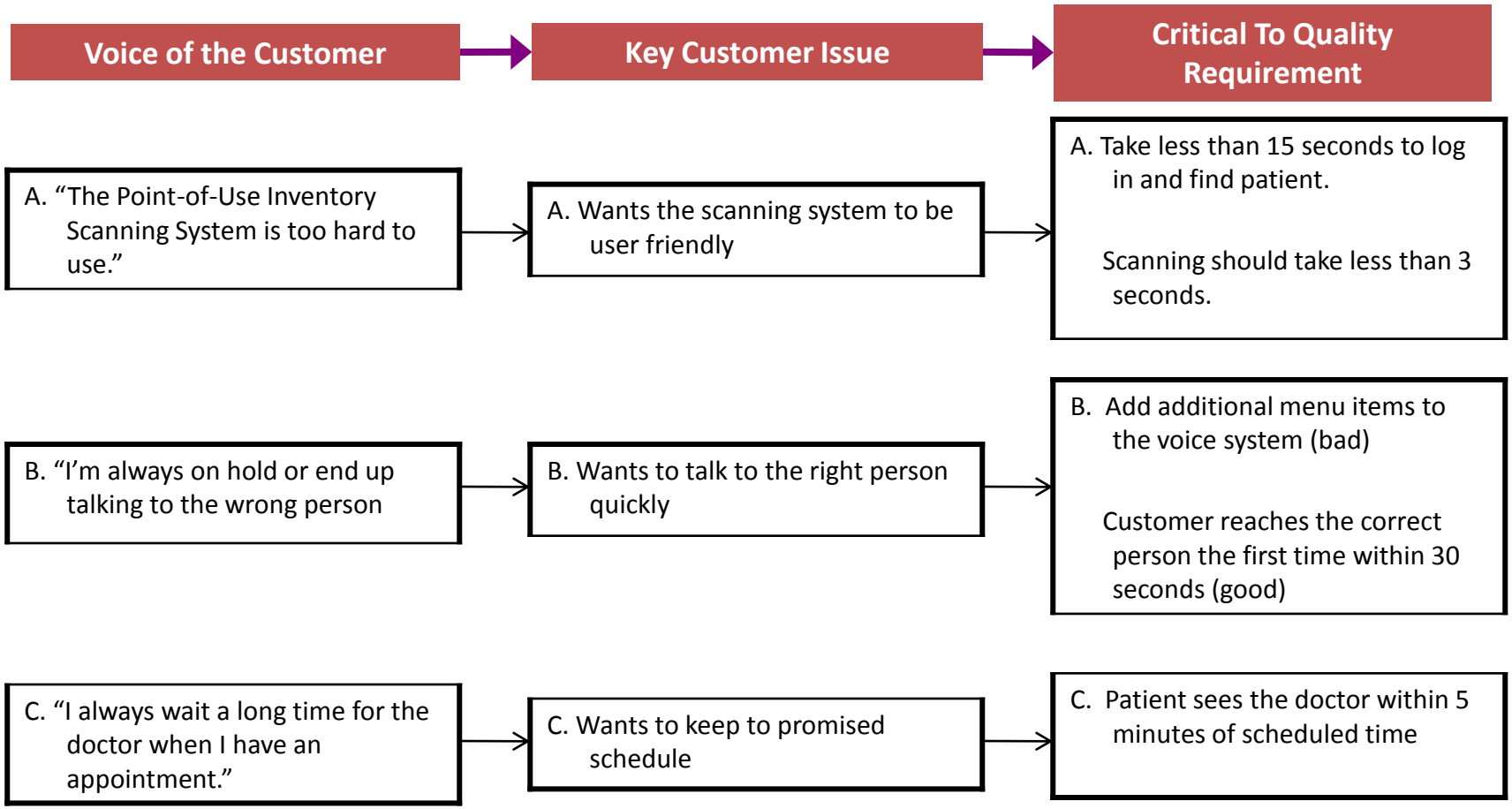
Translate VOC to *Measurable* CTQs



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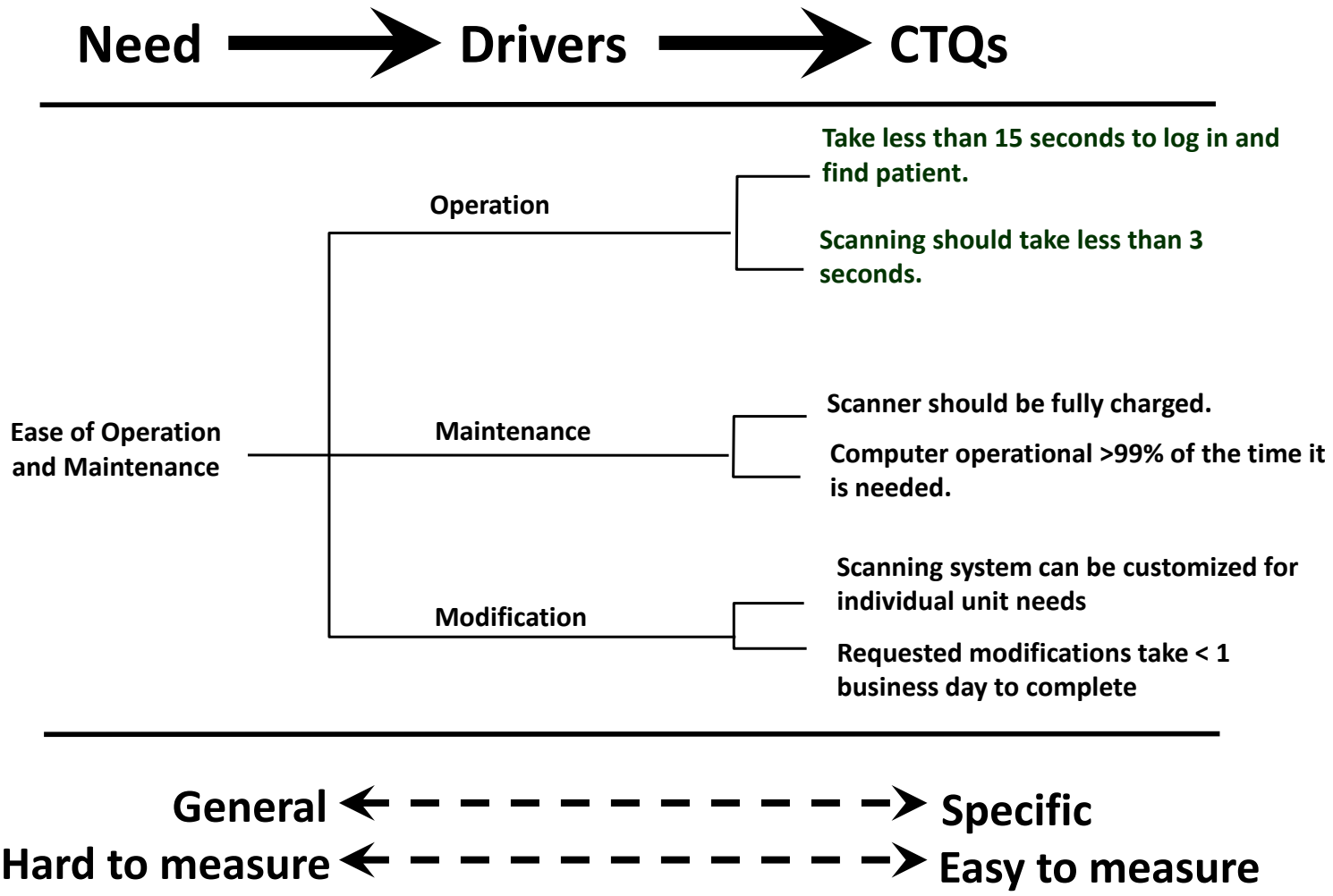
CTQ Tree: Example



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Why CTQ's?

- You can't directly change customer satisfaction ratings, but by improving the CTQ variables, the output quality will improve
- They are measureable, and impactable

Examples: *How would you describe a good cup of coffee?

*How do you choose your doctor?

*Which car would you buy?

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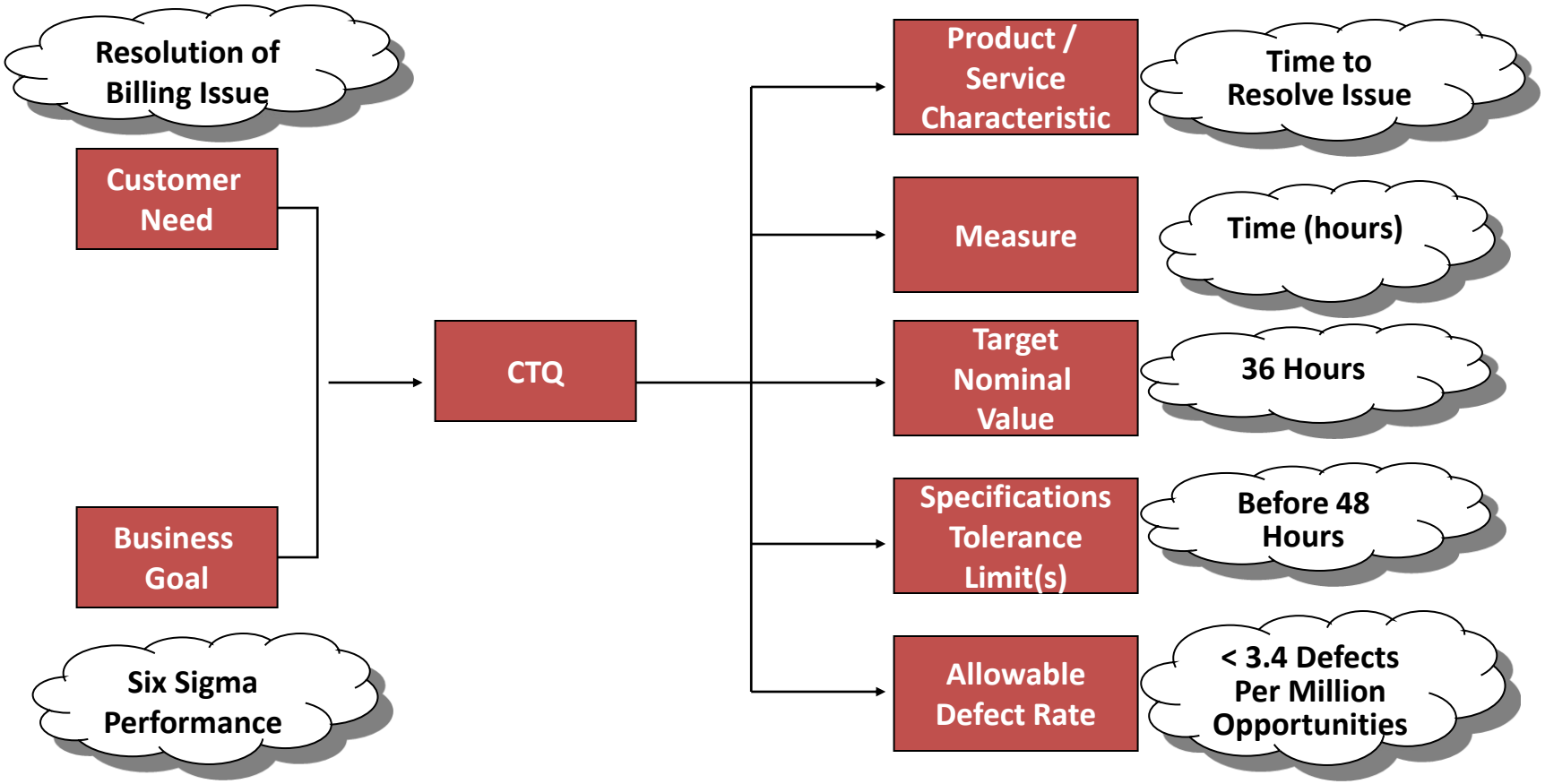
Develop Measures and Indicators



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Activity
Develop Measures and Indicators

Objective

Apply the VOC concept to a project

Instructions

- Define a preliminary measure based on your CTQs
  - CTQ
  - Specification
  - Unit of Measure
- Which is a good chart to start with?

Time

20 Minutes

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Six Sigma Methodology for Process Improvement (DMAIC)

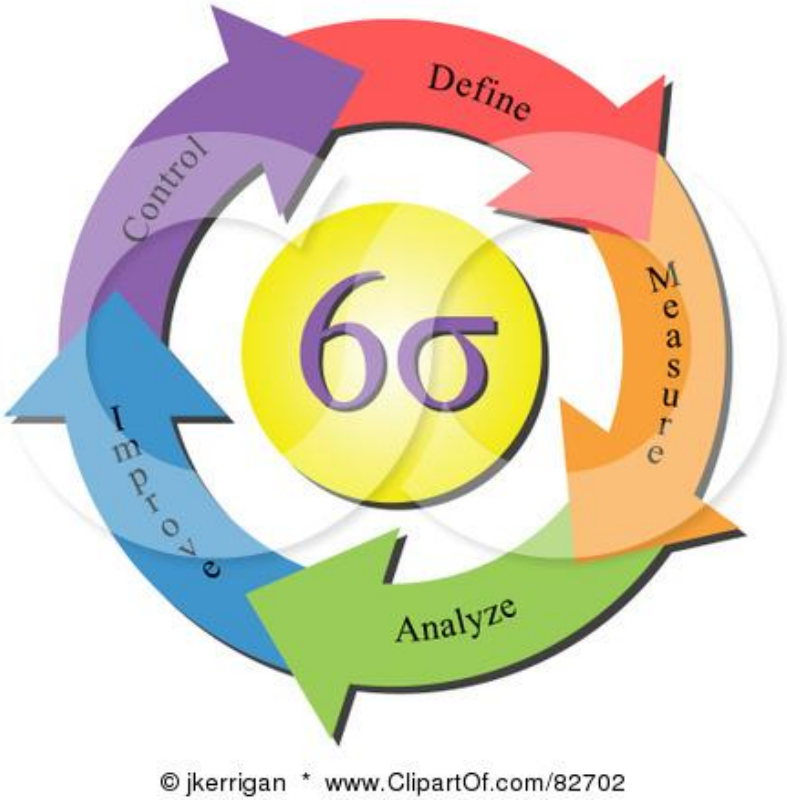
Define

Measure

Analyze

Improve

Control



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Overview of DMAIC

Define the goals of the improvement activity (objectives and primary and consequential metrics.) Obtain goals from direct communication with stakeholders. Select and train team members. Identify deliverables and timeline.

