Magnified Learning Presents…

Lean Six Sigma Yellow Belt

A Guide to Front-Line Optimization

1

Yellow Belt Program Overview

Coursework

1. 7 Units
   - Front Line Problem Solving
   - Lean Six Sigma Reimagined through Cohesive Value Transformation
2. Various Competency Checks
   - 7 quizzes
   - Various cases studies and worksheets

Expected Outcomes

1. 80% or higher passing grade on quizzes and exam

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Lean Six Sigma Green Belt

Unit Purpose:

To introduce the learner to the fundamental components of Cohesive Value Transformation (CVT) in Front-Line Operations.

Unit Objectives:

- Understand the elements of CVT (Unit 1.0)
- Discuss how to achieve Cohesion in Front-Line Operations (Unit 1.1)
- Provide an overview of Value Transformation (VT) through Lean Six Sigma (Units 1.2 – 1.7)

Unit Outcomes:

By the end of this lesson, the learner will be able to:

- Successfully complete the unit exam as evidenced by a minimum score of 80%.

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Transforming Front Line Operations

How do we take back control?

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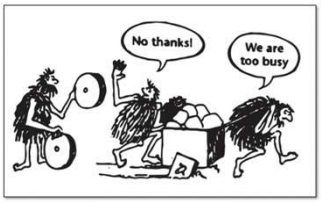
Transforming Front Line Operations

The Front-Line Problem Solver's Dilemma

Scenario #1
Having a Solution When No one Cares



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Transforming Front Line Operations

The Front-Line Problem Solver's Dilemma

Scenario #2
Becoming Numb to Your Problems

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Transforming Front Line Operations

MAGNIFIED LEARNING

The Front-Line Problem Solver's Dilemma

Scenario #1

Having a Solution When No one Cares

Scenario #2

Becoming Numb to Your Problems

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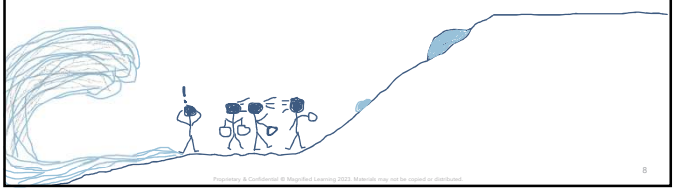
CVT Intro

MAGNIFIED LEARNING

Cohesive Value Transformation (CVT)



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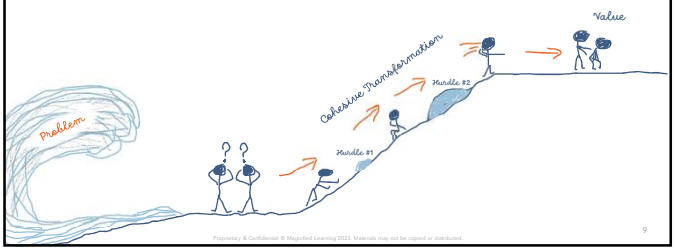
CVT Intro

MAGNIFIED LEARNING

Cohesive Value Transformation (CVT)

The ability to achieve a common desired change



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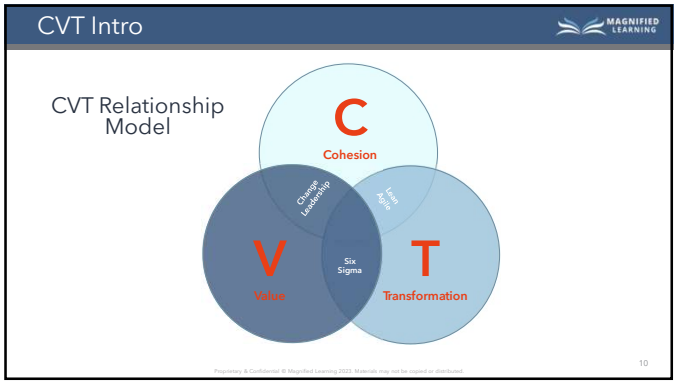

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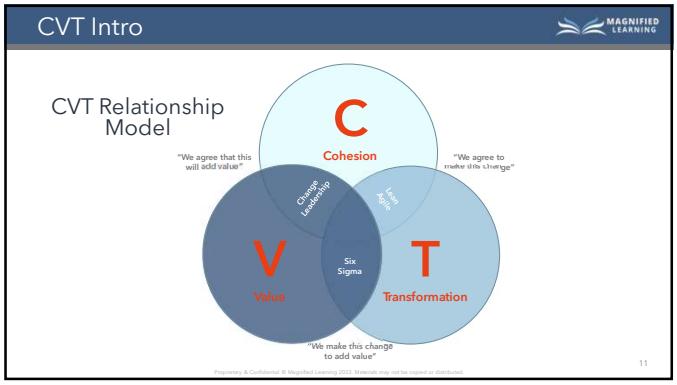

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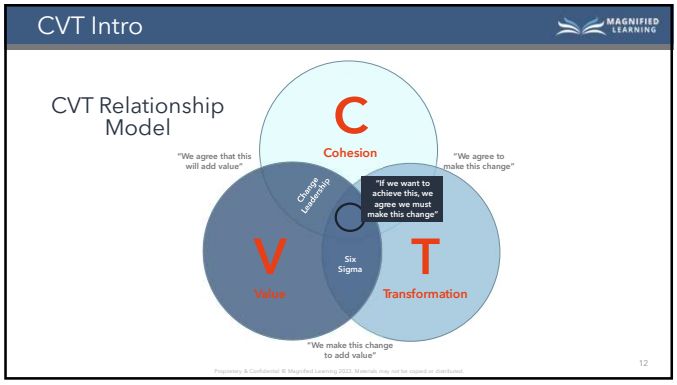

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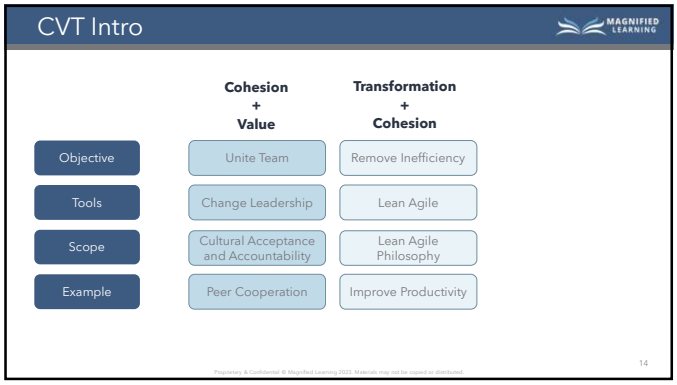

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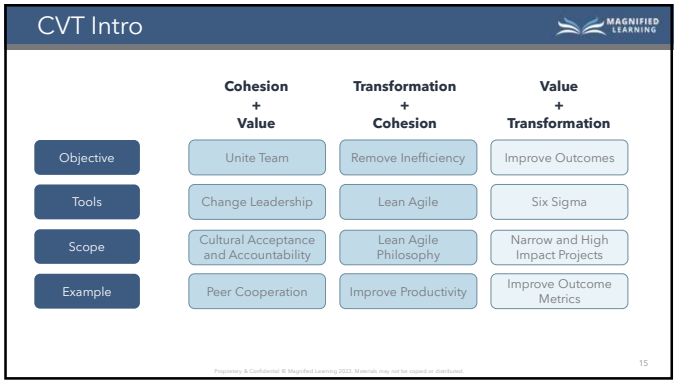

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Cohesive Value

Purpose:

To introduce the learner to the fundamental components of Cohesive Value (CV) in front-line operations.

Objectives:

- Understand the elements of CV
- Discuss how to achieve CV in front-line operations
- Introduce tools and techniques to align with value expectations

Outcomes:

By the end of this lesson, the learner will be able to:

- Successfully complete the unit quiz as evidenced by a minimum score of 80%.

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Cohesive Value (CV)

Change Leadership for Front-Line Operations

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Cohesive Value Intro

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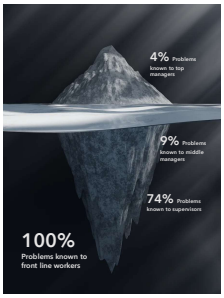
Cohesive Value Intro

MAGNIFIED LEARNING

Value Gaps

The Iceberg of Ignorance is a *Lie*



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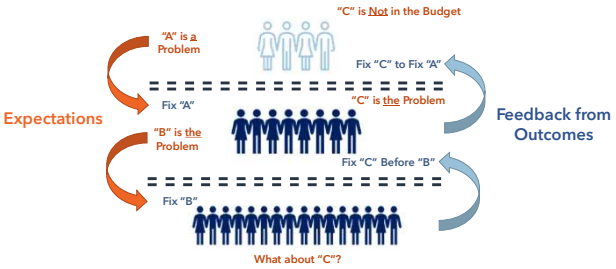
Cohesive Value Intro

MAGNIFIED LEARNING

Value Gaps



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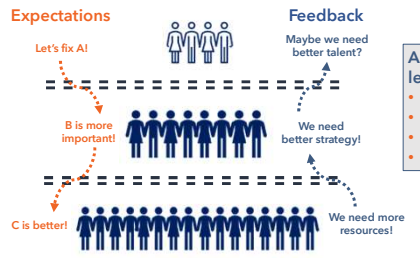
Cohesive Value Intro

MAGNIFIED LEARNING

Value Gaps



A lack of Cohesive Value leads to:

- Poor Outcomes
- Blaming
- Termination
- Ignored Problems

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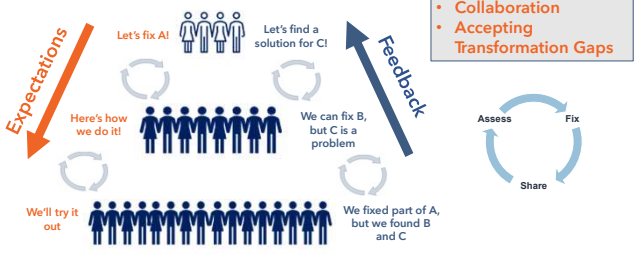
Cohesive Value Intro

Transformation Gaps



Cohesive Value leads to:
- Collaboration
- Accepting Transformation Gaps

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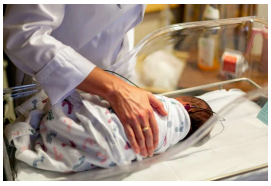
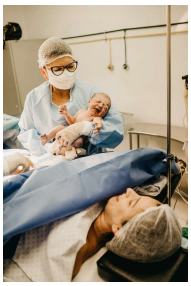
Cohesive Value Application