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Define Step:
Process Metrics

- Business Metrics – High level existing management performance indicator
- Primary Metrics – business or process metric that is focus of team improvement methods
- Consequential Metrics – process metrics that could get worse as a result of improving the primary metric
- Financial Metrics – Convert improvement to impact on bottom line ($)

Tools Used in DMAIC
Define Phase

- Project charter
- VOC tools (surveys, focus groups, letters, comment cards)
- Process map
- QFD
- SIPOC
- Benchmarking

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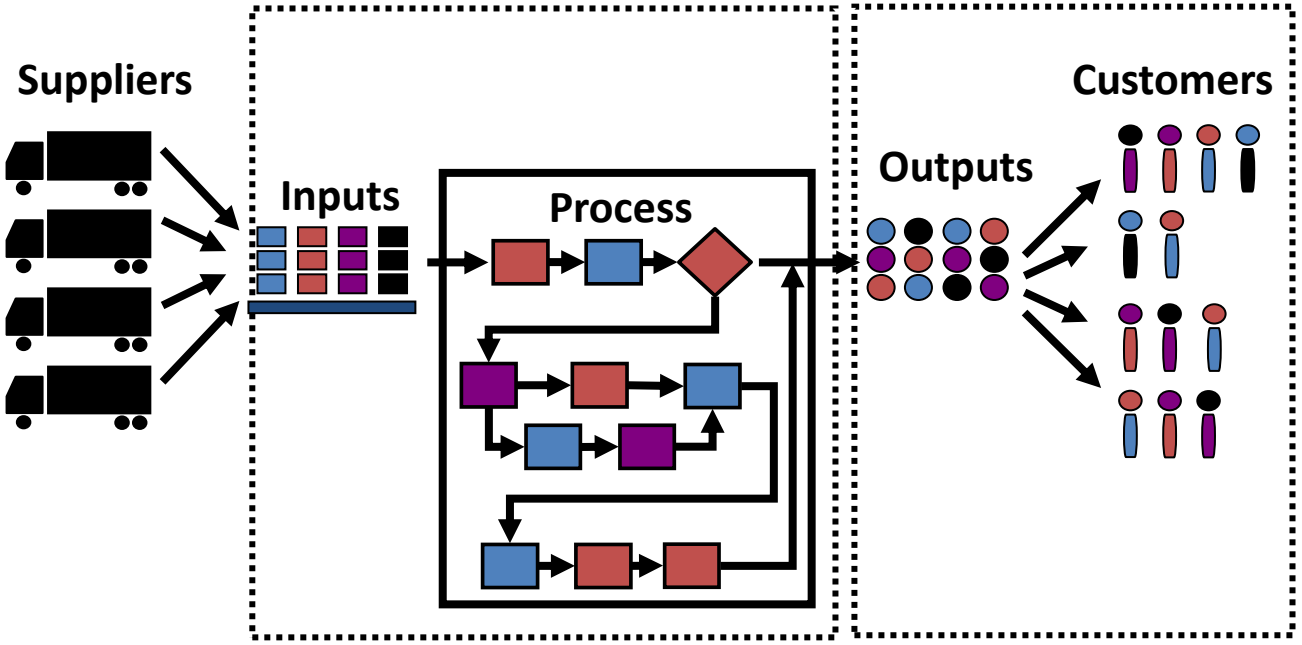
Business processes have 3 main characteristics:

- They're a series of events that produce outputs
- They're defined through numerous steps
- Their beginning and end points are marked by boundaries
- A SIPOC chart is a good tool to understand steps and boundaries

From Skillsoft training materials

High Level Process Map: SIPOC



- A SIPOC diagram is a foundation technique used to develop a high level process map
- Outlines your process with just enough detail to get you started with measurement and analysis

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Components of a SIPOC

- **S**uppliers
  - Providers of information, materials or other resources
- **I**nputs
  - Information or materials consumed or transformed by the process
- **P**rocess
  - Series of steps that transform and add value to the inputs
- **O**utputs
  - Product or service used by the customer
- **C**ustomer
  - People, company or process that receives output from the process

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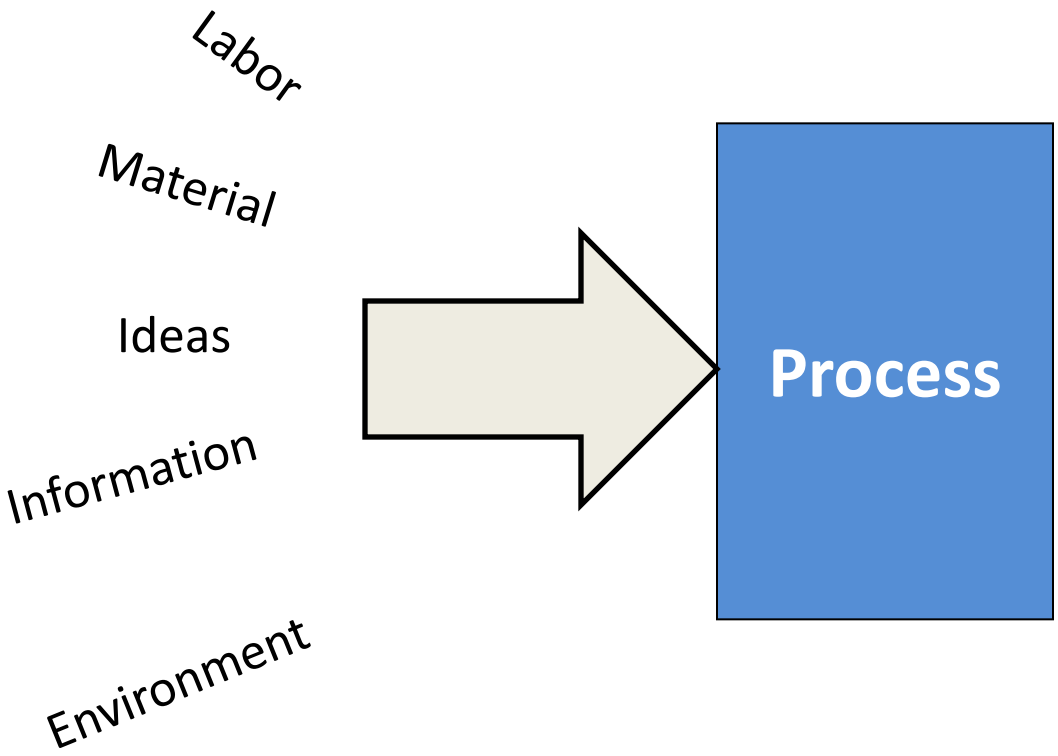
SIPOC: Inputs



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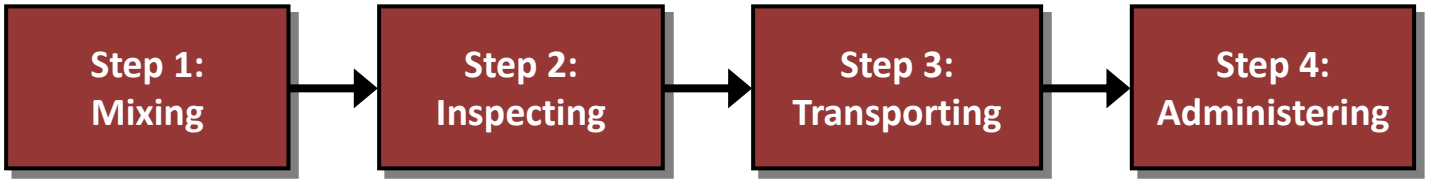
SIPOC: High Level Process View

Capture the Process in 4 – 7 Key Sub-Processes



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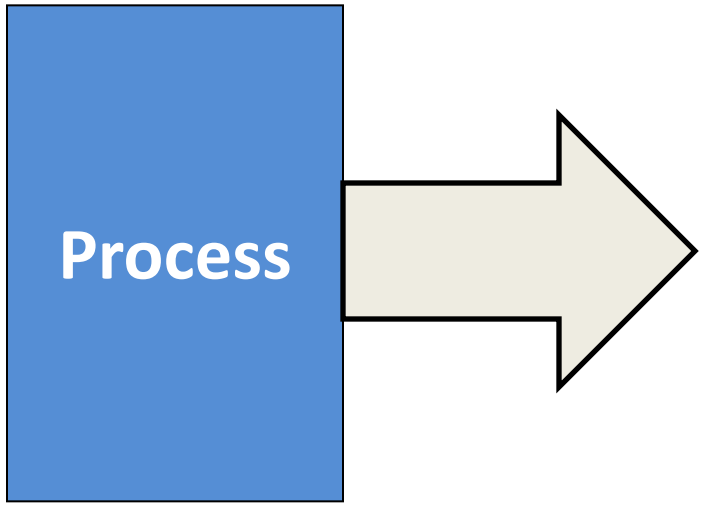
SIPOC: Outputs



Physical products

Documents

Information

Services

Decisions

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SIPOC

Suppliers	Inputs	Process	Outputs	Customers	
(resource provider)	(process)	(high level process flow)	(from the process)	(receiver an output from the process)	
Coffeemaker purchased - on countertop	>5 cup capacity coffee maker	**Making coffee**	heating to keep coffee warm for 1 hour after brewing	All of us enjoy the same brand of coffee with varying condiments	
city water supply into faucet	water supply	Add water	enough coffee to serve all of us within 15 minutes of start time.	1 cup of coffee	wife
purchase from XYZ company	1 filter	Add filter & ground coffee	one filter to prevent overflow	1 teaspoon of french vanilla creamer	
Use ABC brand beans	4 tablespoons of coffee grinds		correct amount of grinds		
Electric company	120V GFCI outlet	Plug-in and turn on		1 cup of coffee	husband
Upper left drawer next to refrigerator	measuring spoons		Source to heat water to temperature	Honey on the table	
			Pump to move water up through filter.	Dash of cinnamon	
Mugs purchased - in upper left cabinet	coffee mugs	Pour into mug	Hot coffee filled near the top of the mug.		
refrigerator and pantry	condiments and containers for sugar, creamer, honey, cinnamon.	Add condiments		1 small cup of coffee for each	
ABC brand for sugar & creamer.			coffee served in spouses favorite mug	1 teaspoon sugar	
XYZ brand for honey and cinnamon		Stir	coffee served in husbands mug	1 tablespoon french vanilla creamer	
pantry	stirrers, lids	Serve	coffee served in personalized kids mugs	Let sit for 5 minutes before serving	2 teenagers

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Overview of DMAIC

Measure the existing system. Evaluate and document the key business metrics of the current process.

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Tools Used in DMAIC Measure Phase

- Measurement systems analysis
- Exploratory data analysis
- Descriptive statistics
- Data mining
- Run charts
- Pareto analysis

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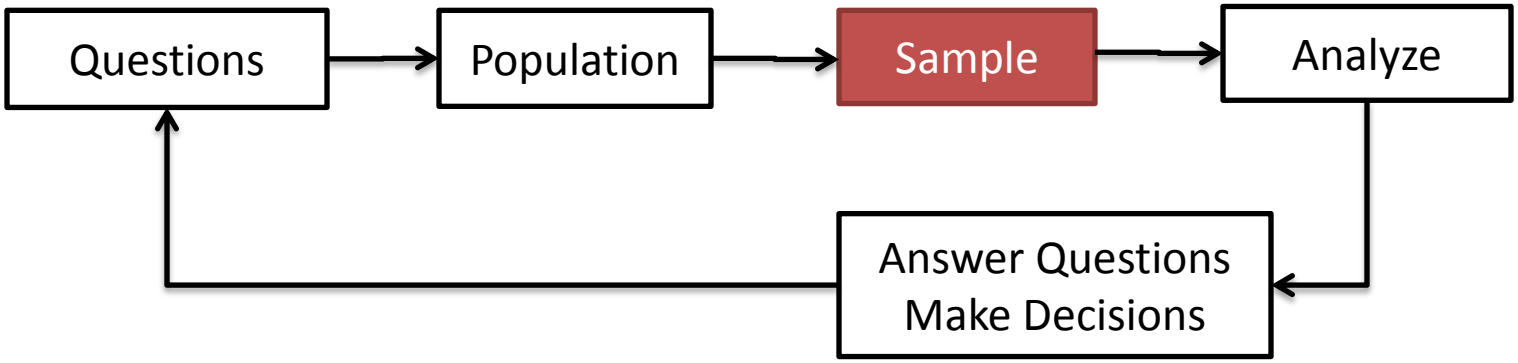
Reason for Sampling a Process

- We have a set of metrics we would like to measure to increase our process knowledge.
- It may not be practical or even possible to investigate every data point in the population.
- So we decide to take a sample.



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Introduction to Sampling

Issues to consider

- Is the data discrete or continuous?
- Is this a one time event or will you be sampling repeatedly over time?
- What is the data source?
  - Is it data extraction or data collection?
- What are the important stratification variables?

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Introduction to Sampling

Issues to consider

- Risk Management
  - Samples are great in that they are efficient. The down side to samples is that they vary.
  - If I take a sample of 12 out of a population of 1,000, and you also take a different sample of 12 from the same population, we are not likely to get the same answer.
  - The larger the sample size, the better the sample will represent the population. However, amount of time available needs to be considered.

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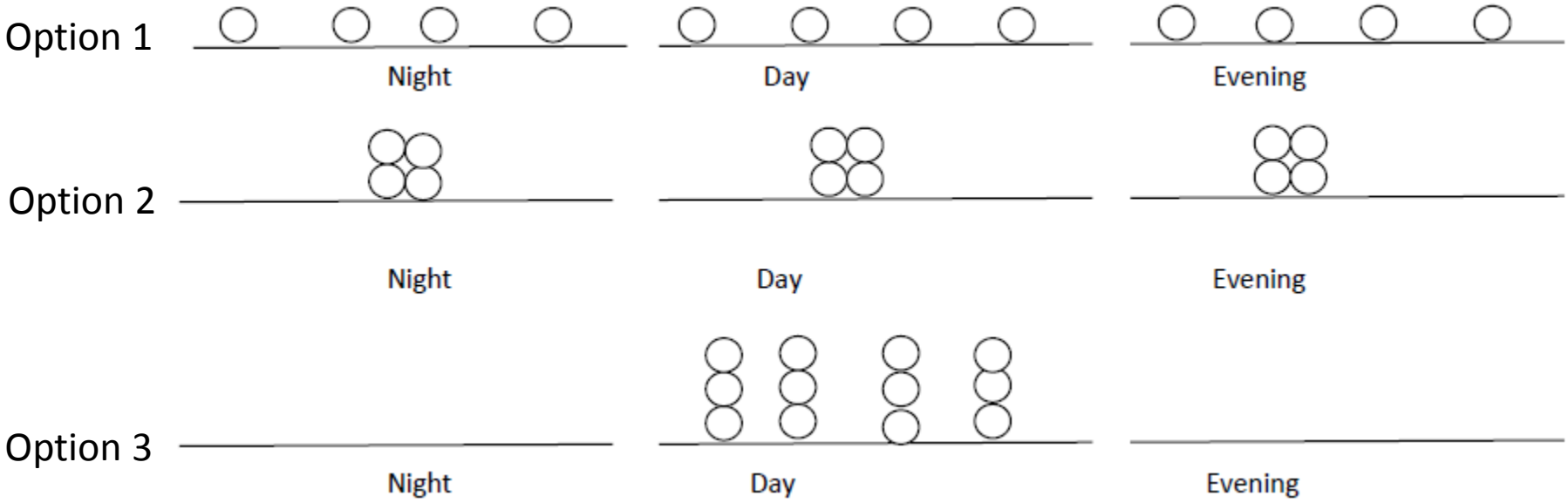
Sampling Strategy

If 12 samples can be taken across 3 work shifts, which option is best?



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Selecting the right Sampling Choices

- What are the sources of variation we are concerned about?
  - Measurement Variation
  - Within hour variation
  - Hour to hour
  - Morning to afternoon to evening
  - Day to day
  - Week to week
  - Month to Month

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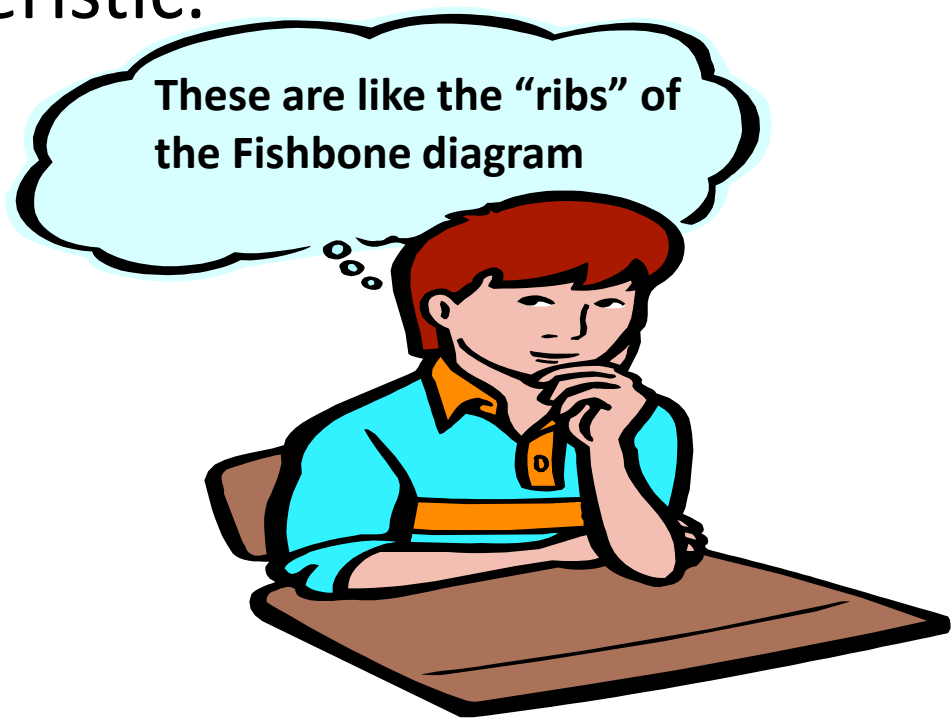
Measurement Systems Analysis

- Allows us to view equipment, operations, procedures, software and personnel that affects the assignment of a number to a measurement characteristic.

Measurement error
+ Process variability
= Observed variability



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Overview of DMAIC

Analyze the system to identify ways to eliminate the gap between the current performance and the goal. Collect data, identify critical variables.

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Tools Used in DMAIC Analyze Phase

- Cause-and-effect diagrams
- Tree diagrams
- Brainstorming
- SPC
- Process Maps
- DOE
- Hypothesis tests
- Inferential statistics
- FMEA
- Simulation

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Overview of DMAIC

Improve the system. Find "*y*" as a function of "*x*". DOE, FMEA. Pilot improvement ideas, then implement those that lead to quantifiable improvements.

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Tools Used in DMAIC Improve Phase

- Force field diagrams
- 7M tools
- Prototype and pilot studies
- Project planning and management tools

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Overview of DMAIC

Control the new system.

Standardize, maintain improvements.