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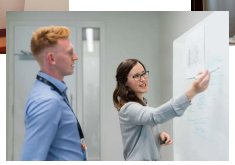
Cohesive Value Application



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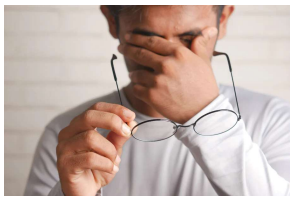
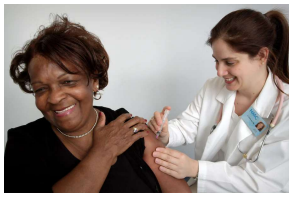
Cohesive Value Application





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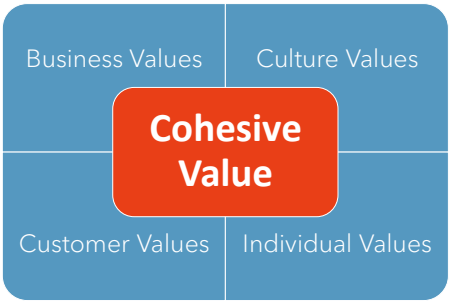
Four Dimensions of Value



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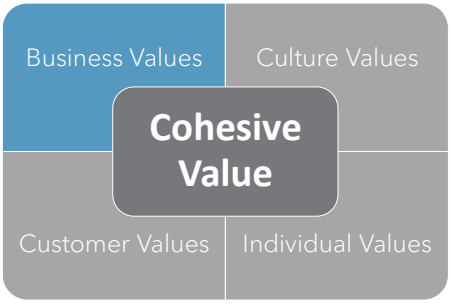
Business Value



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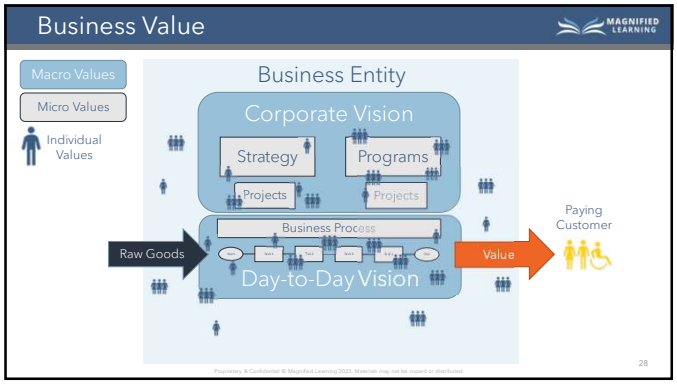

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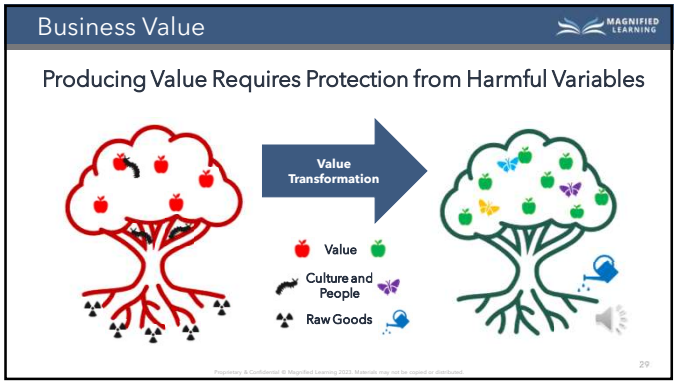

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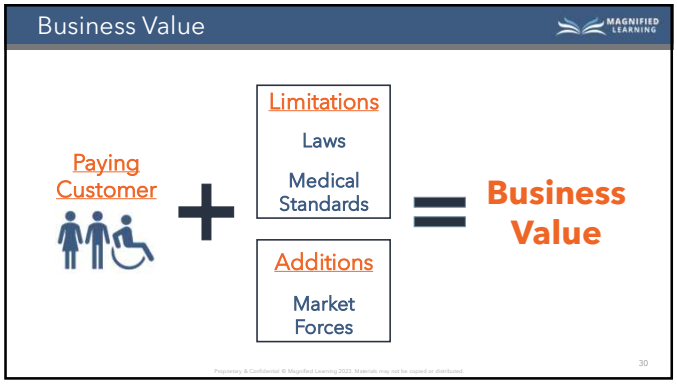

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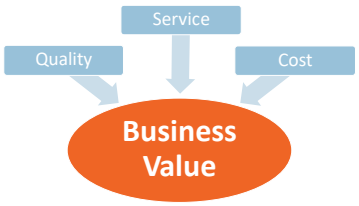
Business Value

Elements of Business Value



Traditionally, only one or two elements can be positively changed at a negative impact to the third

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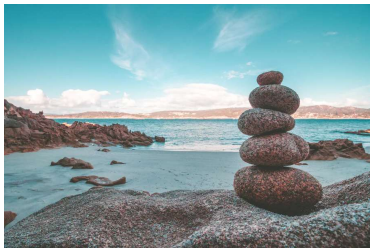
Business Value

Understanding Your Business



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Business Value

Traditional Healthcare Relationship

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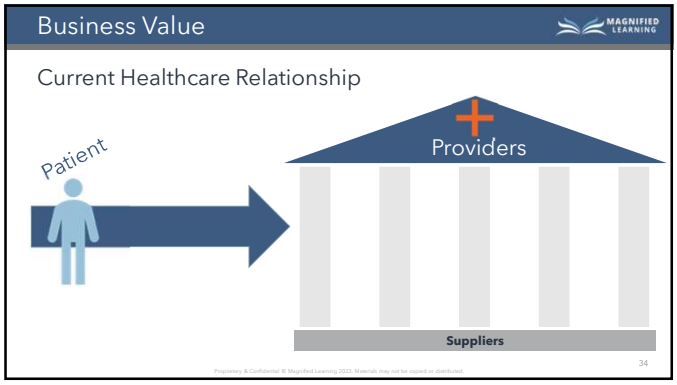

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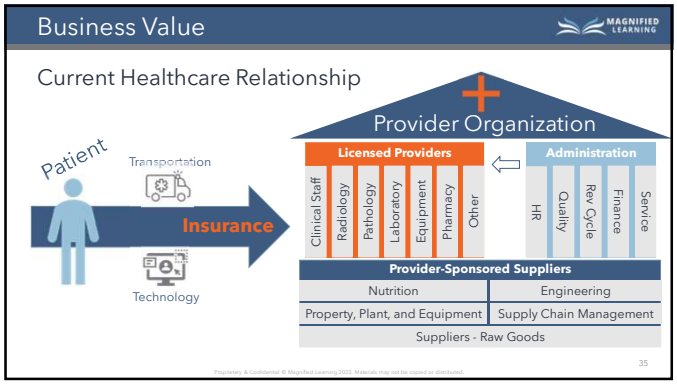

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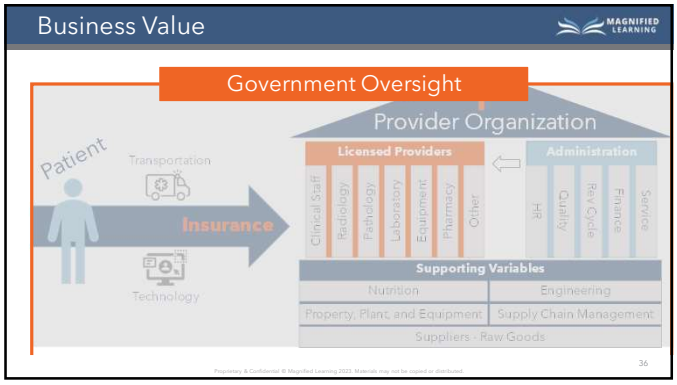

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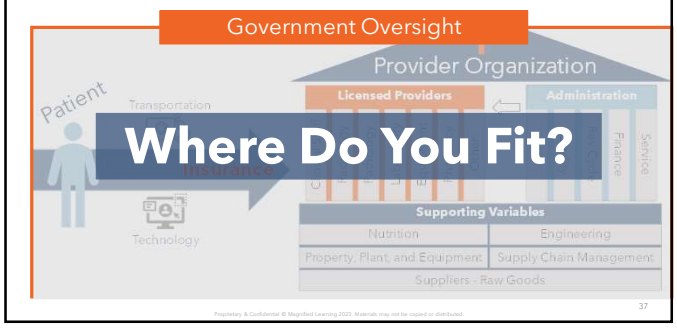
Business Value



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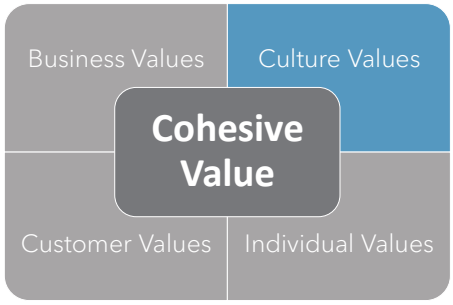
Culture Value



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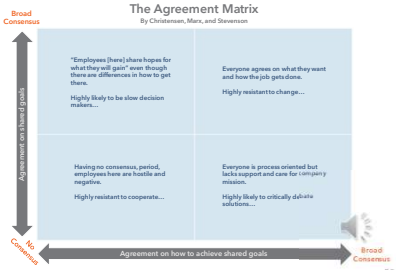
Culture Value

Understanding Your Culture

Where is my Culture?

Where do I stand on the Matrix?

What characteristics emerge when asked to follow a different plan or change how to perform?



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Culture Value

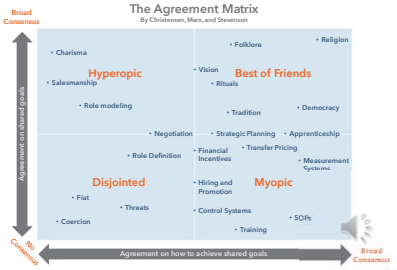
Understanding Your Culture

Best of Friends → Culture Tools

Hyperopic → Leadership Tools

Myopic → Management Tools

Disjointed → Power Tools



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Culture Value Application

Practice – Align the Situation to Agreement Matrix

Dr. Porter and Her Cardiology Clinic

- Partnership between Dr. Porter and outpatient facility
- Dr. Porter frustrated with poor communication, process design, and cooperation
- Facility frustrated with lack of adoption of established practices, tired of feeling attacked
- Both groups struggling to address concerns about necessary change

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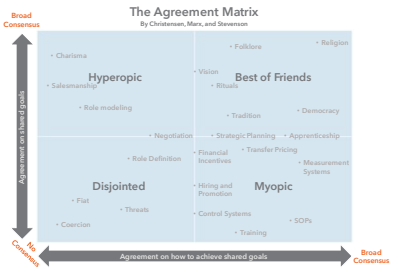
Culture Value Application

Agreement on shared goals?

Yes, allow Dr. Porter and team access to outpatient facility

Agreement on method to achieve goals?

No, both parties struggle to agree on how to get the job done. However, each individual culture demonstrates being process driven and oriented, so the answer is really, yes.



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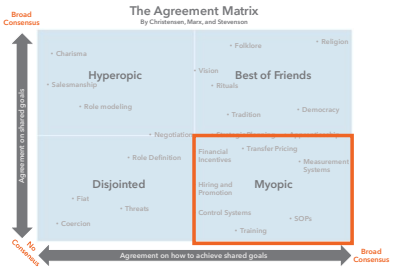

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Culture Value Application

Practice – Align the Situation to Agreement Matrix

Tinisha and her ED Team

- Tinisha is new supervisor learning about established processes and practices
- Some answers to Tinisha's questions are being ignored and avoided. Eventually, Tinisha's peer tells her to accept it the way it is.
- Tinisha's management is upset about performance. Tinisha's peers and team disregard metrics and leadership concerns

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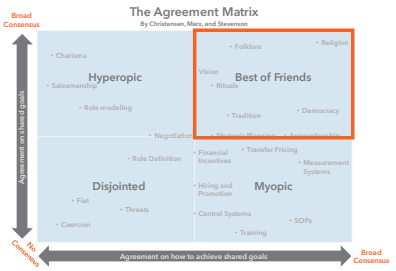
Culture Value Application

Agreement on shared goals?

Yes, providing care in the ED the current way

Agreement on method to achieve goals?

Yes, despite management and Tinisha's influences, the culture remains consistently aligned on cause and effect



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Culture Value Application

Practice – Align the Situation to Agreement Matrix

Dan and his New Business Model

- Dan asked to pilot new at home business model
- Dan's team and partners struggle to find the best way to operationalize the pilot
- Leadership involvement mandates certain changes that upset team
- Soon, team members leave due to "loss of voice" and refusing to accept mandates

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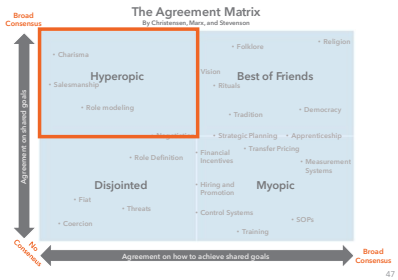
Culture Value Application

Agreement on shared goals?

Yes, providing at home care

Agreement on method to achieve goals?

No, they are struggling to find the right processes to get the pilot started



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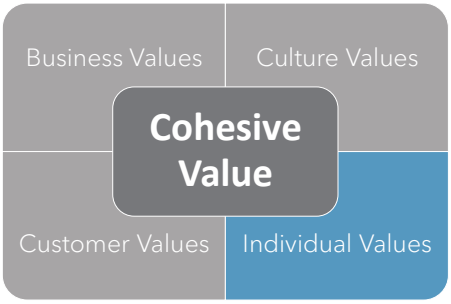
Individual Value



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Individual Value

Understanding The Individual

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Individual Value

Trait VS **Behavior**

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Individual Value

The Big Five Dimensions

By Robert McCrae and Paul Costa

- **C**onscientiousness
- **A**greeableness
- **N**euroticism
- **O**penness to Experience
- **E**xtraversion

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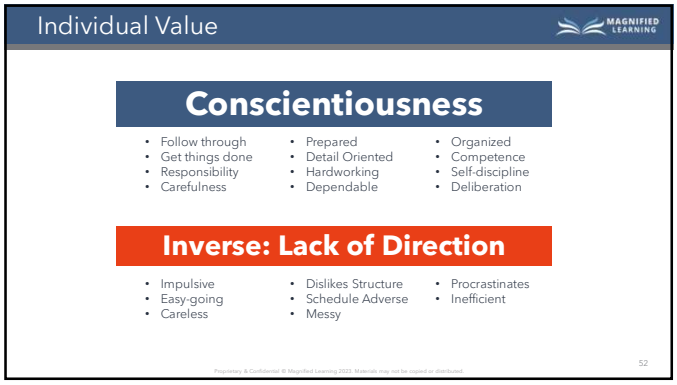

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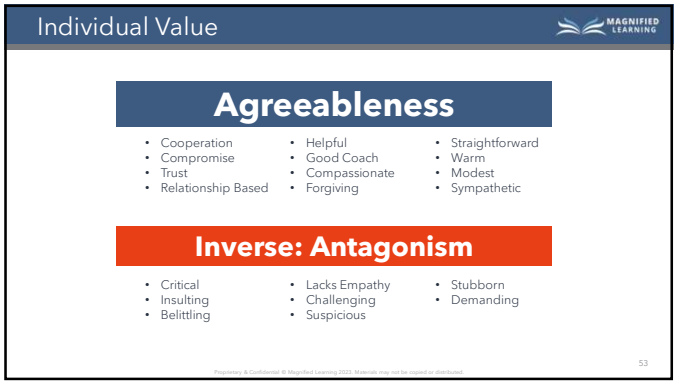

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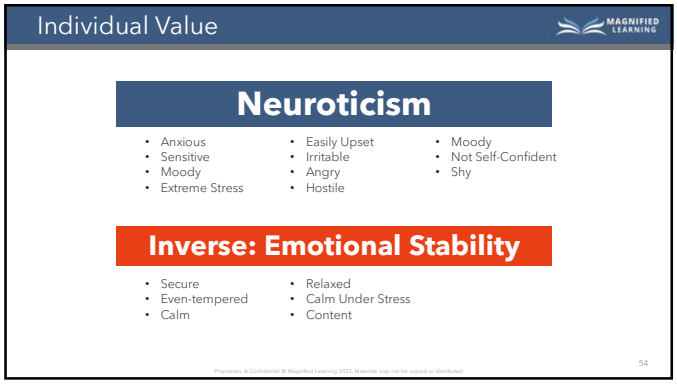

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Individual Value

Openness

- Curious
- Inventive
- Independent
- Seeks New Things
- Creative
- Intelligent
- Wide Interests
- Artistic
- Excitable
- Different Values
- Imaginative

Inverse: Closedness

- Cautious
- Practical
- Conventional
- Dislikes Change
- Resists New Ideas
- Experience Adverse
- Habitual
- Seeks Routine

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Individual Value

Extraversion

- Outgoing
- Sociable
- Confident
- Dominant
- Friendly
- Warm
- Energetic
- Adventurous
- Enthusiastic
- Thrives With People
- Assertive
- Forceful

Inverse: Introversion

- Quiet
- Reserved
- Solitary
- Mindful of Words
- Avoids Spotlight
- Avoids Large Crowds
- Listens
- Thrives alone
- Cold

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The Big Five Personality Types

The Big Five

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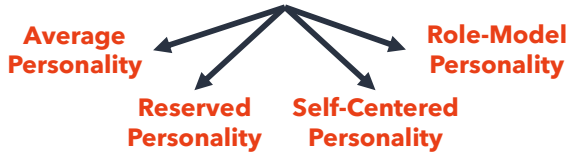
The Big Five Characteristics



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Personality Types

Average

- Like to Associate in Groups
- Follow the Status Quo
- Practical, Conventional, Cautious

Conscientiousness	Mid
Agreeableness	Mid
Neuroticism	High
Openness	Low
Extraversion	High

Average personality types need moral support from the right crowd. However, providing details and listening to their concerns goes a long way. They typically are not the first to change, but they aren't the last either. They need someone to believe in who aligns with their values and can champion them to success.

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Personality Types

Reserved

- Emotionally Unstable
- Prefers to be alone
- Sensitive, Moody, Cautious

Conscientiousness	Mid
Agreeableness	Mid
Neuroticism	Low
Openness	Low
Extraversion	Mid

Reserved personality types have a lot of self-doubt. They are agreeable and conscientious about others, just don't expect them to lead the charge. These individuals struggle to see the value in change. It will require strong emotional support to keep these individuals stable. Small changes over time help move these personalities in the right direction because asking them to do too much at once will have negative consequences.

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Cohesive Value

Personality Types

Self-Centered

- Outgoing
- Independent
- Critical, Challenging, Suspicious

Conscientiousness	Low
Agreeableness	Low
Neuroticism	Mid
Openness	Low
Extraversion	High

Self-Centered personalities struggle to care about anything else other than what is important to them. Their strong values are only likely to change when aligning with individuals that see the world through their perspective. These individuals will likely be the last to accept change, and they will continue to dislike it. Proceed cautiously and do not go it alone when proposing change to these personalities.

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The Big Five Personality Types

Personality Types

Role-Model

- Dependable
- Experienced
- Helpful, Trusting, Warm

Conscientiousness	High
Agreeableness	High
Neuroticism	High
Openness	Low
Extraversion	High

Role Models are incredibly hard working, organized, and compassionate towards others. When a Role Model aligns with your idea or vision, expect things to get done timely and well. These individuals should be targeted for proposed change first. With their tenure and status in the group, they will have the most influence over Average and Reserved personalities and can even put Self-Centered personalities in check and balance when things get out of control.