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Tools Used in DMAIC Control Phase

- SPC
- FMEA
- ISO 900x
- Change budgets, bid models, cost estimating models
- Reporting system

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Representing the Data Trends

- In CS&E, you learned about many tools to show data trends.
- The best tool choice depends on whether you are:
  - Working with ideas,
  - Working with numbers, or
  - Trying to reach team consensus

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Working with Ideas

- Brainstorming
- Affinity Diagrams
- Fishbone Charts
- Flowcharts
- Tree Diagrams

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Working with Numbers

- Check Sheets
- Control Charts
- Histograms
- Pareto Charts
- Scatter Diagrams

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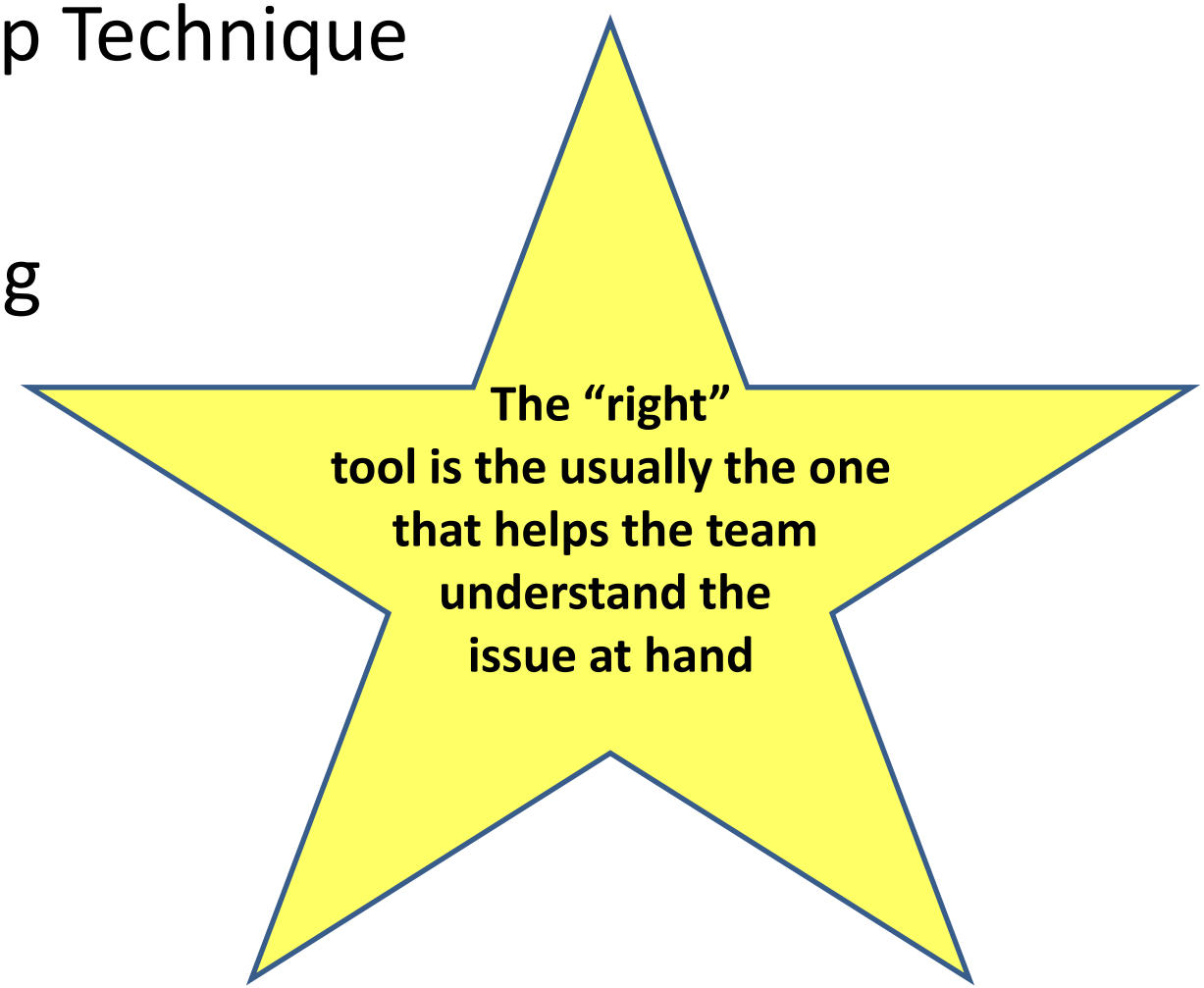
Trying to Reach Consensus

- Nominal Group Technique
- Multi-voting
- Forced Ranking



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Case Studies

Example

Medco Health Solutions

- Mail-service delivery of prescription medications
- Pharmacy network composed of:
  - Eight prescription-processing (‘front end’) pharmacies
  - Three dispensing (‘back end’) pharmacies
  - Six call-center pharmacies

Example

Objective:

To reduce medication errors in its home-delivery service, by using Six Sigma methodology.

Six Sigma Phases

Define Phase Process flow map

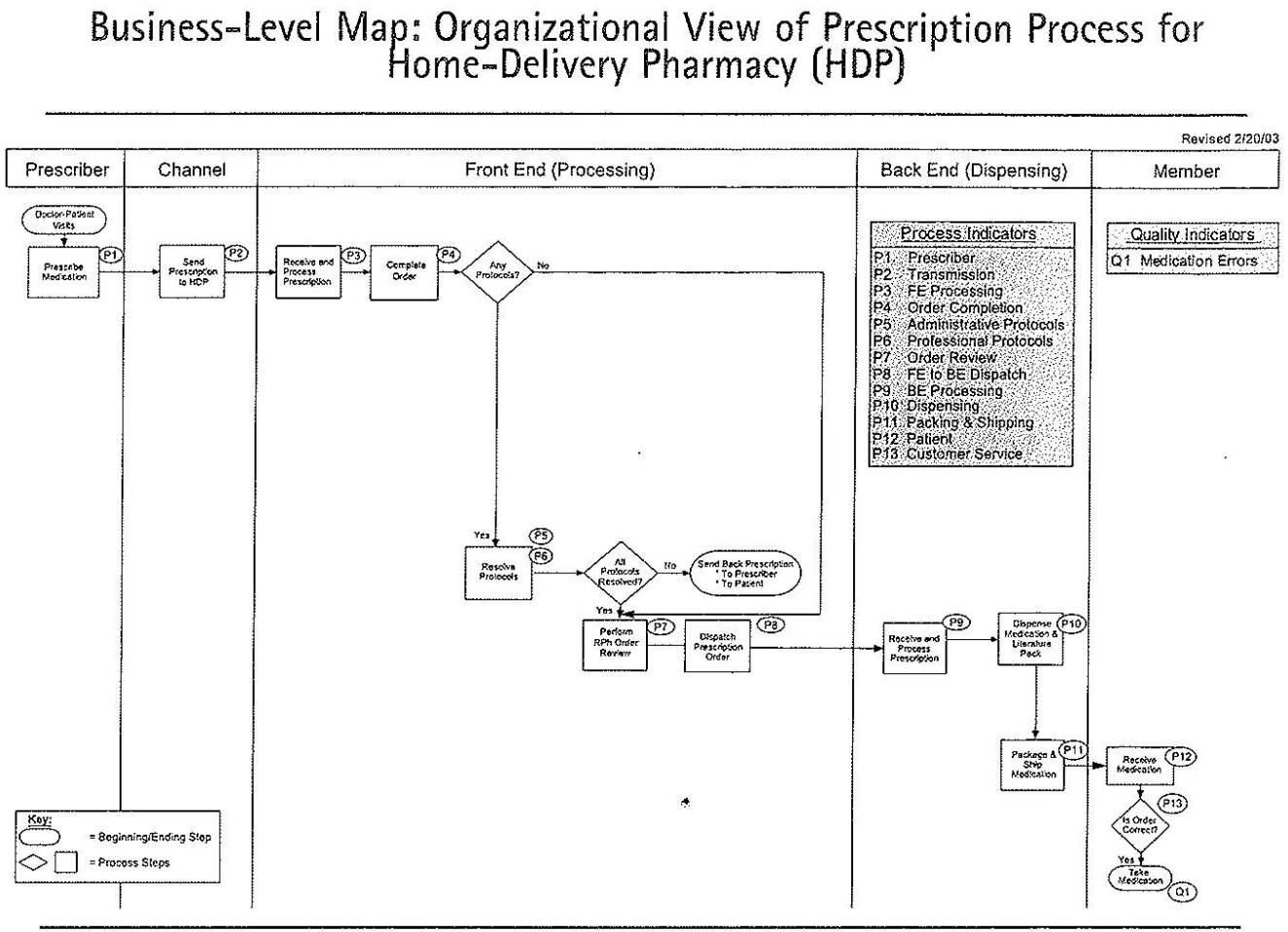


Figure 1. *A flow map to identify 13 process indicators (identified by a "P") that could cause a medication error.*

Six Sigma Phases *(Continued)*

Measure Phase

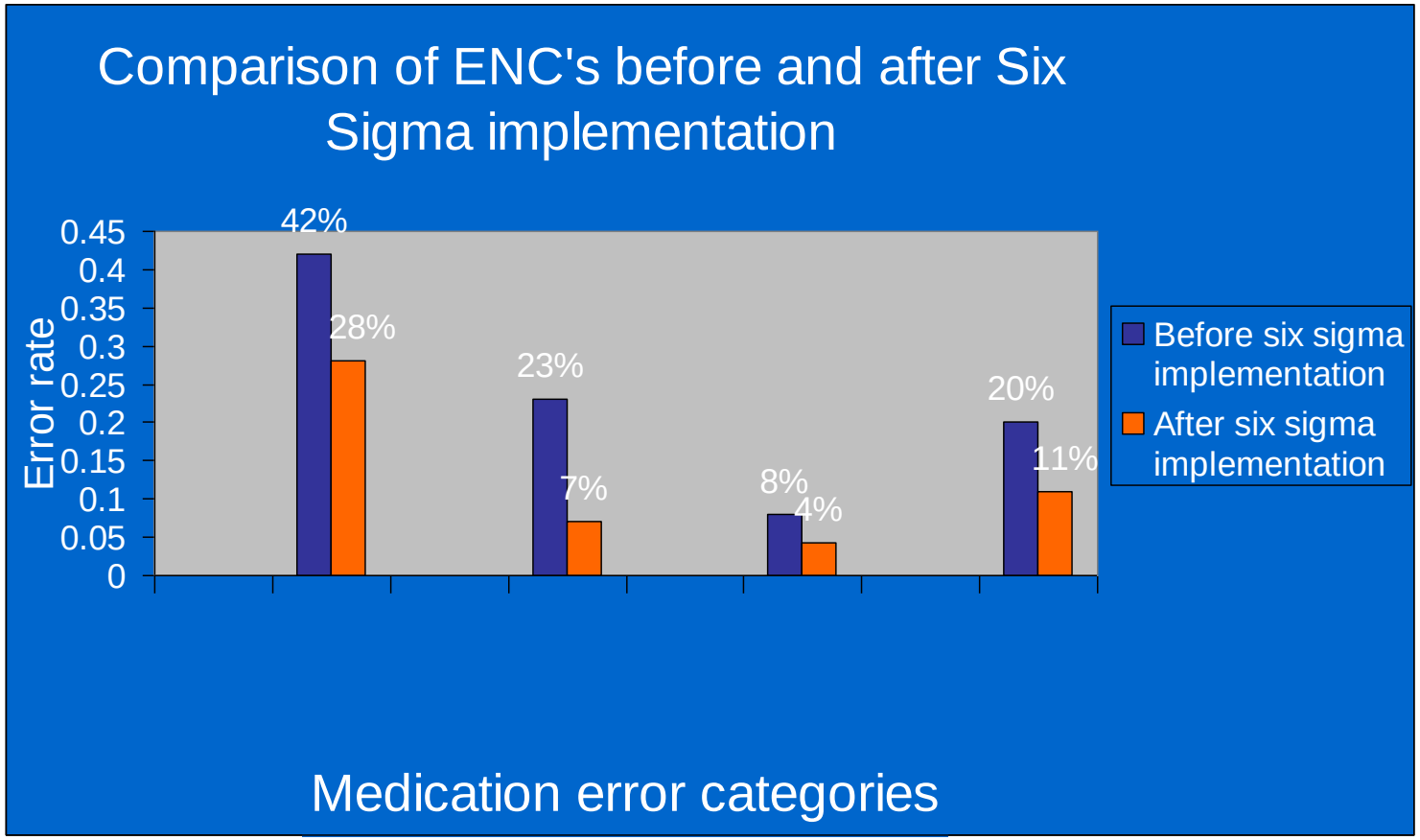
- Standardized ENC (External NonConformance) form designed.
- 304 error elements identified within 13 process indicators
- Centralized error-reporting unit with web based application developed

Six Sigma Phases *(Continued)*

Analyze Phase

- 3,623 ENCs gathered (Sep.15, 2002 – Feb.15, 2003)
- Prescription processing pharmacies (96%); dispensing pharmacies (4%)
- New prescriptions (89%); refills (10%); renewal requests (1%)

Six Sigma Phases *(Continued)*



Six Sigma Phases *(Continued)*

Improve Phase

- Enhanced regular and ongoing education, awareness and training for pharmacists about commonly occurring medication errors.
- Procedure for developing, reviewing and enhancing SALA alerts

Six Sigma Phases *(Continued)*

Control Phase

- Ongoing quality management
- Sustained process improvements

Univ of Pittsburgh Med Center– Inc Cath Lab Capacity

- Define – Identify baseline, goal, objectives
- Measure – Measure all aspects of cath lab performance including pre-case, exam time, and post-case processes; impact on patient scheduling, overtime, and capacity; cycle time data; current procedures

Univ of Pittsburgh Med Center– Inc Cath Lab Capacity (cont)

- Analyze – Found that patients were on avg 14 min early; although 2 hours were blocked, procedures only took 55 minutes.
- Improve – Changed procedures so beginning baseline was reduced, staff redeployed; holding area for patients

Univ of Pittsburgh Med Center– Inc Cath Lab Capacity (cont)

- Control – dashboard used to monitor times:

Metric	Target	Baseline Average	Baseline Std.Dev.	Post-Improvement Average	Post-Improvement Std.Dev.	Change Mean/-Std.Dev.
Cases Start on Time	10 Mins.	22.1 Mins.	17.6 Mins.	10.2 Mins.	10.91 Mins.	++/++
In-Room Wait	5 Mins.	33.4 Mins.	17.6 Mins.	4.8 Mins.	10.2 Mins.	++/++
Room Turnaround Time	15 Mins.	51.28 Mins.	41.62 Mins.	19.96 Mins.	13.32 Mins.	++/++
MD Response to Page	10 Mins.			10.0 Mins.	8.8 Mins.	?

Univ of Pittsburgh Med Center– Inc Cath Lab Capacity (cont)

Results:

- Inc capacity by 2.08 patients per lab/per day (250 days per year)
- Financial Impact = $5.2 million annually @ $2500 / case
- Job satisfaction (less strain)
- Reduced in-room wait time from 33 min to 4.8 min
- Reduced lab turnaround time from 51 min to 20 min

Section 3 – The Lean Enterprise

1. Introduction to Six Sigma
2. Fundamentals of Six Sigma Implementation
3. The Lean Enterprise
   - **3.1 Understanding Lean**
   - **3.2 The Seven Elements of Waste**
   - **3.3 Value Stream Mapping**
   - **3.4 5S**
   - **3.5 One-Piece Flow**
   - **3.6 Spaghetti Maps**
4. Managing a Successful Six Sigma Effort

- Course Evaluation and Wrap-Up

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What is Lean?

- Series of tools focused on eliminating all waste in processes
  - Identifying 'waste' from the customer perspective and then determining how to eliminate it

- Focuses on delivering products and services in the right amounts, to the right location, at the right time, in the right condition

Lean was not created yesterday; it is the culmination of a century's worth of discovery and innovation.

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History of Lean Methods

- **1900**: Frederick Taylor studied work methods and used time studies to develop **standard work**
- **1910**: Frank and Lillian Gilbreth used process flow charts to analyze work elements including **non-value added** steps, and how work area design influenced worker psychological motivation ("cheaper by the dozen")
- **1920**: Henry Ford developed the concept of continuous flow production and the application of JIT(the right number of parts at the right time)
- **1945**: Deming & Juran: Statistical Process Control, Pareto, **PDSA**
- **1950**: Beginnings of Lean: Taiichi Ohno and Shigeo Shingo incorporated Ford production techniques, standard work, methods improvement, SPC, and others into a system called the **Toyota Production System (TPS)**
- **1990**: **Lean Manufacturing**, based on the TPS, began to take root in the United States, first in manufacturing, then into the office environment, service industries, and healthcare

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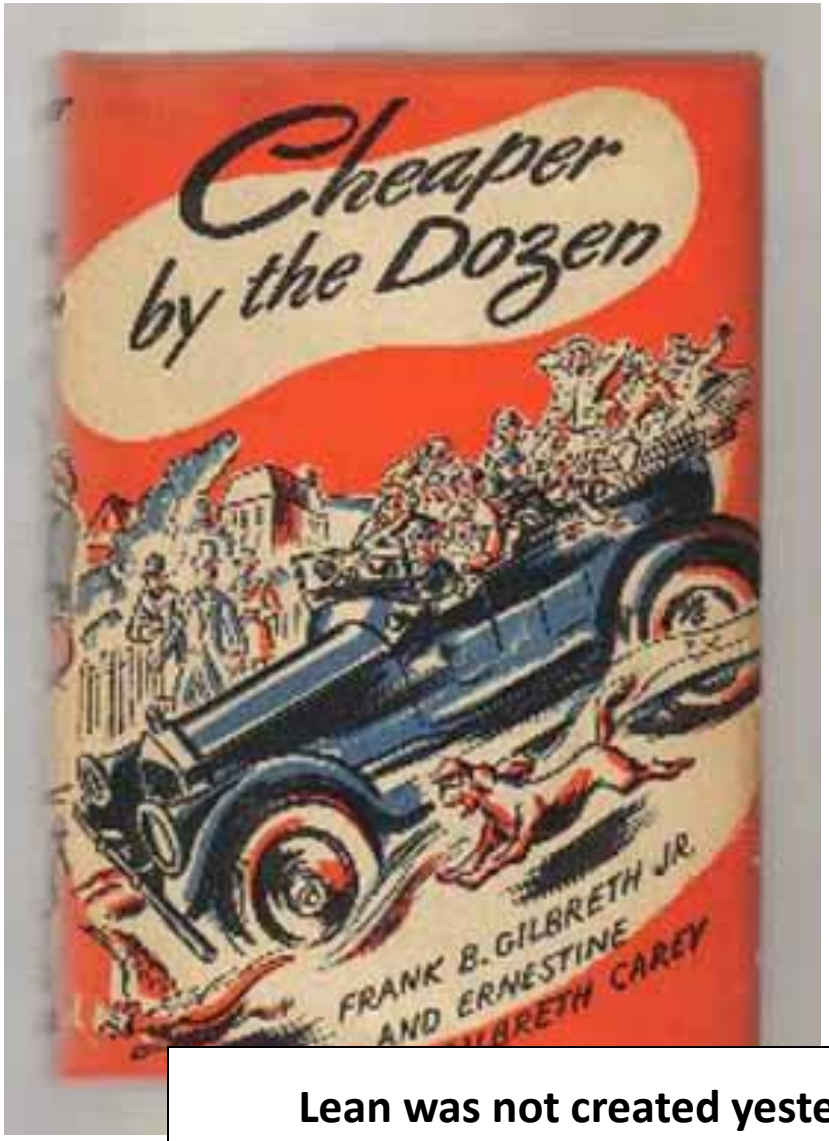

Lean was not created yesterday; it is the culmination of a century's worth of discovery and innovation.

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Lean Process Thinking

- Includes:
  - Designing processes
  - Improving processes
  - Managing processes

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Lean is *NOT*:

- Fewer people
- Less space
- Limited resources
- Efficiency no matter what
- Not enough supplies
- Giving the customer the bare minimum

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Understanding Value

- Waste is defined as any activity or resource expended that add no value to the product or service from the customer's perspective
  - It may be required in the current process but it’s still waste

- Value is defined by what a customer would want to pay for and by their expectations

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Is your work value-added?

- Employees often know precisely what their tasks are, but may only have a vague idea of where they stand within the process
- There may also be confusion when different people doing the same task have different approaches to it, some things may not add value for customers
- Mapping a process and all inputs can be helpful in identifying wasted effort

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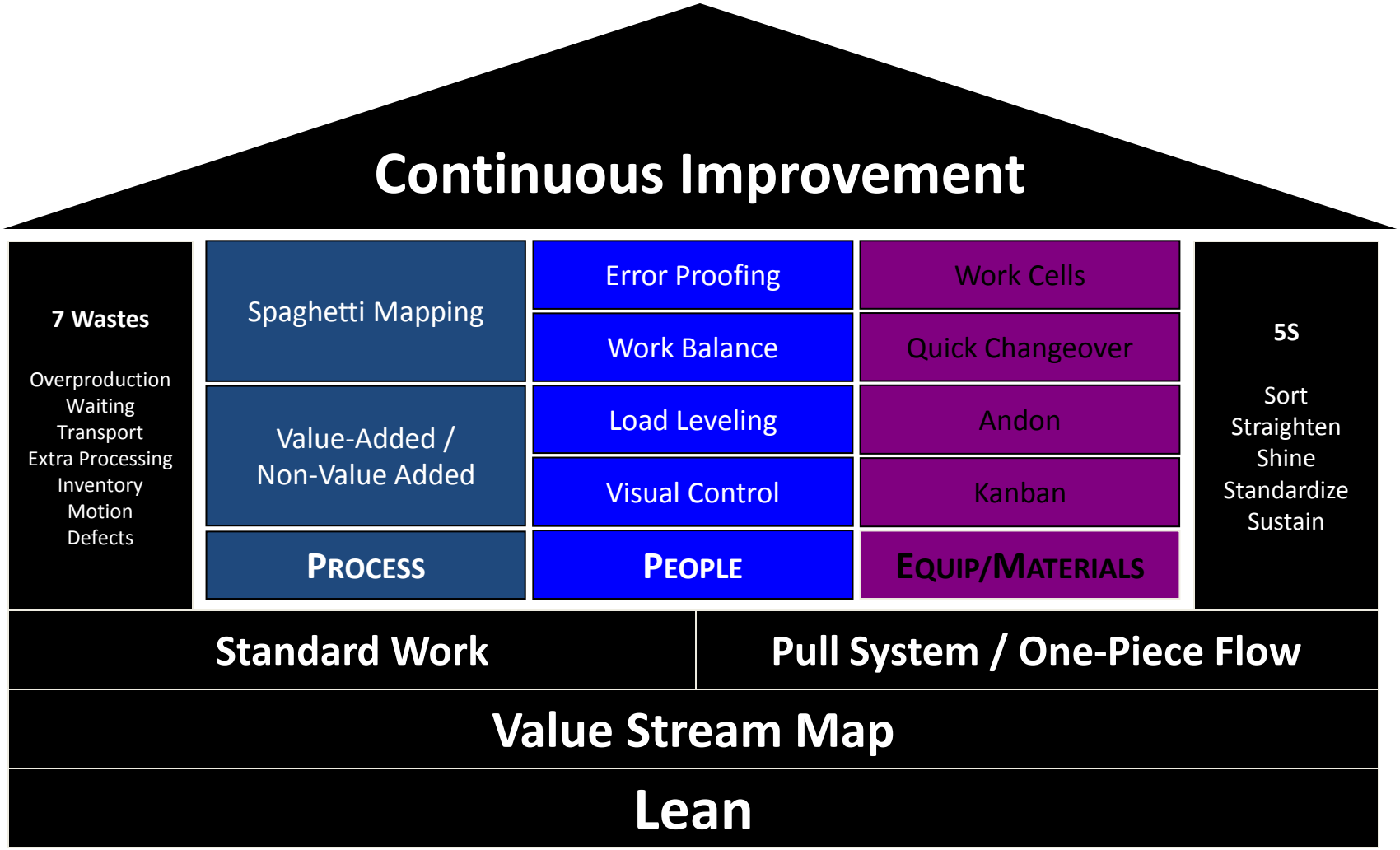

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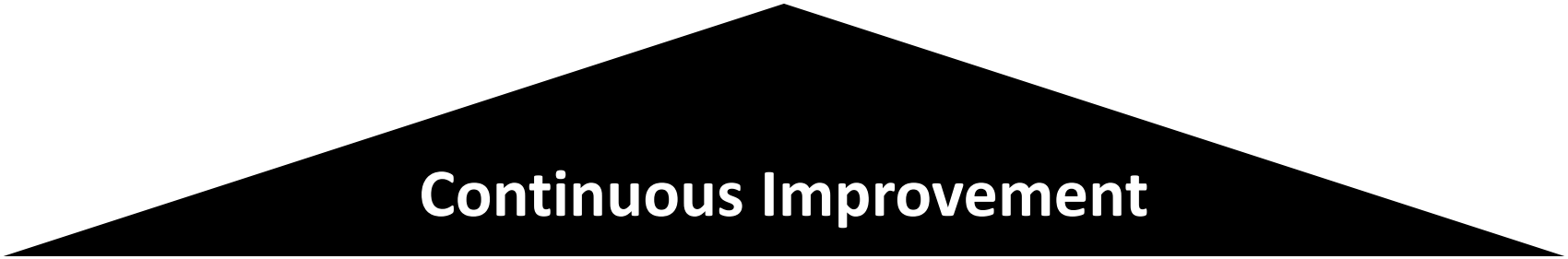

7 Wastes

Overproduction
Waiting
Transport
Extra Processing
Inventory
Motion
Defects

Value Stream Map

Lean

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Hierarchy of Value

- Keep: Value-Added Activities
- Minimize: Non-Value Added, but necessary activities
- Eliminate: Non-Value Added activities that are not necessary (pure waste)

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Waste

- Any activity that takes up time, resources or space but does not add value to the product or service

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Seven Types of Waste

- Overproduction
- Waiting
- Transport
- Extra processing
- Inventory
- Motion
- Defects

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Examples of Waste

Inventory, Motion – Lack of inventory control leads to expirations, excess inventory, searching and extra handling

Waiting, Transport, – Results in batching which increases turnaround time

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Steps to Reduce Waste
(Each Step is Harder than the Last!)

1. Recognize and identify waste
2. Have the courage to call it waste
3. Have the desire to eliminate it
4. Follow through and eliminate the waste

Finally, understand that waste simply:

- Raises cost
- Provides no corresponding benefit
- Negatively affects customer satisfaction/safety
- Threatens all our jobs

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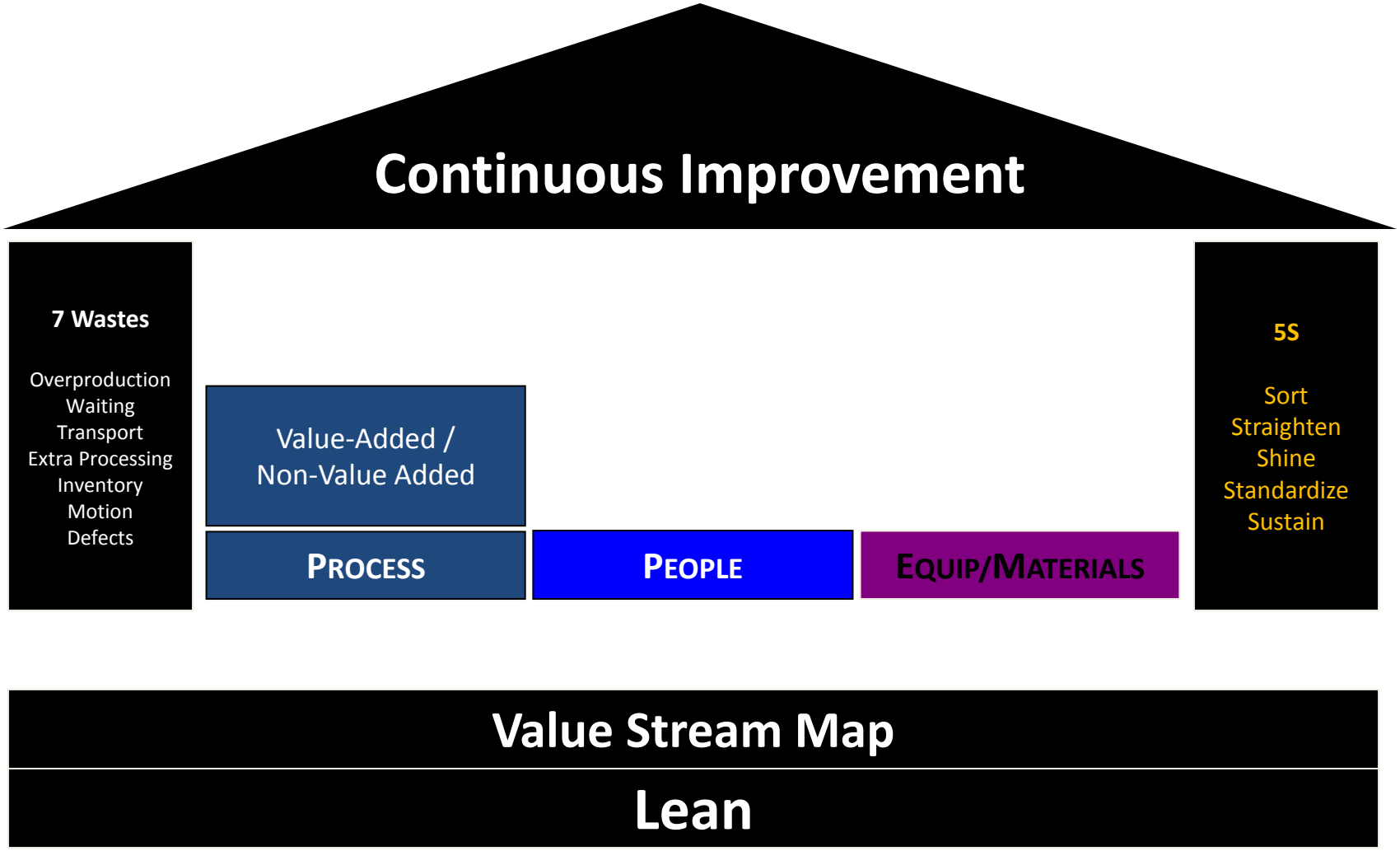

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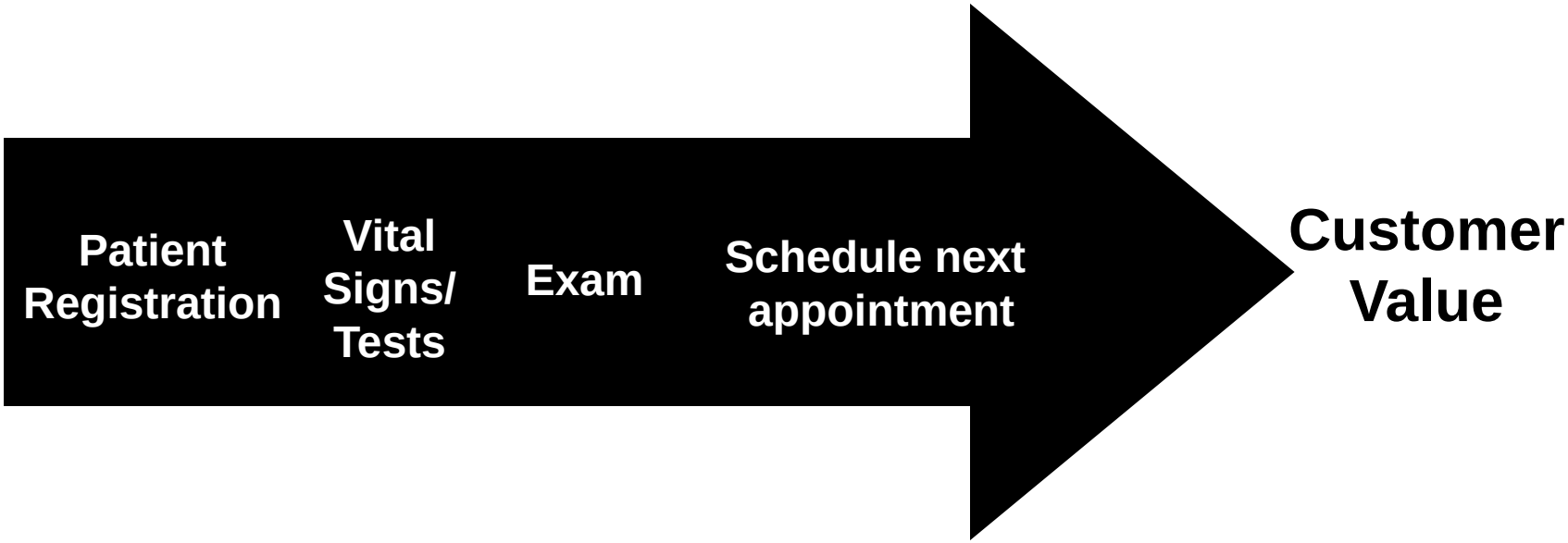
What is the Value Stream?