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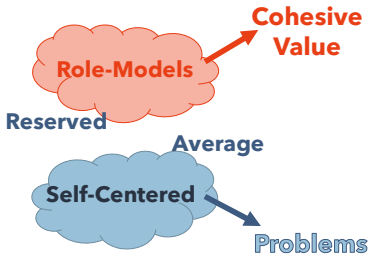
The Big Five Personality Types



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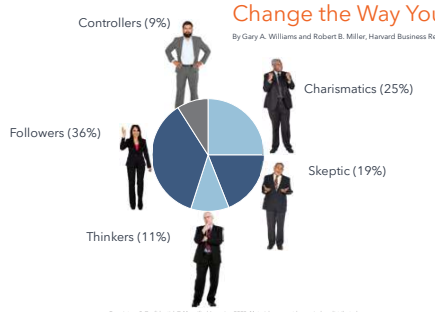
Leadership Decision Making Styles

MAGNIFIED LEARNING

Change the Way You Persuade

By Gary A. Williams and Robert B. Miller, Harvard Business Review



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Leadership Decision Making Styles

MAGNIFIED LEARNING

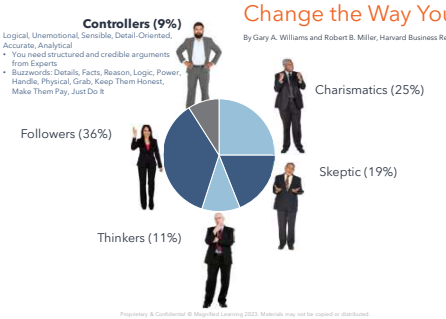
Change the Way You Persuade

By Gary A. Williams and Robert B. Miller, Harvard Business Review

Controllers (9%)

Logical, Unemotional, Sensible, Detail-Oriented, Accurate, Analytical

- You need structured and credible arguments from Experts
- Buzzwords: Details, Facts, Reason, Logic, Power, Handle, Physical, Grab, Keep Them Honest, Make Them Pay, Just Do It



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Leadership Decision Making Styles

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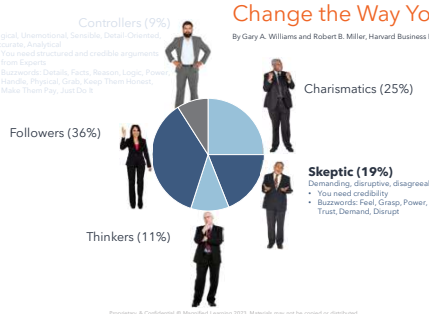

Skeptic (19%)

Demanding, disruptive, disagreeable, rebellious

- You need credibility
- Buzzwords: Feel, Grasp, Power, Action, Suspect, Trust, Demand, Disrupt

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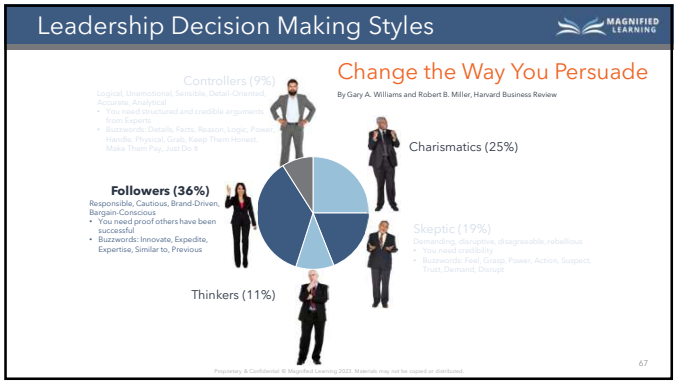

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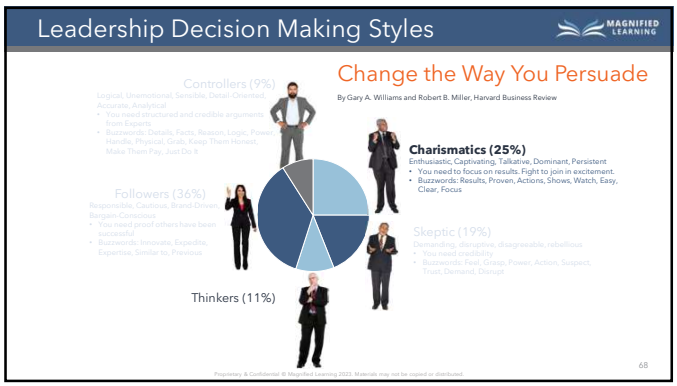

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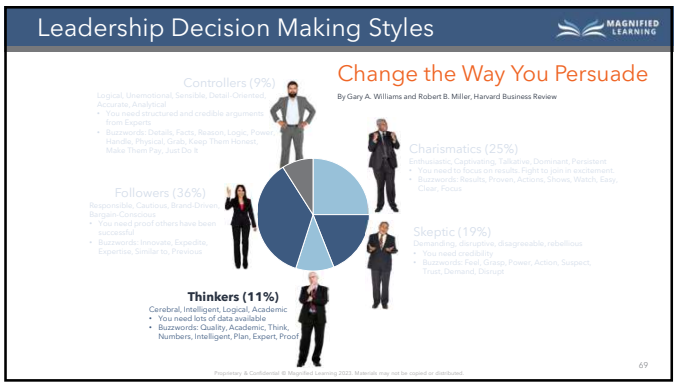

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Decision Making Application

Practice – Align an Approach to the Situations

Connie the Nurse Practitioner

- Connie, NP, working as on call support.
- Focused on preventive medicine
- Wants to implement new solutions that generate new revenue
- Jim questions everything, is critical, and allows for interruptions in his meetings

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Decision Making Application

Change the Way You Persuade

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Jim, The Skeptic (19%)

What should Connie Do and how should she present her case?

- Bring credibility and find someone who can endorse and back Connie's plans that Jim trusts
- Connie's endorser should use words and phrases like:
  - "You should act now before you miss out on the opportunity."
  - "I suspect if you don't, there will be negative disruptions."
  - "The experts say, 'grasping these concepts now will put you ahead of demand' so let's go!"
  - "Jim, as your colleague, these are powerful changes with positive results. Here is what we did, how we did it, and our results."

How can she bring all parties together?

- After Jim has agreed to do it, ask the endorser to recommend Jim take charge. Connie should share with the endorser that Jim should be mindful of each organizations' culture and leaders' decision-making styles

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Decision Making Application

Practice – Align an Approach to the Situations

Dr. Jack and Administration

- Dr. Jack wants to address his scheduled procedures with medical director (MD) and administrator (Admin)
- MD and Dr. Jack don't get along. MD wants proof and things done his way. He is blunt and unemotional.
- Admin seems more concerned with competition and competing against their model.

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Decision Making Application

Change the Way You Persuade

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Hospital Administrator, The Follower (36%)

What should Dr. Jack do?

Responsible, Cautious, Brand-Driven, Bargain-Conscious

- You need proof others have been successful
- Key phrases and words:
  - "Others across the nation have grabbed ahold of this opportunity. The logical reasonings and details presented demonstrate that it's been successful in other organizations."
  - "Others have been innovative, and we should be more innovative as well, like what these experts have proven.
- Key phrase and words to avoid:
  - "We could be the first"
  - "No one else is doing this in the community!"

Medical Director, the Controller (9%)

What should Dr. Jack do?

- Bring structure, credible arguments from experts. Plenty of proof.
- Key phrases and words:
  - "Others across the nation have grabbed ahold of this opportunity. The logical reasonings and details presented demonstrate that it's been successful in other organizations."
  - "We should keep ourselves honest because of the facts in this case, we just need to do it."
- Key phrases and words to avoid:
  - "Let's just do it now!"
  - "We don't have time, we need to make a decision about these facts, today."

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Decision Making Application

Practice – Align an Approach to the Situations

Sue and the Nursing Director

- Sue is an ICU nurse. She has several ideas for change to avoid burnout.
- The Nursing Director (ND) is verbally supportive and excited about new ideas, but rarely follows through.

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Decision Making Application

Change the Way You Persuade

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Nurse Director, the Charismatic (25%)

What should Sue do?

- You need to focus on results. Fight to join in excitement.
- Buzzwords: Results, Proven, Actions, Shows, Watch, Easy, Clear, Focus
- Key phrases and words:
  - "We need change before there's any more burnout. The results yield 55% less quitting."
  - "The science shows improvement by 15%. If we act now, we could easily prove the same."
  - "Watch what happens after we implement change. If we focus, we could see the same thing here."
- Key phrases and words to avoid:
  Avoid being satisfied with excitement and verbal commitment. For example:
  - "Let's do it. I'm looking forward to what you had to say." – Nurse Director
  - "Thank you. I knew you would see what I see." - Sue

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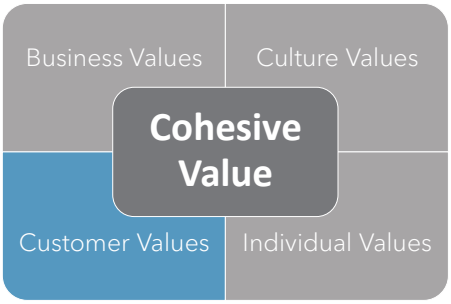
Customer Value



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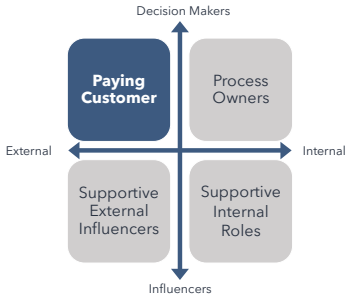
Customer Value



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Customer Value

The Four Paying Customer Personality Types

Analytical

Expressive

Amiable

Driver

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Customer Value

The Analytic

- Looking for details
- Facts and Figures
- Research
- Deeper Context
- Logical Thinking

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Customer Value

The Amiable

- Respectful
- Sociable
- Trustworthy
- Good Listeners
- Relationships

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Customer Value

The Expressive

- Creative Side
- Relationships
- Concerned for welfare of those affected by choices
- Fast Decisionmakers

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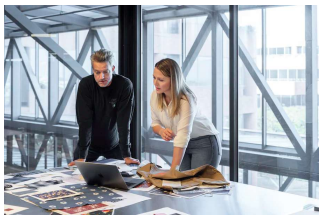
Customer Value

The Driver



- Self-centered
- Opinionated
- Goal-Oriented
- Quick Answers
- Fast Decisionmakers

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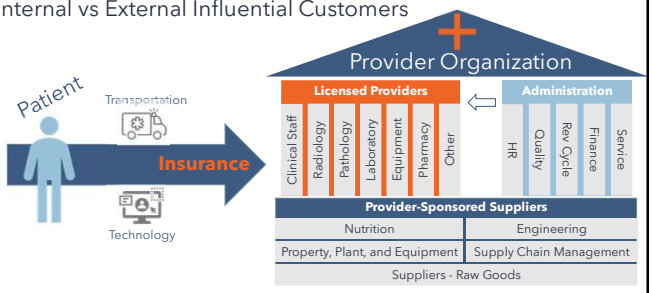
Internal vs External Influential Customers

Internal vs External Influential Customers



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Internal vs External Influential Customers

External Customers

Ask Questions!