- All actions and activities required by the current state of the process to meet the customer demand



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Purpose of a Value Stream Map

- Focus attention on the flow of a system, rather than discrete processes

- Increase understanding of the flow, find ways to eliminate waste and to add value to a system

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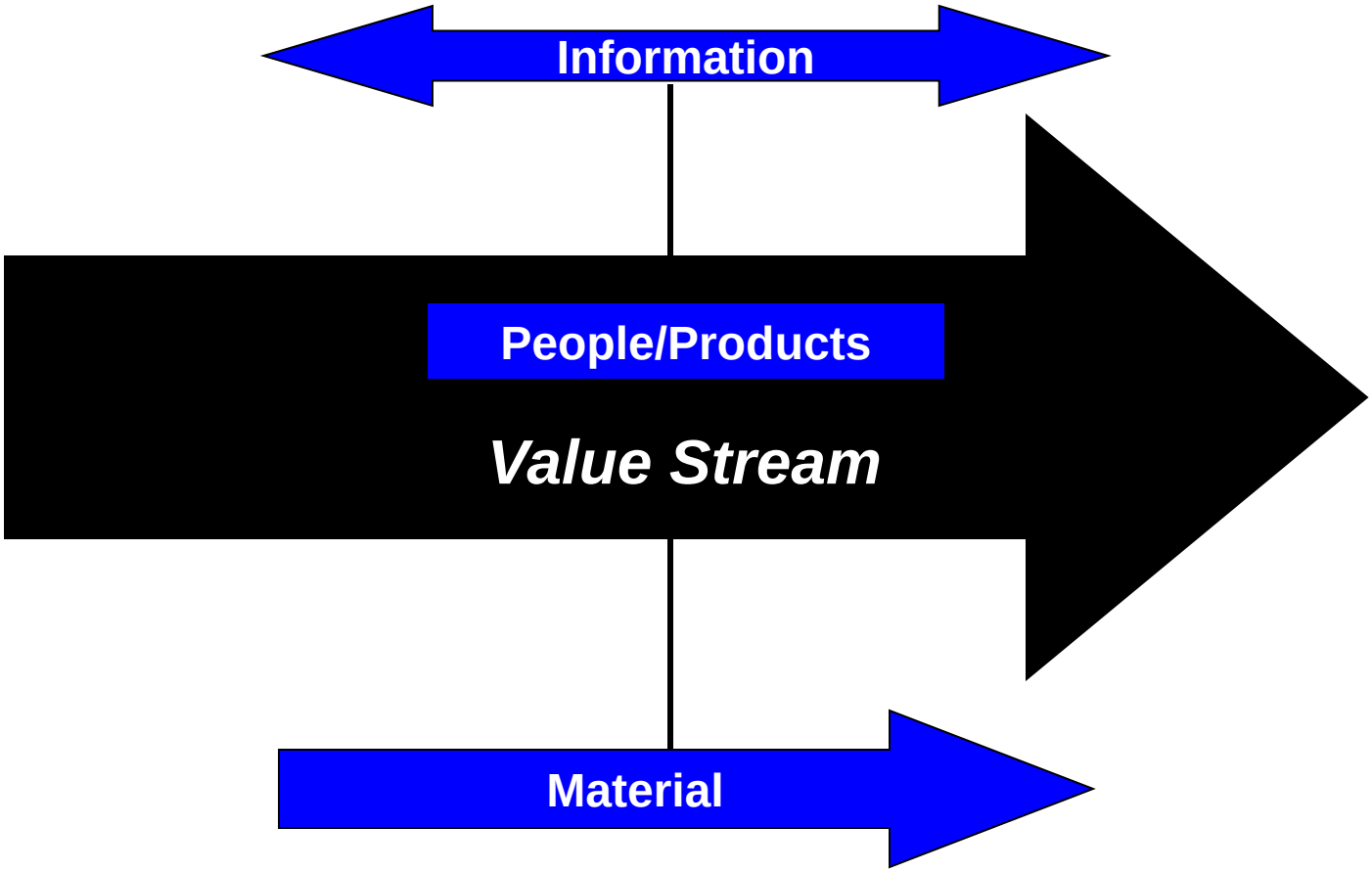
Elements of a VSM



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Why bother with a VSM?

- Represents several process levels in the flow
  - For example, the link between information and material flow
- Identifies sources of waste
- Informs decisions about changing flow
- Forms the basis of an implementation plan

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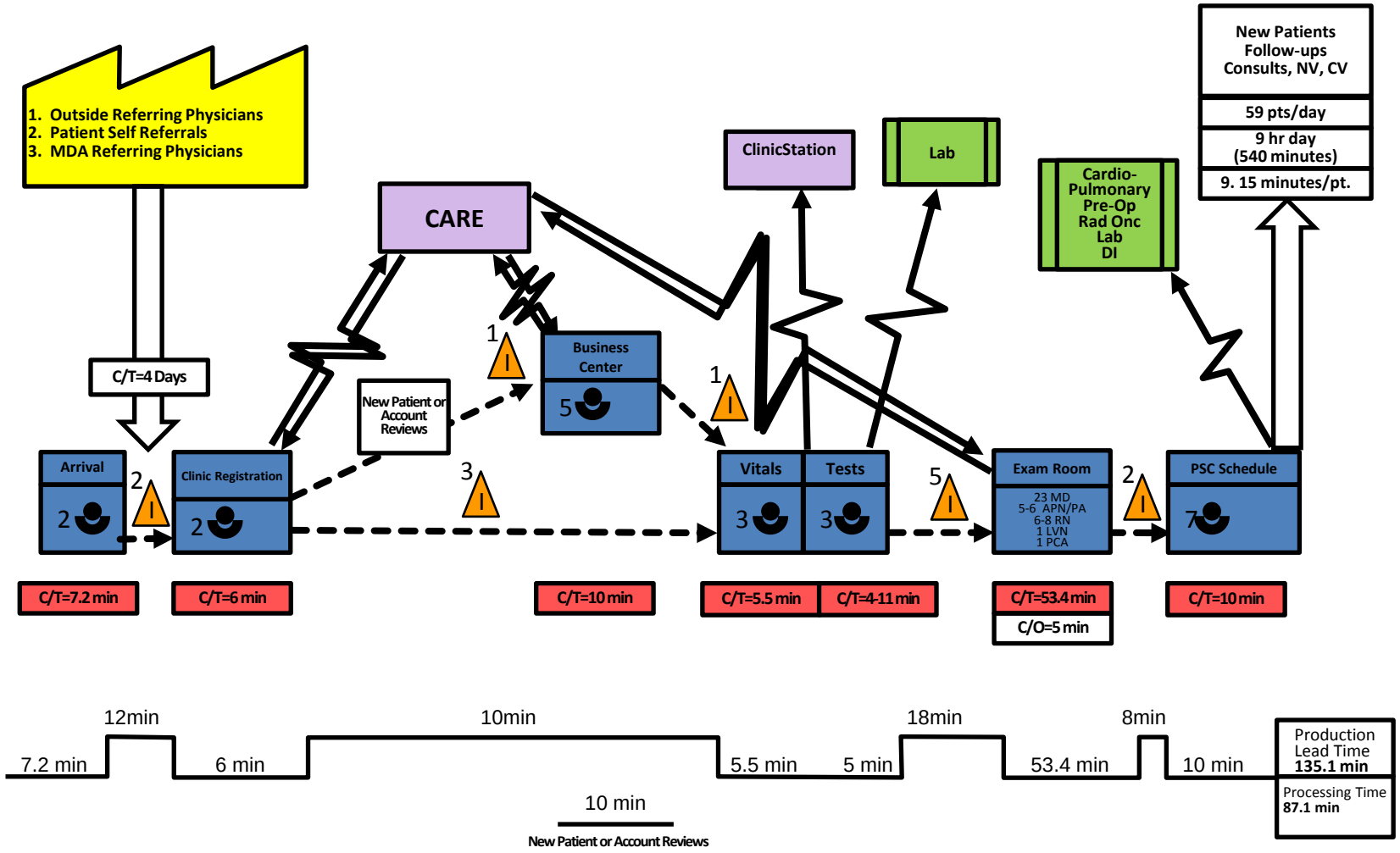
Value Stream Map



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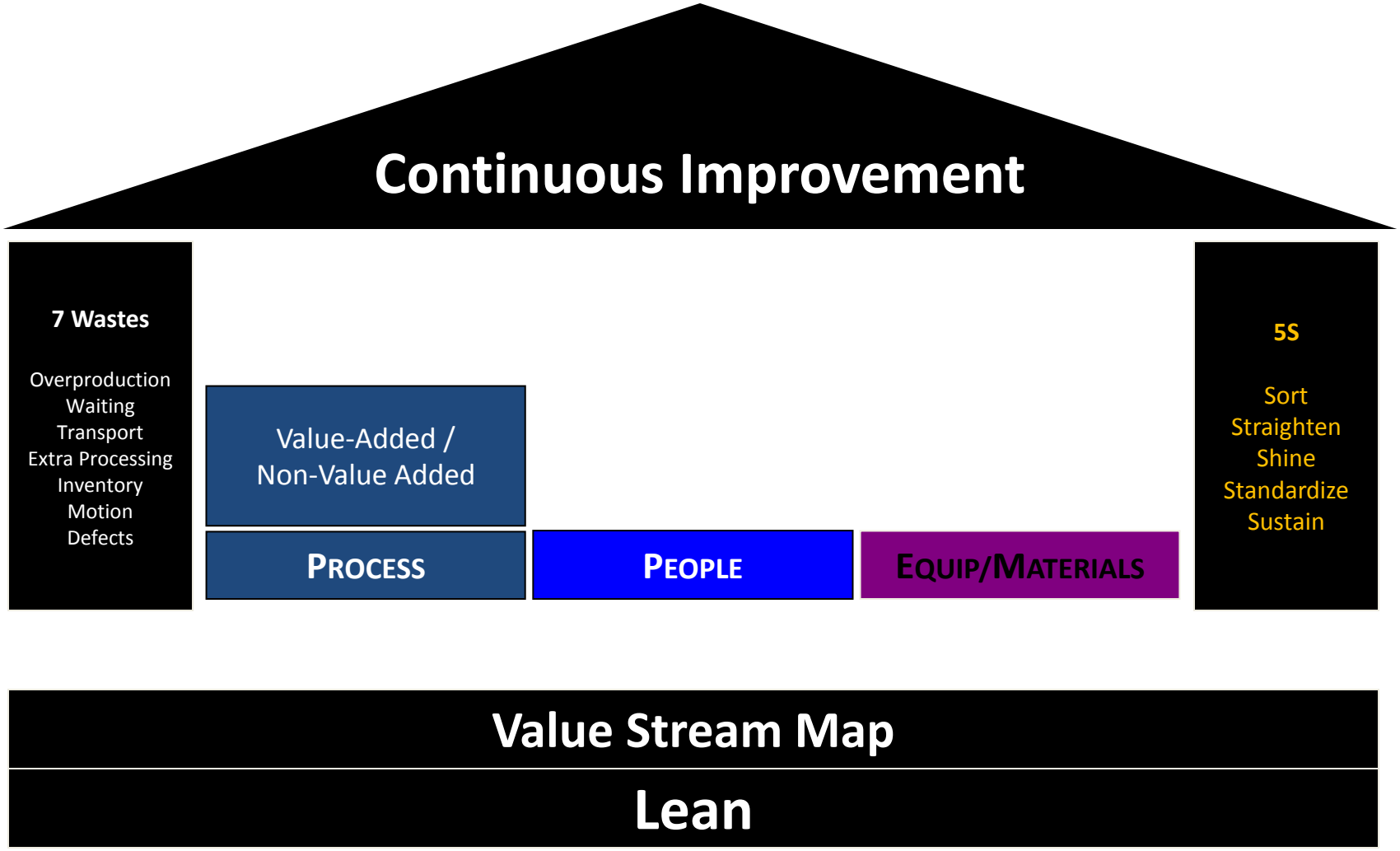

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5S Program

- Technique of workplace organization that fosters effectiveness
- Tools used to eliminate waste caused by a lack of order in the workplace
- In other words,
  - **Think Housekeeping**!

5S paves the groundwork for improvement!

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Do you ever . . .

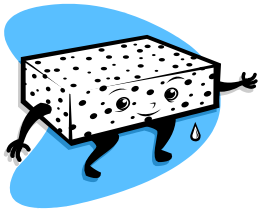
Scrounge

Steal

Stash

Scramble

Search



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5S Program

Sort	Keep only what is required
Straighten	Arrange and identify for ease of use, organize
Shine	Clean regularly. Clean up everything that's left
Standardize	Eliminate causes to reduce variations, make standards obvious
Sustain	Set discipline, plan, schedule, train … **AND STICK TO IT!**

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Example

Before:

After:

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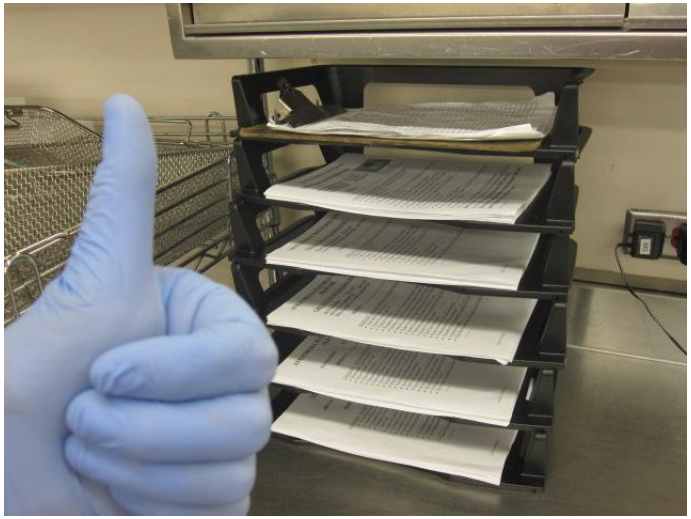
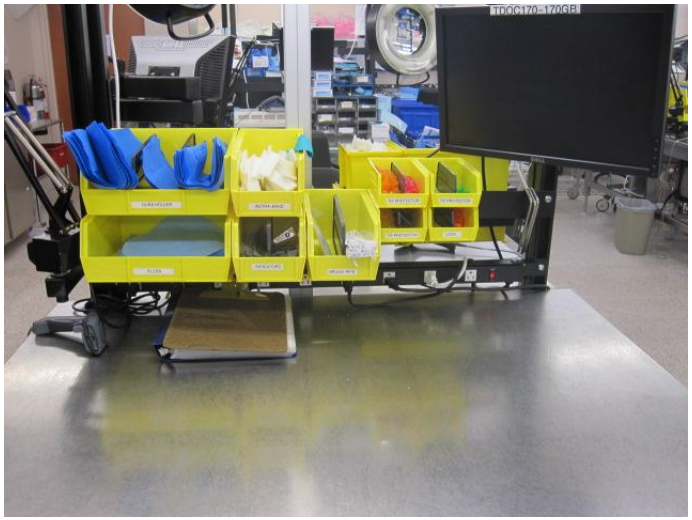
Before:

After:





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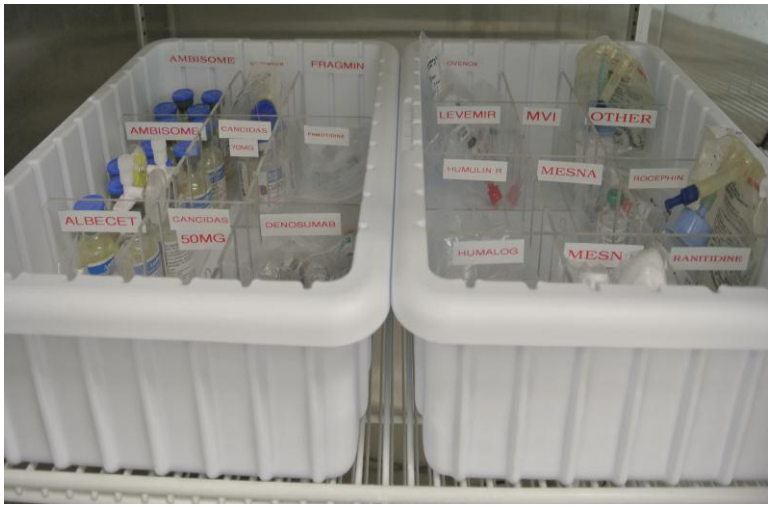
Examples



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5S Counting

The 1 to 60 Workshop

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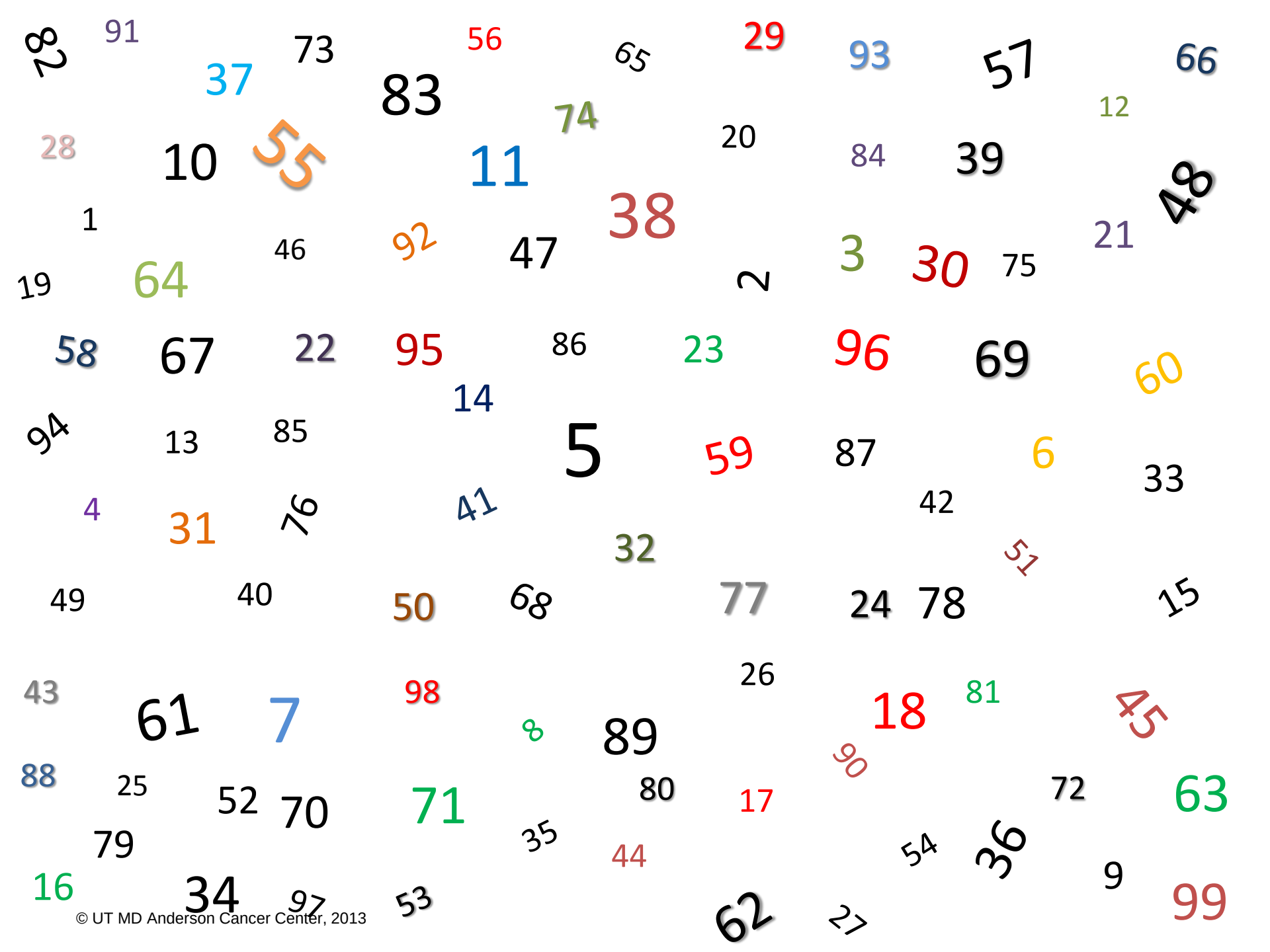

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How did you do?

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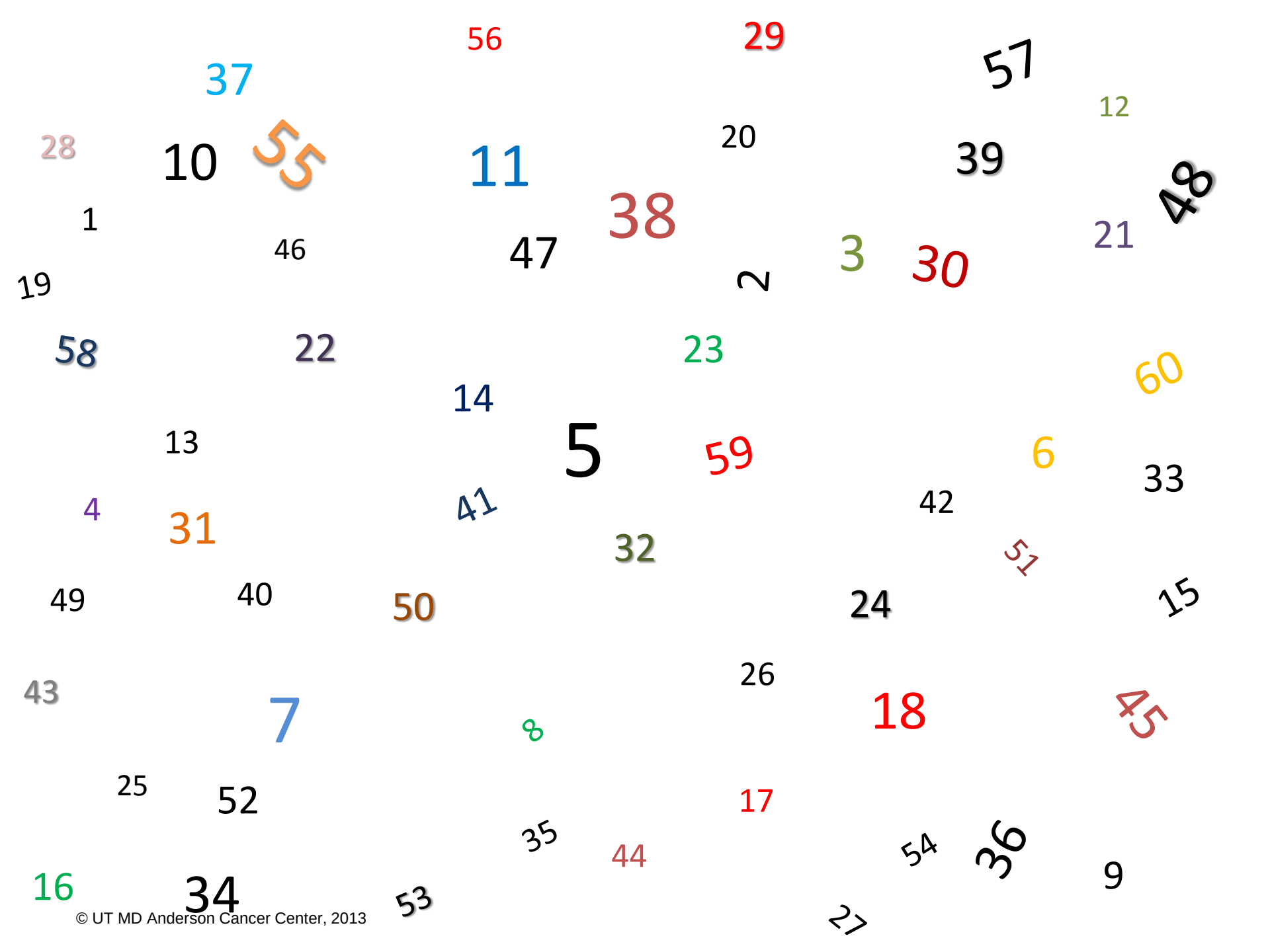

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How did you do?

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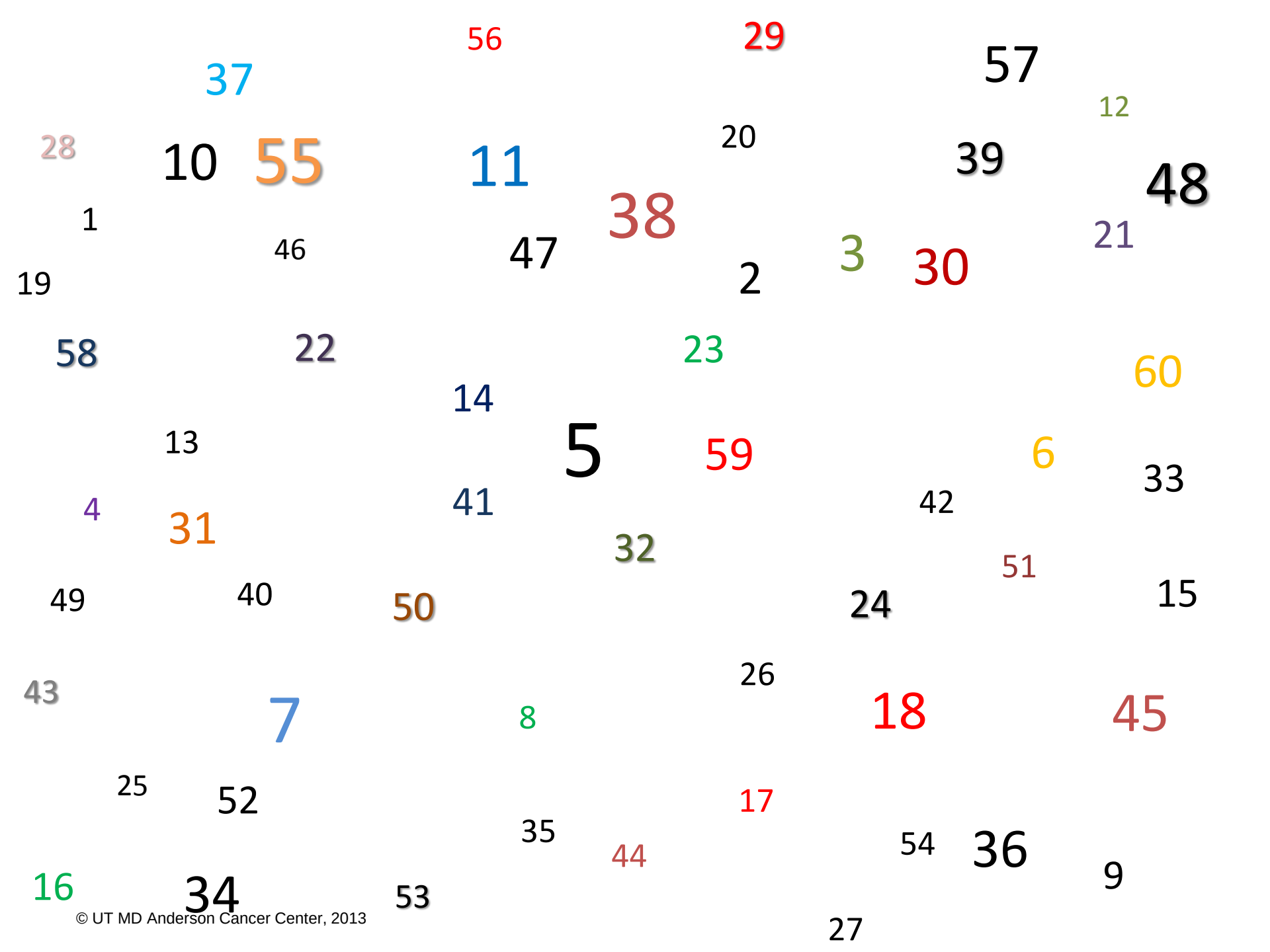

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How did you do?

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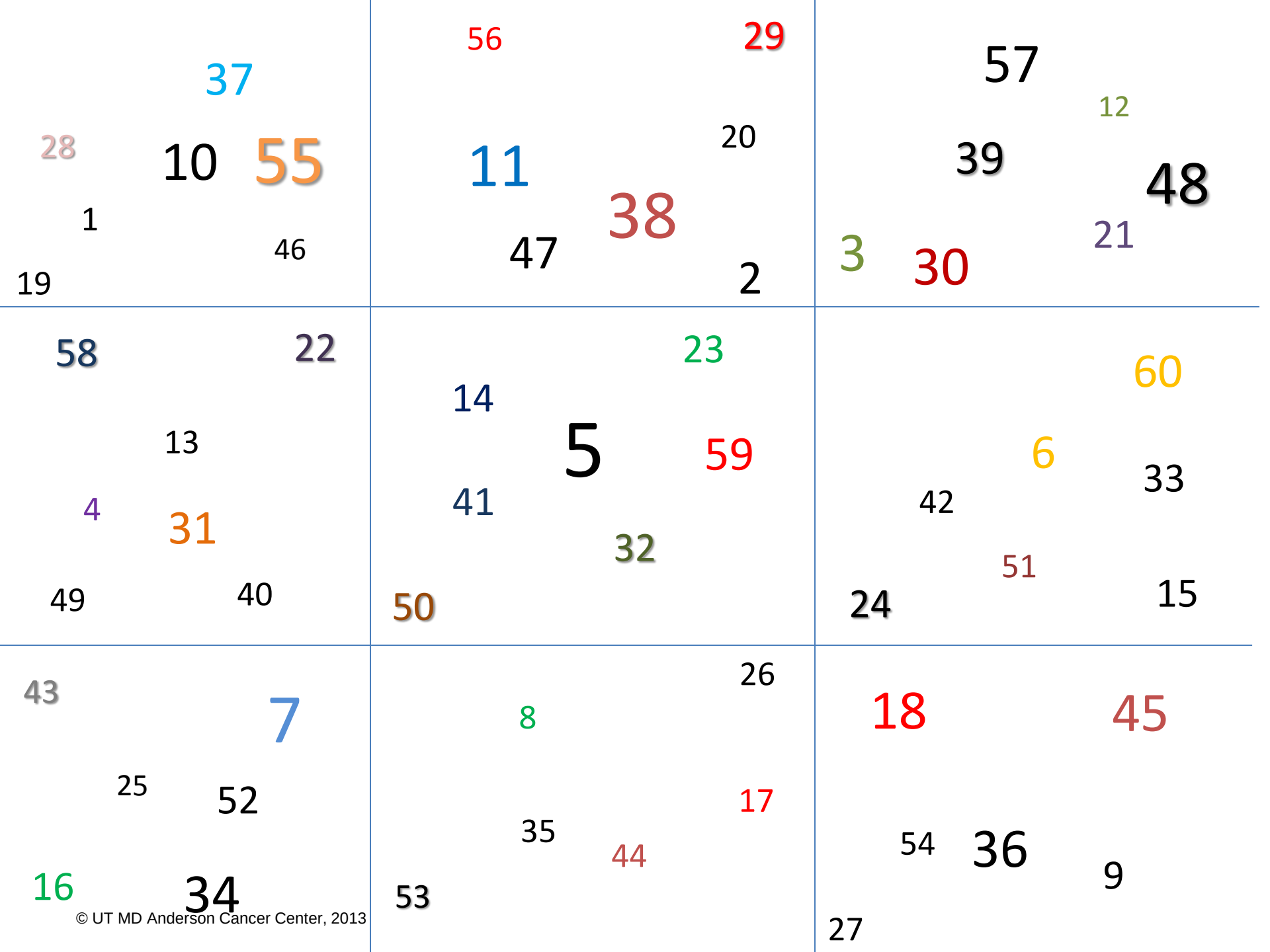

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How did you do?

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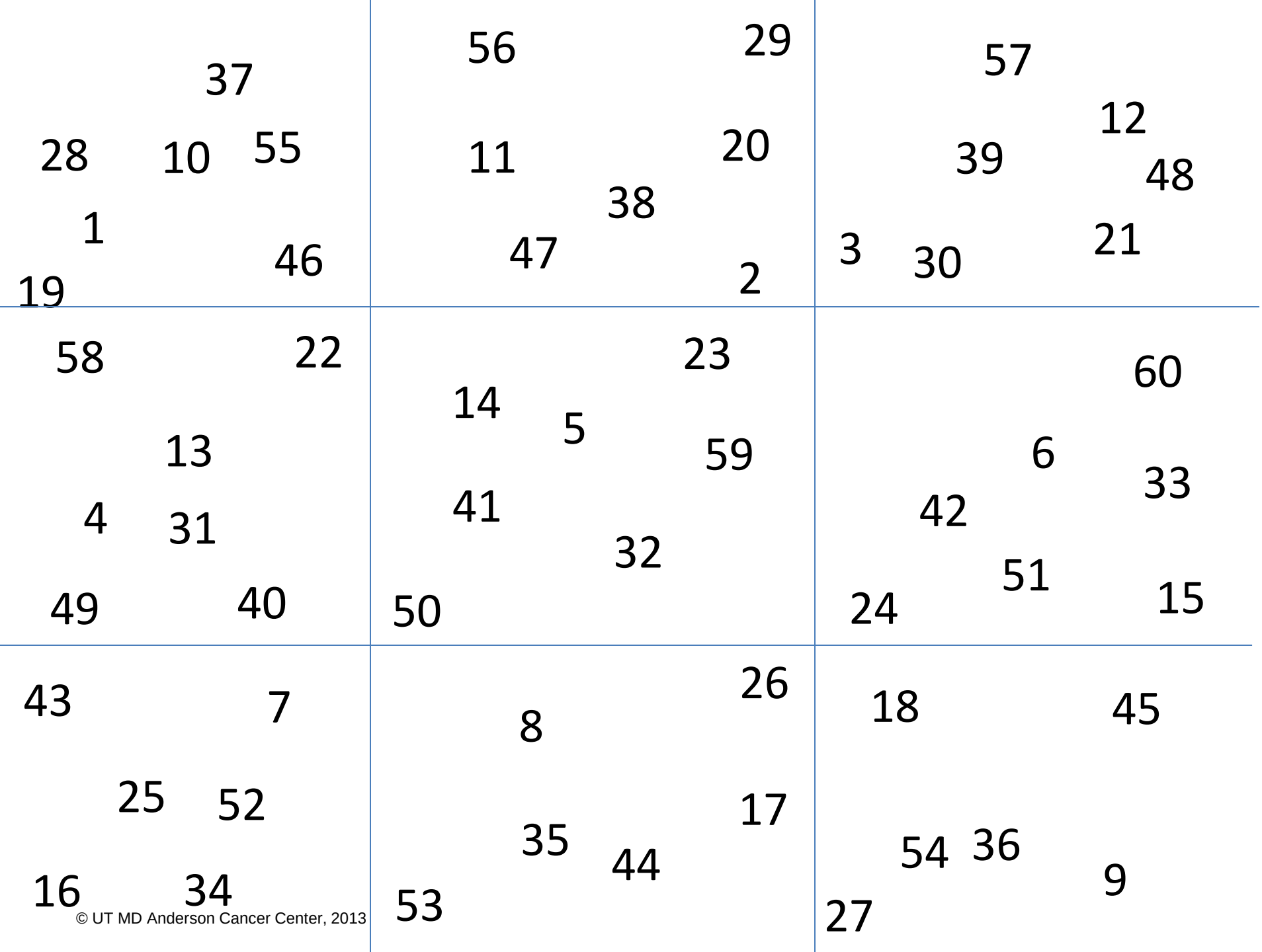

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How did you do?