- How may I help?
- How are you doing?
- Is there something I can do for you?
- How can I make your day better

Take Action!

- Commit immediately to a solution
- One problem at a time
- Keep addressing new problems
- Don't take on problems you cannot control

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Internal vs External Influential Customers

External Customers

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Internal vs External Influential Customers

Internal Customers

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Internal vs External Influential Customers

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Internal vs External Influential Customers

Internal and External Customers

88

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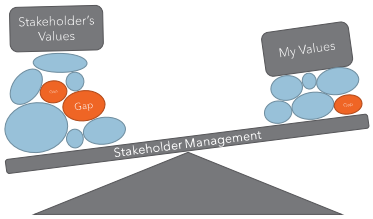
Problem Statement

How to Improve Your Situation



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Problem Statement

Problem Statement: Questions to Answer

Where is the Problem?	When did the problem happen?	Who was impacted?	What are the Costs?
Location Service line(s) Customer Type	Dates Durations	Departments Areas Processes Stakeholder	Revenue Loss Expense Increase Poor Quality Bad Service

90

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Problem Statement

Problem Statement

In Jan 2022, our ED had 1,211 patients leave before being seen due to an average wait time of 184 minutes. This resulted in $1.8M of lost patient revenue. If these high wait times continue, the hospital may experience a loss of $22M in patient revenue in 2022.

91

Problem Statement

Problem Statement

Time/Duration Location Problem Description
In Jan 2022, our ED had 1,211 patients leave before being seen due to an average wait time of 184 minutes. This resulted in
Severity of Problem
$1.8M of lost patient revenue. If these high wait times continue,
Reason to Prevent
the hospital may experience a loss of $22M in patient revenue in 2022.

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Problem Statement

Front Line Problem Statement

Last month, I heard over 1,000 patients left the ED before being seen. They were waiting over two and a half hours. I asked Steve to look into it and he said they're leaving during our shift. Dr. Jones is livid and wants to speak with all of us. I think we need to do something before heads start rolling.

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Problem Statement

Problem Statement: Questions to Answer

What Matters to Audience?	Where is the Problem?	When did the problem happen?	Who was impacted?	What are the Costs?
Culture Values Personal Values Decision-Making Styles	Location Service line(s) Customer Type	Dates Durations	Departments Areas Processes Stakeholder	Revenue Loss Expense Increase Poor Quality Bad Service

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Stakeholder Analysis Part 1

Problem Statement

↓

Stakeholder Analysis

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Stakeholder Analysis Part 1

Stakeholder Analysis

1. List All Relevant Stakeholders

- **External**
  - Primary – Patient
  - Patient's Family
  - Insurance Companies

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Stakeholder Analysis Part 1

Stakeholder Analysis

1. List All Relevant Stakeholders

- **Internal**
  - Influential
  - Obvious

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Stakeholder Analysis Part 1

Name	Stakeholder Type	Culture Type	Culture Tools	Decision-maker's Style	Current State (X) to Future State (O)				
					Strongly Against	Somewhat Against	Neutral	Somewhat For	Strongly For
MD Dir.	Int-Decision	Culture	Tradition	Follower					
Admin	Int-Decision	Culture	Tradition	Follower					
Phys 1	Int-Influen.	Culture	Tradition	Thinker					
Phys 2	Int-Influen.	Culture	Tradition	Controller					
Sup 1	Int-Influen.	Mngmt	SOPs	N/A					
Sup 2	Int-Influen.	Mngmt	SOPs	N/A					
Sup 3	Int-Influen.	Mngmt	SOPs	N/A					
Nurse 1	Int-Influen.	Mngmt	SOPs	N/A					
Nurse 2	Int-Influen.	Ldrshp	Vision	N/A					
Nurse 3	Int-Influen.	Ldrshp	Charisma	N/A					
Clerk 1	Int-Influen.	Culture	Vision	N/A					
Clerk 2	Int-Influen.	Culture	Tradition	N/A					

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Stakeholder Analysis Part 1

Name	Stakeholder Type	Culture Type	Culture Tools	Decision-maker's Style	Current State (X) to Future State (O)				
					Strongly Against	Somewhat Against	Neutral	Somewhat For	Strongly For
MD Dir.	Int-Decision	Culture	Tradition	Follower	X				
Admin	Int-Decision	Culture	Tradition	Follower		X			
Phys 1	Int-Influen.	Culture	Tradition	Thinker	X				
Phys 2	Int-Influen.	Culture	Tradition	Controller	X				
Sup 1	Int-Influen.	Mngmt	SOPs	N/A		X			
Sup 2	Int-Influen.	Mngmt	SOPs	N/A		X			
Sup 3	Int-Influen.	Mngmt	SOPs	N/A			X		
Nurse 1	Int-Influen.	Mngmt	SOPs	N/A			X		
Nurse 2	Int-Influen.	Ldrshp	Vision	N/A			X		
Nurse 3	Int-Influen.	Ldrshp	Charisma	N/A		X			
Clerk 1	Int-Influen.	Culture	Vision	N/A			X		
Clerk 2	Int-Influen.	Culture	Tradition	N/A			X		

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99

Stakeholder Analysis Part 1

Name	Stakeholder Type	Culture Type	Culture Tools	Decision-maker's Style	Current State (X) to Future State (O)				
					Strongly Against	Somewhat Against	Neutral	Somewhat For	Strongly For
MD Dir.	Int-Decision	Culture	Tradition	Follower	X				O
Admin	Int-Decision	Culture	Tradition	Follower		X			O
Phys 1	Int-Influen.	Culture	Tradition	Thinker	X			O	
Phys 2	Int-Influen.	Culture	Tradition	Controller	X				O
Sup 1	Int-Influen.	Mngmt	SOPs	N/A		X		O	
Sup 2	Int-Influen.	Mngmt	SOPs	N/A		X		O	
Sup 3	Int-Influen.	Mngmt	SOPs	N/A			X	O	
Nurse 1	Int-Influen.	Mngmt	SOPs	N/A			X	O	
Nurse 2	Int-Influen.	Ldrshp	Vision	N/A			X	O	
Nurse 3	Int-Influen.	Ldrshp	Charisma	N/A		X			O
Clerk 1	Int-Influen.	Culture	Vision	N/A			X	O	
Clerk 2	Int-Influen.	Culture	Tradition	N/A			X	O	

100

100

Stakeholder Analysis Part 2

Name	Personality Type	Decision-maker's Style	Notes	Current State (X) to Future State (O)				
				Strongly Against	Somewhat Against	Neutral	Somewhat For	Strongly For
MD Dir.	Reserved	Follower	Build Support	X				O
Admin	Role Model	Follower	Gain Support First		X			O
Phys 1	Role Model	Thinker	Gain Support First	X			O	
Phys 2	Self-Centered	Controller	Limit Interaction	X				O
Sup 1	Role Model	N/A	Gain Support First		X		O	
Sup 2	Average	N/A	Gain Support Second		X		O	
Sup 3	Average	N/A	Gain Support Second			X	O	
Nurse 1	Reserved	N/A	Build Support			X	O	
Nurse 2	Self-Centered	N/A	Limit Interaction			X	O	
Nurse 3	Self-Centered	N/A	Limit Interaction		X			O
Clerk 1	Average	N/A	Gain Support Second			X	O	
Clerk 2	Average	N/A	Gain Support Second			X	O	

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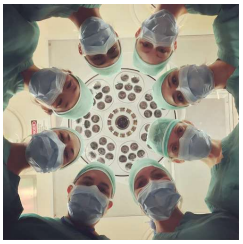
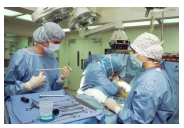
Cohesive Value Conclusion

Conclusion





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Lean Six Sigma Introduction

Purpose:

To introduce the learner to the fundamental components of Lean Six Sigma.

Objectives:

- Define and describe Lean and Six Sigma including the development of process control and continuous process improvement
- Discuss the origin of Lean Six Sigma (LSS)
- Introduce the application and importance of LSS in industries today

Outcomes:

By the end of this lesson, the learner will be able to:

- Successfully complete the section quiz as evidenced by a minimum score of 80%.

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What is Lean Six Sigma?

LEAN + SIX SIGMA = LEAN SIX SIGMA

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Lean Introduction

Lean

Lean is one big waste removal machine.

105

Lean Thinking

Eliminate Waste & Create Value

- Stakeholder Management
- Capacity Enhancement
- Continuous Improvement
- Cost Reduction
- Quality Insight
- Customer Focused
- Holistic Solutions
- Empowering Change

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IMPROVEMENT ISN'T OPTIONAL IN HEALTHCARE.

Innovate by:

- Removing Waste
- Managing resources to improve value
- Finding better ways to perform

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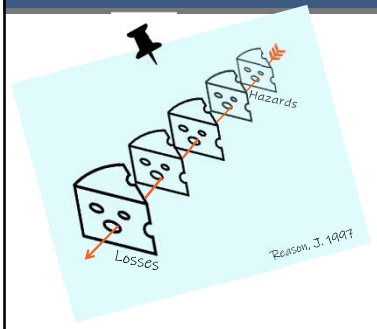

LEAN THINKING:
A required skill for effective leadership.

Leadership is everything & Leadership starts with...*you*.

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Lean History

KEY:

Lean Evolution

Eli Whitney
- Interchangable Parts

Frank Gilbreth
- Motion Study

Taiichi Ohno
Shigeo Shingo
- Toyota Production System
- Just-in-Time
- Stockless Production

1800 — 1911 — 1912 — 1913 — 1988 — 1990

Frederick Taylor
- Standardization, Time Study
- Worker: Management Dichotomy

Henry Ford
- Assembly & Flow Lines
- Manufacturing Strategy

James Womack
- Lean Manufacturing

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Lean History

1910

Henry Ford contributed many innovative business practices. Thanks to his Lean thinking, he was the first to build his River Rouge factory around a continuously moving assembly line. This resulted in faster car production, which led to greater profits for Ford as he outperformed his competitors. However, in 1910 Henry Ford faced a new challenge…variation. Variation in service slows down workflow and Henry Ford felt the financial pressures of creating variation when his customers wanted more than just a black automobile.