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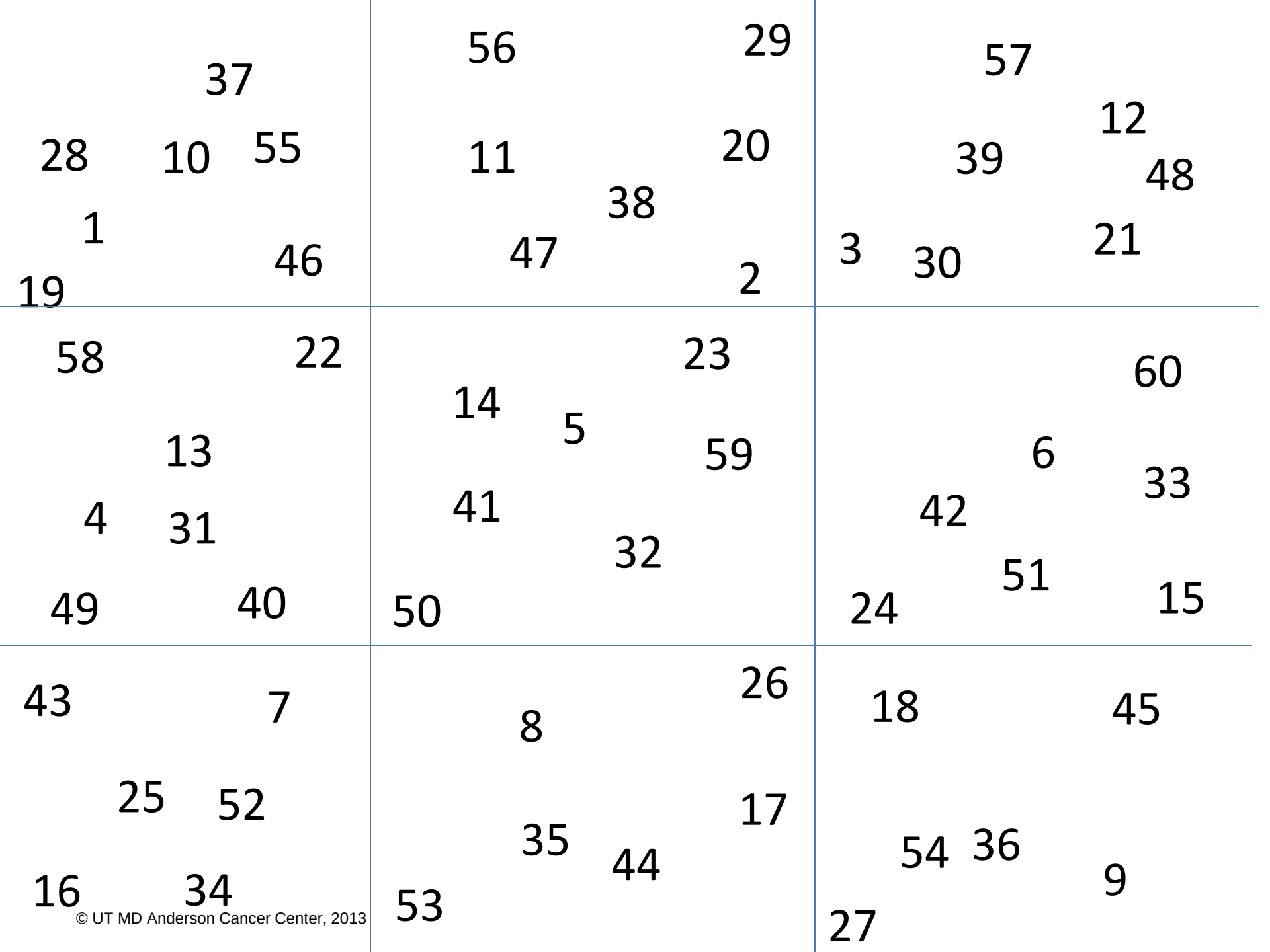

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1	2	3
4	5	6
7	8	9
10	11	12
13	14	15
16	17	18
19	20	21
22	23	24
25	26	27
28	29	30
31	32	33
34	35	36
37	38	39
40	41	42
43	44	45
46	47	48
49	50	51
52	53	54
55	56	57
58	59	60

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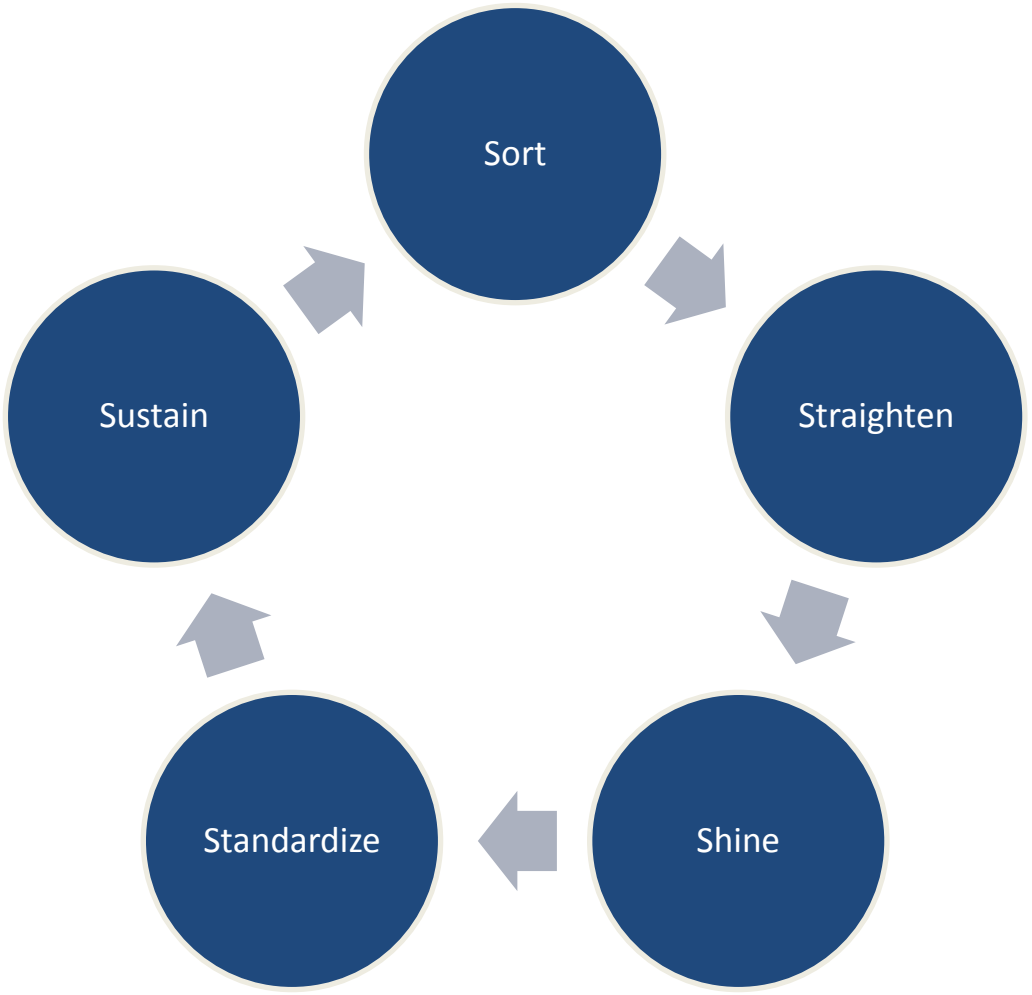
Summary: The 5S Cycle



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Push System

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Pull System

- A method of controlling the flow of products or services; nothing is produced or moved until it is needed or wanted downstream
- Customer-driven system where product or services are moved from one operation to the next, based on a request from the next operation (“the customer”)
- Workstations are set up as close together as possible and in the correct sequence

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Pull System: Benefits

- Reduces waste
  - Time spent in non-value added steps, such as waiting and transporting
- Reduces work-in-process
- Reduces the distance that work-in-process must travel between operations
- Reduces paperwork
- Minimizes or Eliminates the need for inspection or reworking

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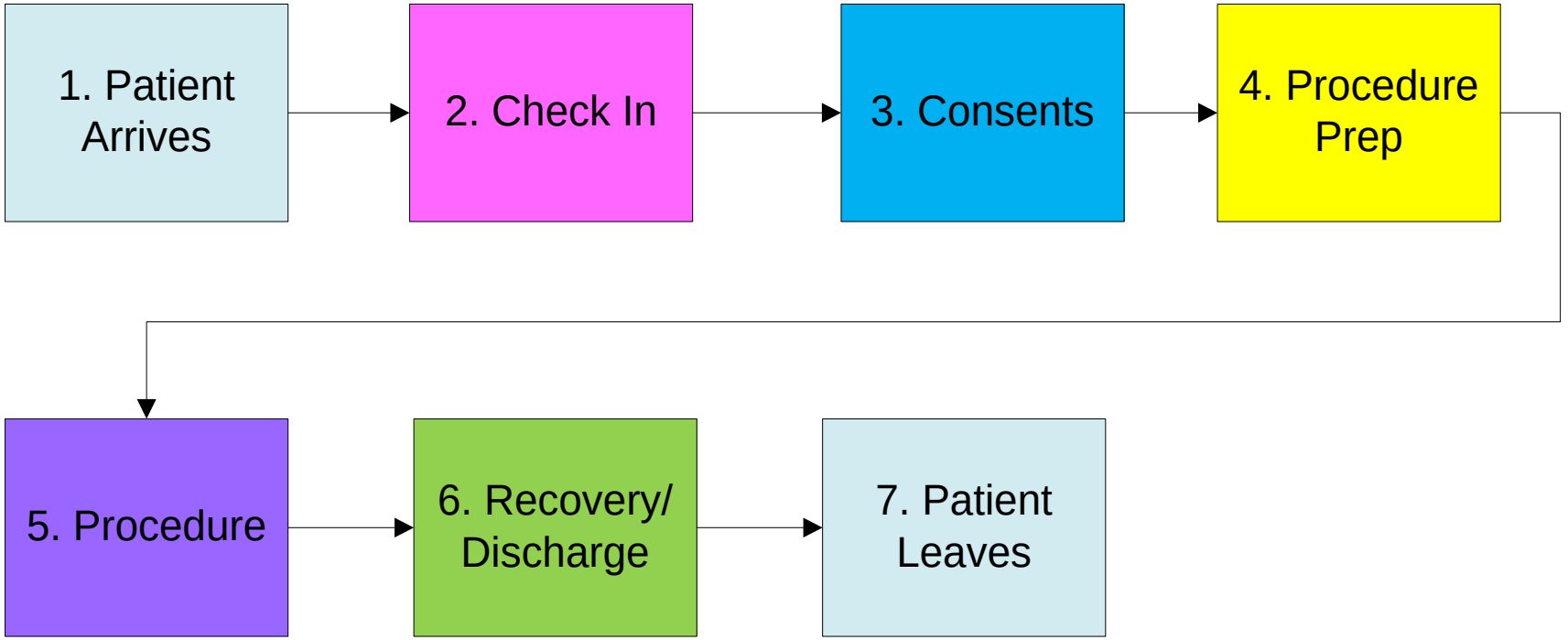
Patient Flow Diagram



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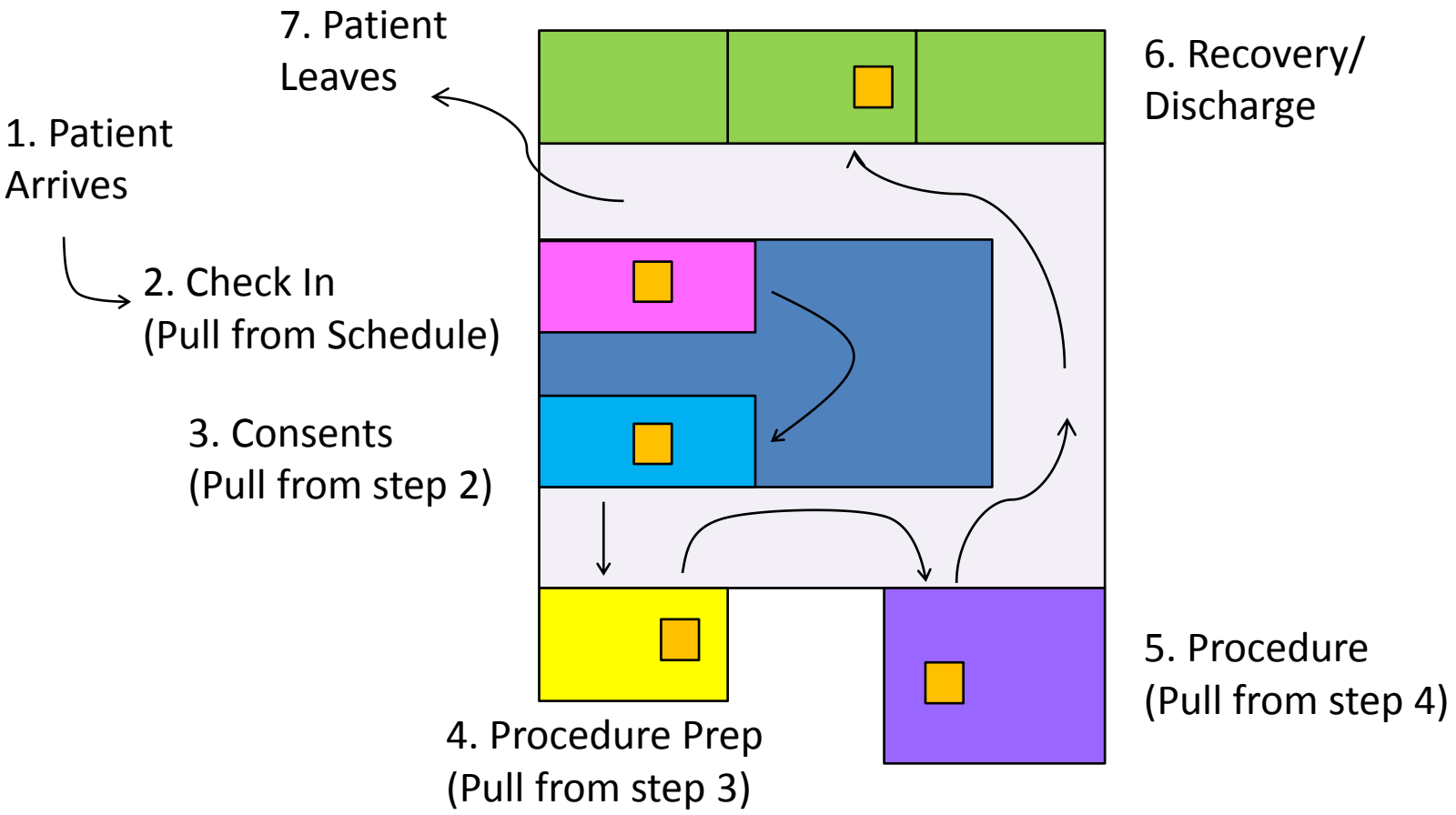
Pull Flow Diagram



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One-Piece Flow

- The movement of products through the process one unit at a time
  - in contrast to batch processing

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Advantages of One-Piece Flow