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Lean History

1940-1950

Toyota is a major company today thanks in part to Taiichi Ohno's Lean Thinking. Toyota faced a serious challenge in combating new variation demands. In addition to color, customers wanted different models. Taiichi partnered with Shigeo Shingo to implement Rapid (or Quick) Changeover, or Single Minute Exchange of Die (SMED), which allows rapid changing over one mode of production to another. Taiichi also identified that he could avoid waste if he waited to produce a car when inventories ran low, contrary to Ford's massive production theory. Don't waste precious supplies by over producing. Think of a grocery store, as Ohno did. Supplies are ordered only after inventory runs low.

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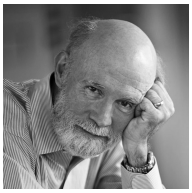
Lean History



James P. Womack

- **Value** – Act on what's important to the customer of the process
- **Value Stream** – Understand which steps in the process add value, and which don't.
- **Flow** – Keep the work moving at all times and eliminate waste that creates delay.
- **Pull** – Avoid making more or ordering more inputs for customer demand you don't have.
- **Strive for Perfection** – There is no optimum level of performance; just a continuous pursuit for improvement.

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Six Sigma History

KEY:

6σ Evolution

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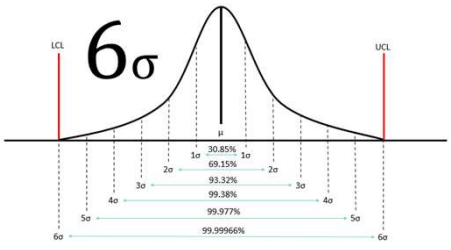
Six Sigma History



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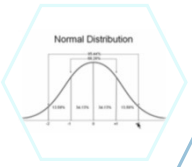
Six Sigma History

Carl Friedrich Gauss

In 1809, Carl Gauss first utilized the normal distribution to explain errors in astronomy. During the 19th century, his distribution explanation was applied extensively in applied probability statistics.



6σ

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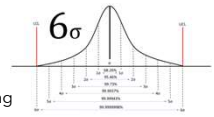
Six Sigma History

Walter Shewhart

In the 1920's, he established the underlying statistical foundation for six sigma principles, mainly that processes require correction when they are three six sigma levels from the mean.



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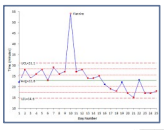
Six Sigma History

We measure the things that matter to us, known as production output, against time to see how changes in process effect production output, allowing leaders to articulate the seriousness of a problem and track potential variations in operations that could lead to problems, or defects.



6σ

Sigma Level	Defects per Million	Yield
6	3.4	99.99966%
5	230	99.977%
4	6,210	99.38%
3	66,800	93.32%
2	308,000	69.15%
1	690,000	30.85%

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Six Sigma History

W. Edwards Deming

His work on the 1940 U.S Census is still widely used today, but his major contributions to Six Sigma reside in his work in the 1970's and 1980's creating the PDCA approach to improvement. PDCA later evolved to DMAIC.

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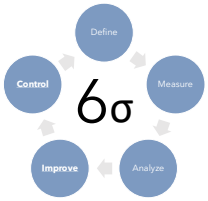
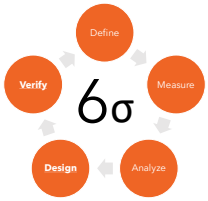
Six Sigma History

Existing Processes: **DMAIC**



New Processes: **DMADV**



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Six Sigma History

Motorola

Motorola pushed themselves to achieve a 6-sigma defect reduction level. This resulted in a $16B improvement over 12 years

MOTOROLA

Sigma Level	Defects per Million	Yield
6	3.4	99.99966%
5	230	99.977%
4	6,210	99.38%
3	66,800	93.32%
2	308,000	69.15%
1	690,000	30.85%

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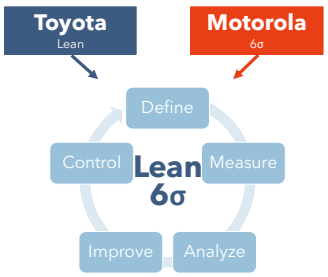
Lean Six Sigma History

Michael George

In the 1990's, he combined the Toyota Lean principles with the Motorola Six Sigma methodologies to contribute to the Lean Six Sigma transformation.



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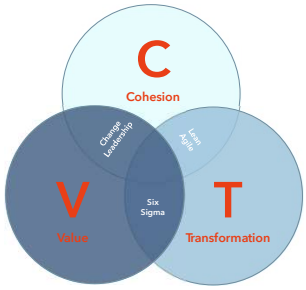
Lean Six Sigma History

Magnified Learning

In 2019, Magnified Learning added change and project management philosophies to Lean Six Sigma process improvement, creating Cohesive Value Transformation problem solving



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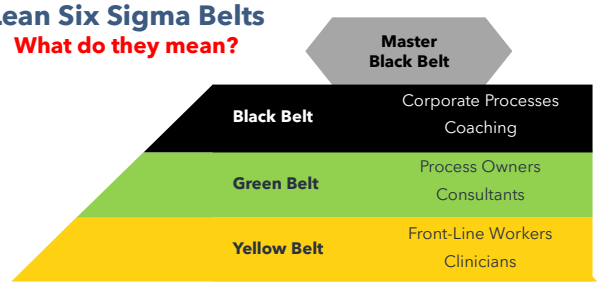
Lean Six Sigma History

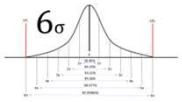
Lean Six Sigma Belts

What do they mean?



123

Six Sigma Level Yield



Sigma Level	Defects per Million	Yield
6	3.4	99.99966%
5	230	99.977%
4	6,210	99.38%
3	66,800	93.32%
2	308,000	69.15%
1	690,000	30.85%

Putting Six Sigma to Work

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Six Sigma Level Yield

Finding Sigma Level Yield

To determine a sigma levels' yield, use the following Sigma Level Yield equation

$$\text{Yield} = \left[\frac{\text{\# of Opportunities} - \text{\# of Defects}}{\text{\# of Opportunities}}\right] \text{ X } 100$$

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Six Sigma Level Yield

Yield	Sigma	DPMO
99.99966	6.0	3.4
99.9995	5.9	5
99.9992	5.8	8
99.999	5.7	10
99.998	5.6	20
99.997	5.5	30
99.996	5.4	40
99.993	5.3	70
99.99	5.2	100
99.985	5.1	150
99.977	5.0	230
99.967	4.9	330
99.952	4.8	480
99.932	4.7	680
99.904	4.6	960
99.865	4.5	1350
99.814	4.4	1860
99.745	4.3	2550
99.654	4.2	3460
99.534	4.1	4660
99.379	4.0	6210
99.181	3.9	8190
98.93	3.8	10700
98.61	3.7	13900
98.22	3.6	17800
97.73	3.5	22700
97.13	3.4	28700
96.41	3.3	35900
95.54	3.2	44600
94.52	3.1	54800
93.32	3.0	66800
91.92	2.9	80800
90.32	2.8	96800
88.5	2.7	115000
86.5	2.6	135000
84.2	2.5	158000
81.6	2.4	184000
78.8	2.3	212000
75.8	2.2	242000
72.6	2.1	274000
69.2	2.0	308000
65.6	1.9	344000
61.8	1.8	382000
58	1.7	420000
54	1.6	460000
50	1.5	500000
46	1.4	540000
43	1.3	570000
39	1.2	610000
35	1.1	650000
31	1.0	690000
28	0.9	720000
25	0.8	750000
22	0.7	780000
19	0.6	810000
16	0.5	840000
14	0.4	860000
12	0.3	880000
10	0.2	900000
8	0.1	920000

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Six Sigma Level Yield Application

At Regional One Hospital, 4,000,000 procedures were performed in 2021. It is estimated that each surgical cart opened in error produces $200 worth of waste.

What would be Regional One's cost of performing procedures under each sigma level of defects?

	Defects per Million Opportunities	Yield	Estimated Surgical Cart Defects	Total Cost (at $200 per error)
Six Sigma	3.4	99.99966%	13.6	$ 2,720
Five Sigma	233	99.977%	920	$ 184,000
Four Sigma	6200	99.38%	24,800	$ 4,960,000
Three Sigma	66,800	93.32%	267,200	$ 53,440,000
Two Sigma	308,000	69.15%	1,234,000	$ 246,800,000
One Sigma	690,000	30.85%	2,766,000	$ 553,200,000

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Six Sigma Level Yield Application

Key Facts

	Region A	Region B	Region C	Overall
Opportunities	20,000,000	5,000,000	3,000,000	28,000,000
Defects	5,000,000	100,000	25,000	5,125,000

$$Yield = \frac{(Opportunities - Defects)}{Opportunities} \times 100$$

Answer Key

	Yield	Region A	Region B	Region C	Overall
Six Sigma	99.99966%	X	X	X	X
Five Sigma	99.977%	X	X	X	X
Four Sigma	99.38%	X	X	X	X
Three Sigma	93.32%	X	98%	99.1667%	X
Two Sigma	69.15%	75%	X	X	81.696%
One Sigma	30.85%	X	X	X	X

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Lean Six Sigma In Practice

Experience might say a process isn't working.

Intuition might guide you to believe a certain change could improve output.

Lean Six Sigma tools help organizations validate those assumptions.

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Lean Six Sigma In Practice

Beta Testing

Implementing a new idea, system, or product with a select group of people or processes in as controlled an environment as possible to reduce the risks and costs inherent in launching an unproven product or system to a widespread audience.

Beta Testing **With** Lean Six Sigma

Decreased Risk because the idea or change in question goes through rigorous analysis and data testing **first** further reducing costly waste & errors.

Beta Testing **Without** Lean Six Sigma

Increased Risk because the success of the idea is weighed **after** implementation; problems are addressed **after** they've already impacted products or processes in some way in the present or the future

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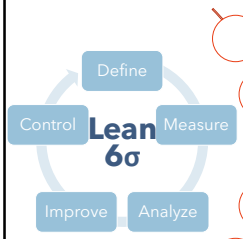
Lean Six Sigma In Practice



- Identify Problems
- Validate Assumptions
- Brainstorm Solutions
- Plan for Implementation
- Avoid Unintended Consequences

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Applying Lean Six Sigma Knowledge

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Applying Lean Six Sigma Knowledge

Common Six Sigma Principles:

- **Customer Focused Improvement**

Benefits

- Offer additional features customers want and are willing to pay for
- Prioritize product development to meeting current needs
- Understand changing trends in the market
- Identify areas of concern
- Prioritize work around challenges based on how customers perceive various problems or issues
- Test solutions and ideas before investing time and money in them

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Applying Lean Six Sigma Knowledge

Common Six Sigma Principles:

- Customer Focused Improvement
- **Waste Removal**

Benefits

- Improved dashboard reporting and cultural awareness around opportunities.
- Empowers individuals to act now, not wait to be told what to do.
- Develops a culture of empirical decision making and moves away from hearsay, gossip, and finger pointing to create awareness for change.

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Applying Lean Six Sigma Knowledge

Common Six Sigma Principles:

- Customer Focused Improvement
- Waste Removal
- **Value Stream Mapping**

Benefits

- Illuminates the organization on current day to day operations.
- Identifies waste in process(es).
- Becomes a standard operating procedure for training, auditing, etc.

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Applying Lean Six Sigma Knowledge

Common Six Sigma Principles:

- Customer Focused Improvement
- Waste Removal
- Value Stream Mapping
- **Empowering and Enabling Talent**

Benefits

- Reduced variation brings simpler, more predictable outcomes and expenses.
- Waste reduction requires understanding both business and process waste types.
- Through improvement, organizations experience many financial, quality, services, and performance benefits.

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Applying Lean Six Sigma Knowledge

Common Six Sigma Principles:

- Customer Focused Improvement
- Waste Removal
- Value Stream Mapping
- Empowering and Enabling Talent
- **Controlling the Process**

Benefits

- Able to make timely change and adapt quickly with more control in processes
- Focused approach to assigning control and holding others accountable to what they do control
- Creating a safe haven for best practice exploration without emotionally complex debates and bias

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Applying Lean Six Sigma Knowledge

Cultural Challenges of Implementing Six Sigma

- Lack of Resources or Knowledge
- Lack of Support
- Poor Project Execution
- Poor Data Management
- Concerns About Applying Principles in Specific Industry

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Summary

Lean	Six Sigma	Lean Six Sigma	Applying 6σ
• Lean Thinking • Waste Reduction	• Statistical Variation • Defect Removal • Six Sigma Levels • DMAIC Approach	• Combining Lean and Six Sigma Principles • Multi-Industry Approach	• Organizational Transformation • Cultural Acceptance • Stronger Leadership • Empowered Employees

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Cohesive Value

Purpose:

To introduce the learner to the fundamental components of Transformative Cohesion through Lean philosophies.

Objectives:

- Understand the elements of Transformative Cohesion from Lean Principles
- Understand Lean Waste in processes
- Introduce tools and techniques that help eliminate waste

Outcomes:

By the end of this lesson, the learner will be able to:

- Successfully complete the unit quiz as evidenced by a minimum score of 80%.

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Transformative Cohesion (TC)

Lean Principles in Front-Line Operations

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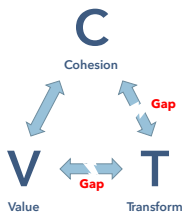
Transformative Cohesion Intro



"Addressing Transformation Gaps is all about applying Lean Six Sigma tools, techniques, and methodologies to improving business value"

- Jared Stanger, Founder Magnified Learning

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Lean Intro

What is Lean?

1. Waste Elimination
2. Lifestyle Habits
3. Service Focused Operations

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Lean Intro

Each process step is considered either **value added** or **non-value added** to the customer.

In healthcare, we seek to reduce those non-value add steps through correction and innovation.

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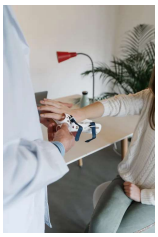
Lean Intro



Stakeholder Goals

- Patient Recovery
- Pain Management
- Timely Service
- Affordable Price
- Sustainable Cost
- Community Value

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Intro to Process Mapping

Process

Tasks taken in a specific order to produce a good or service.

Process Map Type	Definition	Best Used For…
Basic Flow Chart	The simplest of diagrams to map macro steps	Planning new projects, documenting company processes, solving issues, helping teams communicate ideas

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Intro to Process Mapping

Basic Flow Chart Shapes

Shape	Step
Right Angled Rectangle	**Process Step**. This visual represents the task being performed to produce a specific good or service. It requires an input to initiative the task and results by pushing the product or service to the next step or final product.
Diamond	**Decision**. During a process, a decision may need to be made in order to proceed to the next appropriate step. Therefore, a diamond is used when a question needs answered before moving on.
Start/End	**Start or End**. Either a circle or this rounded off rectangle represents the start or end of a process map.
Trapezoid	**Produced Data or Information**. The trapezoid represents when data or information is produced from a process step. This is a key activity when the use of software is required in a process and that information is pushed and initiates another process step.

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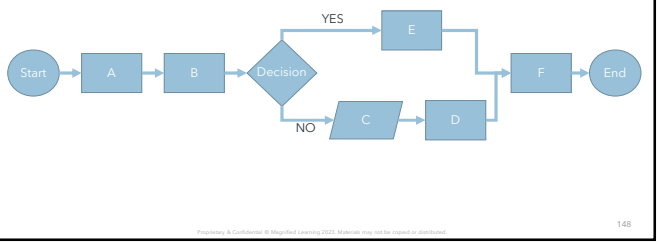
Intro to Process Mapping



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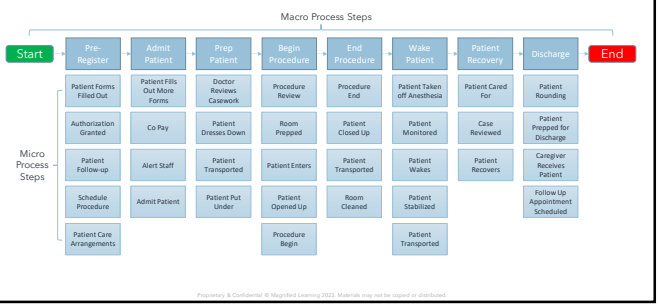
Anatomy of Process Value



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Anatomy of Process Value

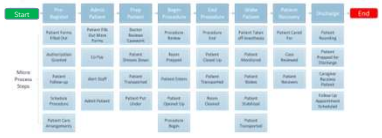
Anatomy of Process Value

In process improvement, it is important to identify and differentiate the value add from the non-value add activities.

Value Added (VA) Tasks: **What the customer wants**

Non-Value Added (NVA) Tasks: **All other steps**

1. Essential Non-Value Add Tasks: **Have to keep**
2. Non-essential Non-Value Add Tasks: **Remove**



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Anatomy of Process Value

Name	Stakeholder Type	Culture Type	Culture Tools	Decision-maker's Style	Values – Voice of The Customer
Patient	Ext-Decision	N/A	N/A	Various	Cure/Health, Affordable Care, Timely Care
Payor	Ext-Decision	N/A	N/A	Various	Positive Outcomes, Claim Paperwork, Prior Authorization
Caregiver	Ext-Influencer	N/A	N/A	Various	Cure/Health, Timely Care, Flexibility
Dr. A	Int-Influencer	Mang.	SOPs	Support	Healthy Culture, Staff, Patients, Profits
Dr. B	Int-Influencer	Mang.	KIPs	Support	Healthy Culture, Patients, Profits
Dr. C	Int-Decision	Mang.	KPIs	Control	Authority, Leadership Role, Primary Decision Maker
Dr. D	Int-Decision	Mang.	KPIs	Follower	Patients, Profits
Admin	Int-Decision	Mang.	KPIs	Skeptic	Healthy Culture, Profits, Staff
Nurse 1	Int-Influencer	Mang.	SOPs	N/A	Staff, Resources, Fair Compensation, Good Benefits
Nurse 2	Int-Decision	Mang.	SOPs	Control	Staff, Resources, Fair Compensation, Good Benefits
Nurse 3	Int-Influencer	Mang.	SOPs	N/A	Provide Care, Fair Compensation
Nurse 4	Int-Influencer	Mang.	SOPs	N/A	Fair Compensation

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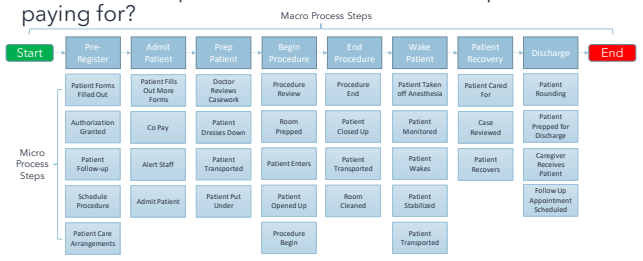
Anatomy of Process Value

Label which steps are Value Add…what is the patient paying for?



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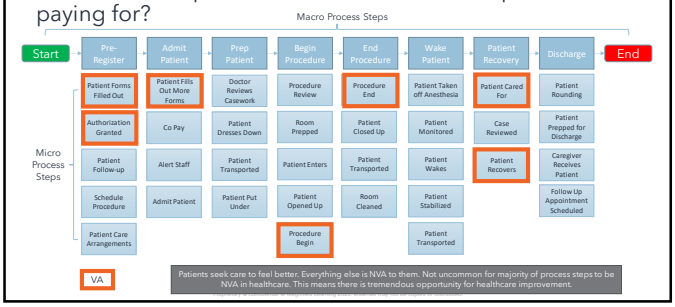
Anatomy of Process Value

Label which steps are Value Add…what is the patient paying for?



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Anatomy of Process Value

Remember these three things?