- Reduces
  - Wait time
  - Transport time
  - Excess inventory
- Focus is on the process
  - Reduces operating costs by making non-value-added work more evident
  - Reveals defects or problems early in the process
- Gives the process more flexibility
  - Allows ability and time to handle variations

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Spaghetti Mapping

- Graphically traces the movement of people, products, documents, and information through a process

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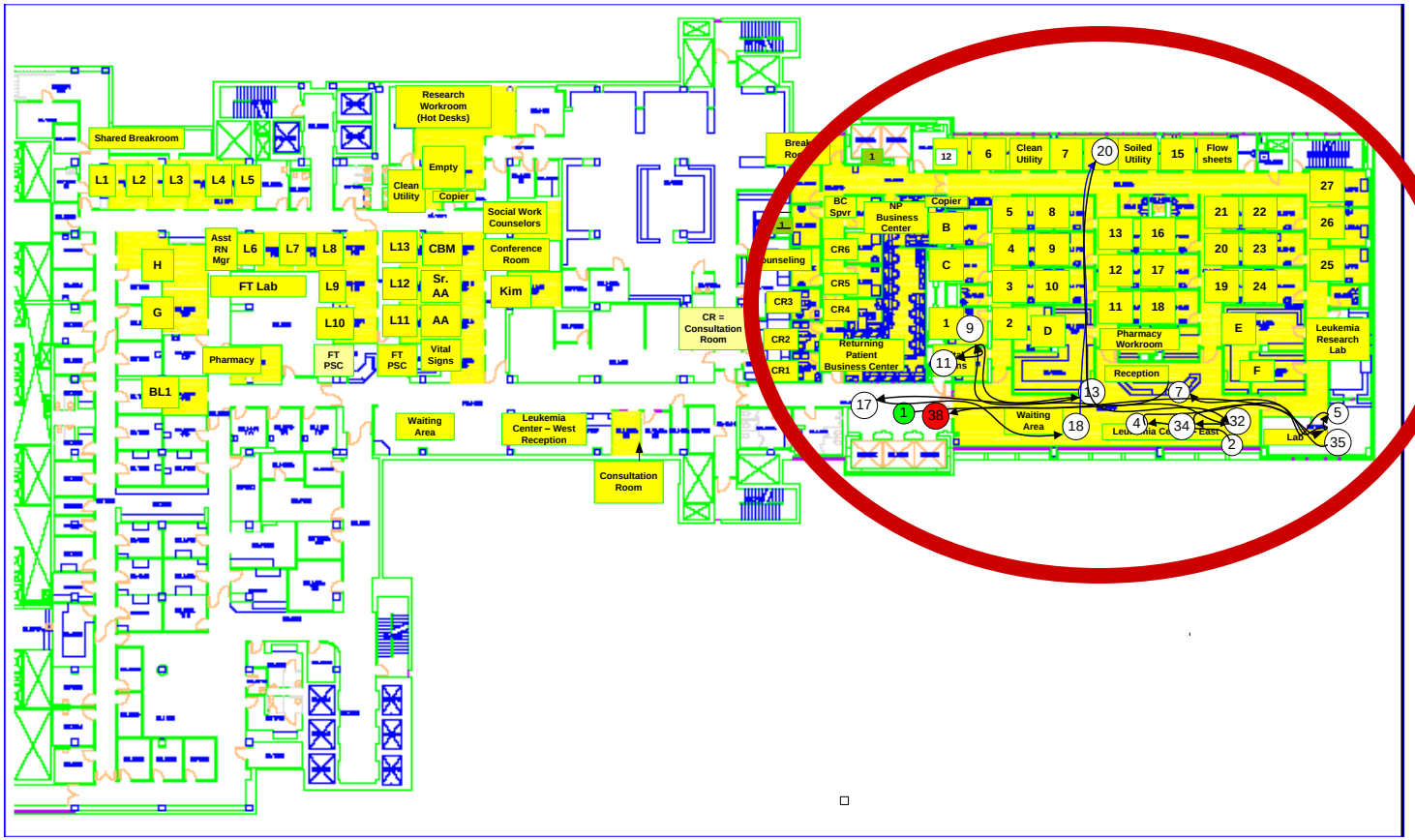
Spaghetti Map Example: Clinic Patient Walking Distance (Before)



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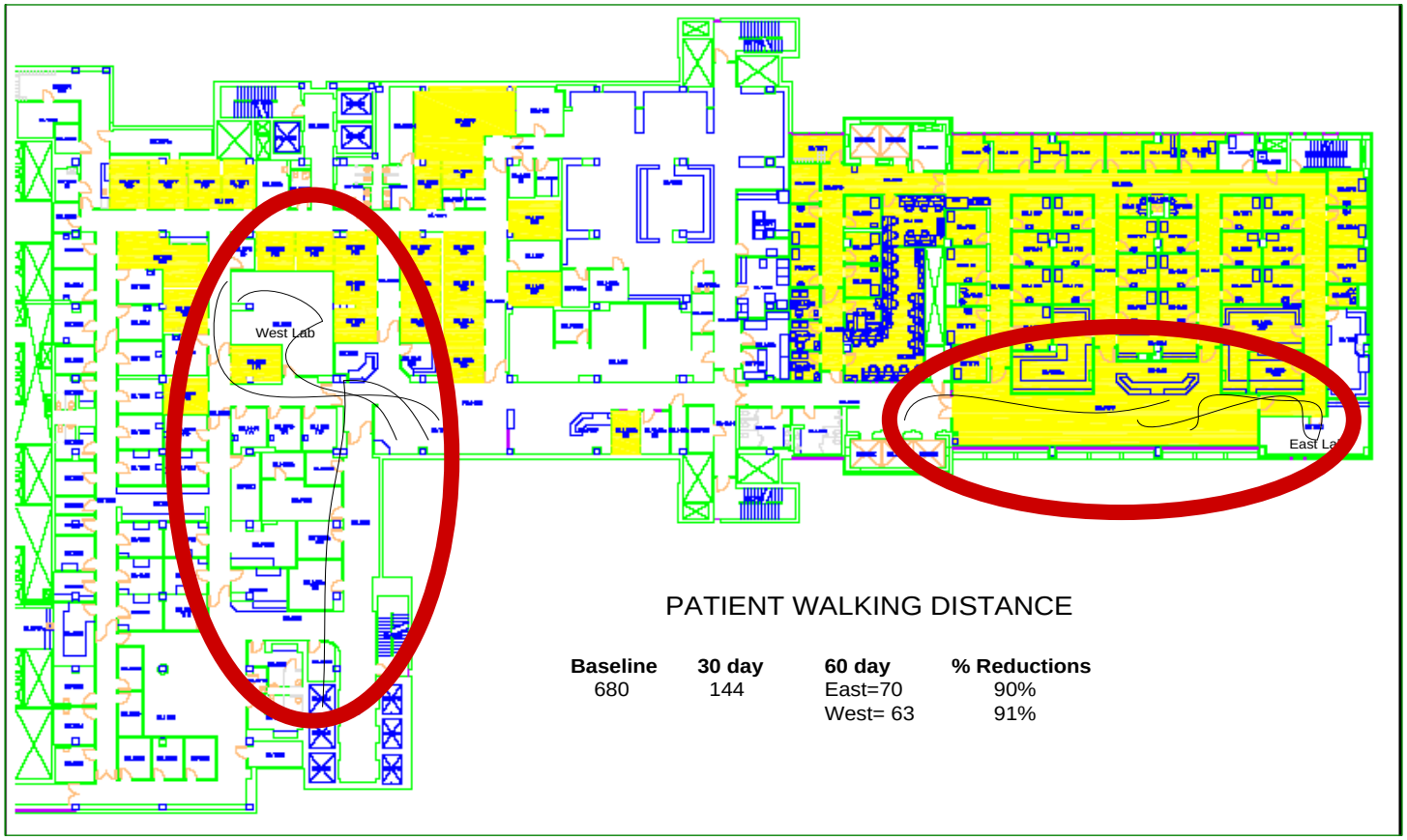
Spaghetti Map Example: Clinic Patient Walking Distance (After)



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Lean and Six Sigma

- Quality improvement tools are used in both
- Six Sigma includes a methodology that follows PDSA, a management structure for implementation, and a metric for goal setting
- Lean includes many tools but no clear methodology
- More opportunities for Lean in healthcare (more waste!)
- Some organizations combine the tools of lean with the methodology of Six Sigma and call it “Lean Six Sigma”

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Section 4 – Managing a Successful Six Sigma Effort

1. Introduction to Six Sigma
2. Fundamentals of Six Sigma Implementation
3. The Lean Enterprise
4. Managing a Successful Six Sigma Effort

   4.1 Roles and Responsibilities

   4.2 Data Driven Management

   4.3 Cost/Benefit Analysis

- Course Evaluation and Wrap-Up

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Six Sigma Key Roles

- ***Executive Leadership*** includes the CEO and other members of top management.
  - They are responsible for setting up a vision for Six Sigma implementation.
  - They also empower the other role holders with the freedom and resources to explore new ideas for breakthrough improvements.
- ***Champions*** take responsibility for Six Sigma implementation across the organization in an integrated manner.
  - The Executive Leadership draws them from upper management.
  - They are typically the ***Process Owners***.

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Six Sigma Key Roles

- ***Master Black Belts*** (MBB) act as in-house coaches on Six Sigma.
  - They assist champions (process owners) and guide Black Belts and Green Belts.
  - Apart from statistical tasks, they spend their time on ensuring consistent application of Six Sigma across various functions and departments.
- ***Black Belts*** (BB) operate under Master Black Belts to apply Six Sigma methodology to specific projects.
  - BBs and MBBs devote 100% of their time to Six Sigma.
- ***Green Belts*** are the employees who take up Six Sigma implementation along with their other job responsibilities, operating under the guidance of Black Belts.
- ***Yellow Belts*** are employees that have basic training in Six Sigma tools and generally participate in projects
- ***White belts*** are those locally trained in the concepts but do not participate in the project team.

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Stakeholders

- Various persons, groups or organizations with an interest in a project (Wikipedia definition)
- Without a detailed process map for improvement, you won't know if the measures you take to satisfy stakeholders and remove inefficiency are successful
- Six Sigma does not involve guessing; hard evidence is needed to show where improvement is needed.

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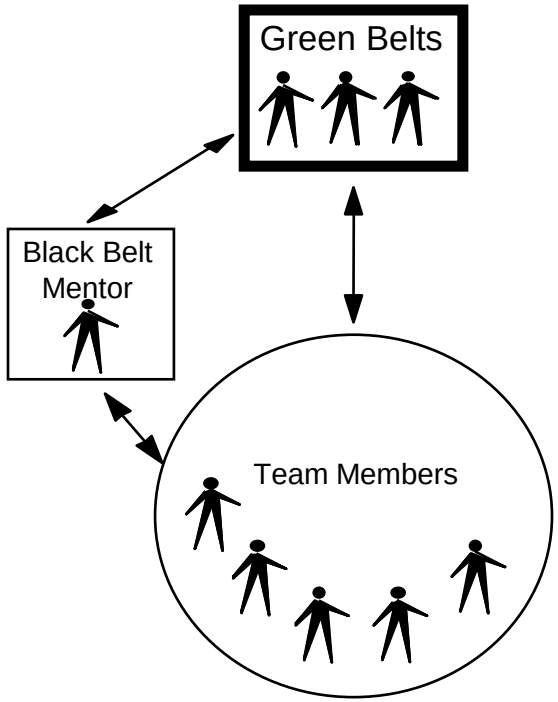
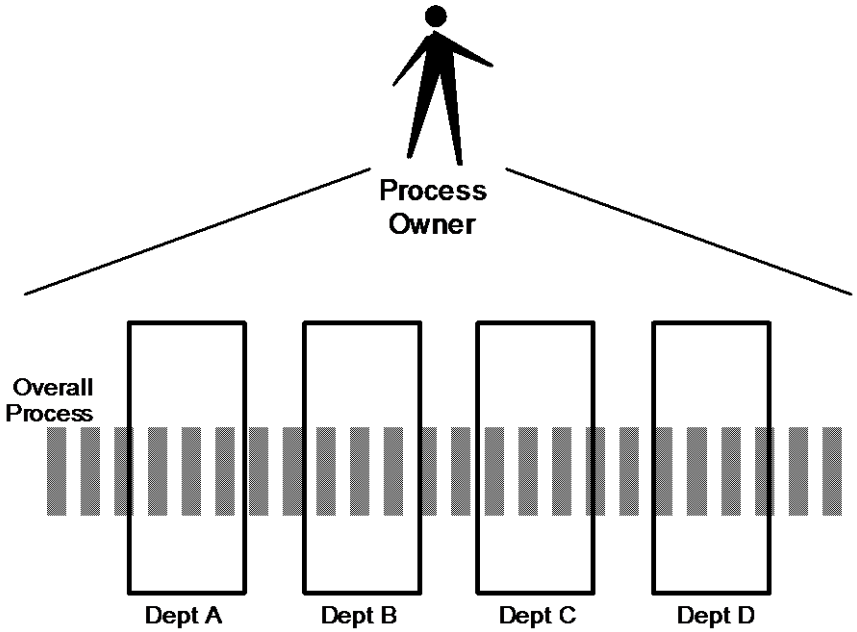
Six Sigma Deployment Strategy: Roles and Responsibilities



Leaders and Green Belts are integrated with the team members to drive *project* success



The Process Owner worries about overall *process* health and has responsibility and authority to manage and improve a process. Sets goals and allocates resources.

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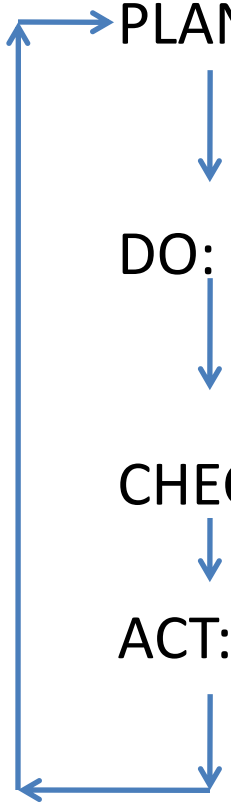
Strategic Planning Process



PLAN: Identify Strategic Objectives & Deployment Plan

DO: Implement Plan with Departments & Cross-Functional Teams

CHECK: Progress on Strategic Goals

ACT: To Eliminate Barriers, Institutionalize Improvements & Update Strategic Plan

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P
L
A
N


VISION
MISSION
Financial
Competitive Analysis
3-5 YEAR STRATEGIC PLAN
Patient Care Process / IOM Aims
Patient Feedback
Regulatory
1 YEAR PLAN
Department Level Goals
Cross-Functional Goals
IDENTIFY COORDINATORS / OWNERS FOR EACH
IDENTIFY AND TRAIN TEAMS

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Implement plan using PDCA

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QUARTERLY REVIEWS / UPDATES FROM COORDINATORS, MANAGERS, CHAIRS

- Compare current levels to goals
- Progress Since Last Quarter
- Plan for Next Quarter
- Identify any Barriers

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LEADERS ELIMINATE BARRIERS IDENTIFIED AT QUARTERLY UPDATES

INSTITUTIONALIZE BEST PRACTICE

MODIFY STRATEGIC PLAN AS APPROPRIATE

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Performing a Cost Benefit Analysis

- A formal cost benefit analysis expresses financial impact of your solution
- Helps to mobilize commitment
- Creates buy-in

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Is It Worth It?

- Cost Benefit Analysis is a relatively* simple and widely used technique for deciding whether to make a change
  - Add up the value of the benefits of a course of action, and subtract the costs associated with it
  - The difference between the two indicates whether the planned action is advisable

Value = Benefits - Costs

The typical failure point in a cost benefit analysis is not including all of the costs

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Costs

- Costs may be static, or may be ongoing
- When analyzing the costs it is important to distinguish between the design / implementation costs and the operation phase costs
  - Cost associated with design and implementation
    - Training Cost
    - System Cost
    - Design and Development Cost
    - Cost of Change
  - Cost associated with Operation (costs of goods and services)
    - Resource Consumption
    - Rework Cost
    - Cost of Capital
    - Maintenance Cost

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Benefits

- Benefits are most often received over time
  - This is the time it takes for the benefits of a change to repay its costs

- Types of Benefits:
  - Tangible- Personnel Training, Employee Salary
  - Intangible - Improved Employee Morale, Heightened customer satisfaction, better business relationships.

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Green Belt Certification: M. D. Anderson versus ASQ

M. D. Anderson	American Society for Quality
Focused on Six Sigma in Healthcare	Focused on Six Sigma in Manufacturing, Research, Service
Tailored for individuals in the class with a focus on tools application	General knowledge and tools Covers a wide body of knowledge
M. D. Anderson Six Sigma Green Belt: • Local Credential	American Society for Quality Certified Six Sigma Green (or Black) Belt • Nationally recognized credential in all industries

For more information on the ASQ exam, training, or recommended reading go to: www.asq.org

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