Context	Customer	Expectations
• Process Outputs • Internal Stakeholders • Business Goals • Politics • Constraints • External Suppliers	• Demand • Expected Outcomes • Service Levels • Experience • Pricing • Access/Location	• Laws • Policies • Rules • Regulations • Budget • Competition



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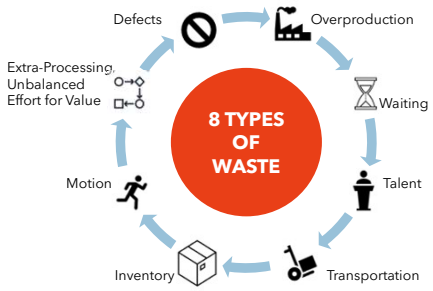
Waste in Front Line Operations



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Waste in Front Line Operations

Types of Waste in Front Line Operations

Abbreviation	Translation or Meaning	Why It Matters
W	**W**aiting	Lose productivity. Low productivity can lead to individual performance and HR issues. Also dissatisfied customers.
O	**O**verproduction	Lose storage space. Increased risk on making goods/services that you cannot sell
R	**R**ejects or Defects	Lose material and time. Dissatisfied Customers
M	**M**otion	Lose opportunity and results. Although employees and customers are "busy", extra motion does not yield more results
P	**P**rocessing	Similar to motion, extra steps doesn't yield more output, just increases costs and decreases throughput
I	**I**nventory	Increase risk of not using excess material, lost storage space, and leads to overproduction of goods
T	**T**ransportation	Waste time, resources, and costs when unnecessarily transporting products and materials
T	**T**alent	Underutilizing people's talents, skills, and knowledge leads to lost opportunities for growth and continuous improvement

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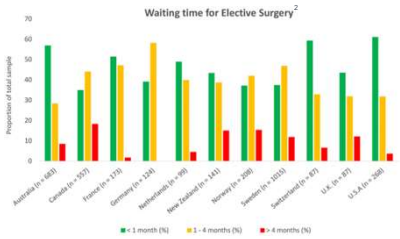
Lean Waste - Waiting

Waiting

- Poor Satisfaction
- Unnecessary Costs
- Poor Productivity



1. https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2720917
2. Canadian Institute for Health Information. How Canada Compares: Results from The Commonwealth Fund's 2016 International Health Policy Survey of Adults in 11 Countries - Accessible Report. Ottawa, Ontario: Canadian Institute for Health Information; 2016

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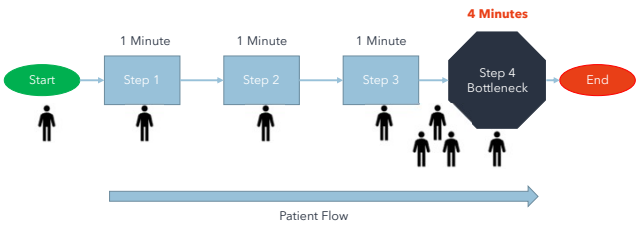
Lean Waste - Waiting

Bottlenecks



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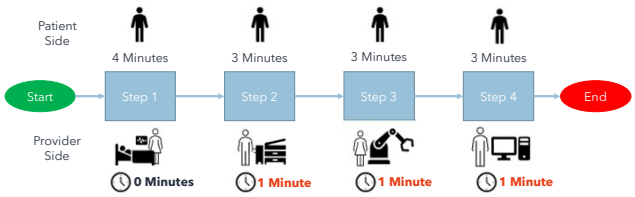
Lean Waste - Waiting

Idle Time



3 minutes idle labor + 3 minutes idle equipment per 4-minute operation pace =
2,160 idle minutes per day

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Waste - Overproduction

Overproduction


Large Batch Size


Unreliable Processes


Unstable Schedules


Unbalanced Cells or Departments


Inaccurate Forecast

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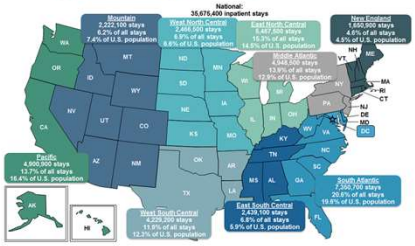
Waste - Overproduction

Figure 1. Number and percentage of inpatient stays by U.S. census division, 2016



https://www.hcup-us.ahrq.gov/reports/statbriefs/sb246-Geographic-Variation-Hospital-Stays.jsp

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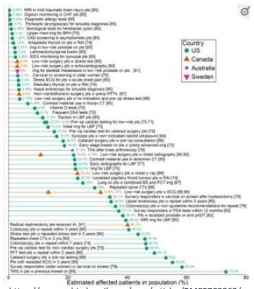
Waste - Overproduction



https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5708862/

Evidence of Overuse of Medical Services Around the World, (NIH, 2017)
By Brownlee, Chalkidou, et al.

"Overuse, which Chassin and Galvin defined as the provision of medical services for which the potential for harm exceeds the potential for benefit, is increasingly recognized around the world…**In the United States, estimates of spending on overuse…range from 6%-9%** of total healthcare spending, [with] **Medicare spending on overuse closer to 29%**"

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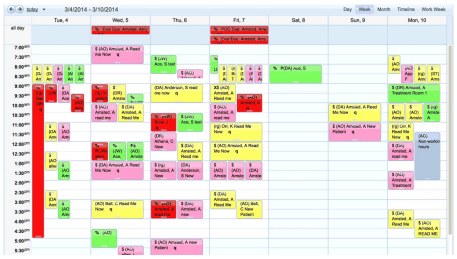
Waste - Overproduction

Overscheduling
- Rushes Clinicians
- Decreases Patient Satisfaction
- Increases Risk for Medical Errors
- Damages Reputation



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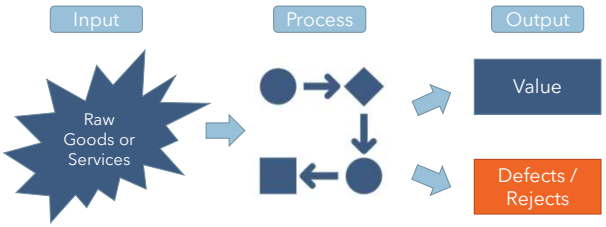
Waste – Rejects/Defects



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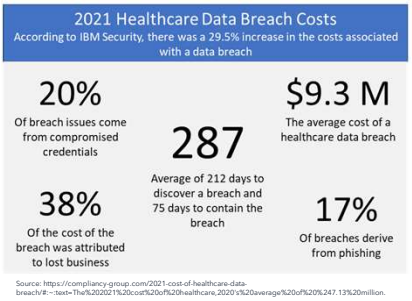
Waste – Rejects/Defects

Rejects (Defects)
- Take the form of both tangible and intangible goods and services.
- Measured in cost of time, resources, and litigation.
- Quality and customer satisfaction decrease as a result of large amounts of defects in a good or service.



Source: https://compliancy-group.com/2021-cost-of-healthcare-data-breach/#:~:text=The%202021%20cost%20of%20healthcare,2020's%20average%20of%20%247.13%20million.

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Waste – Rejects/Defects

NEWS | RANSOMWARE

BlackCat ransomware targets another healthcare facility

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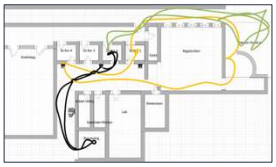
Waste – Motion

Motion – waste in excessive or unnecessary resource (people) movement

Before



After

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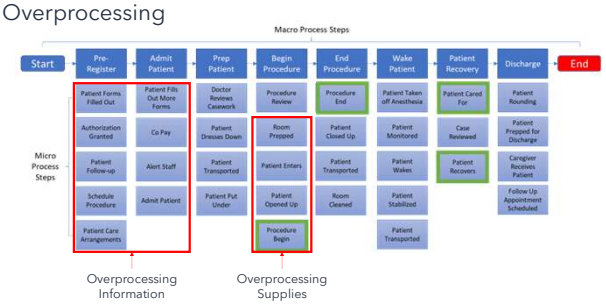
Waste – Overprocessing

Overprocessing



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Waste – Overprocessing

Current Process

Less Steps
Less Costs
Less Time
Better Service

Competitor's Process

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Waste - Inventory

Inventory

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Waste - Inventory

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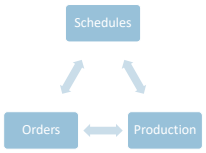
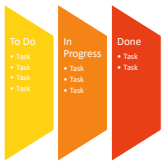
Waste - Inventory

Just-in-Time (JIT)



Kanban Board



PAR Inventory Management

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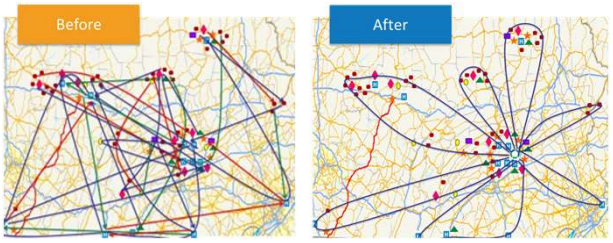
Waste - Transportation

Transportation



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Waste - Talent

Talent

- Clear Roles
- Purpose
- Top of License Performance
- Value Focused

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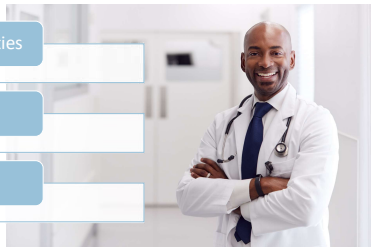
Waste - Talent

- Clear Roles and Responsibilities
- Understanding of Tasks
- Trust and Culture



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Waste – Summary Table

Abbreviation	Translation or Meaning	Why It Matters	How to Eliminate
W	Waiting	Lose productivity. Low productivity can lead to individual performance and HR issues. Also dissatisfied customers.	Reduce variation in processes, address bottlenecks
O	Overproduction	Lose storage space. Increased risk on making goods/services that you cannot sell	Apply Pull philosophy, only take what you need, when you need it
R	Rejects or Defects	Lose material and time. Dissatisfied Customers	Partner with Green or Black Belt
M	Motion	Lose opportunity and results. Although employees and customers are "busy", extra motion does not yield more results	Bring resources closer together, consolidate tasks into area
P	Processing	Similar to motion, extra steps doesn't yield more output, just increases costs and decreases throughput	Simplify the complex into less steps or fewer tasks
I	Inventory	Increase risk of not using excess material, lost storage space, and leads to overproduction of goods	Apply 5S, keep things organized and purposeful
T	Transportation	Waste time, resources, and costs when unnecessarily transporting products and materials	Just In Time (JIT) Operations Process Streamlining
T	Talent	Underutilizing people's talents, skills, and knowledge leads to lost opportunities for growth and continuous improvement	Process Streamlining – Swim Lane Roles/Responsibilities

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Lean Tools for Front Lines

Waste Auditing

5S

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Waste Auditing

Waste Auditing

Performing Waste Audit

Planning:

1. Gather Resources
2. Review Current Performance

Assessing:

3. Culture and Individuals
4. Shadow Process Steps

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Waste Auditing

WORMPITT	QUESTIONS
Waiting	Is there waiting in the process? If so, who is waiting? What is downstream impact?
Overproduction	Is anything overproduced? If so, what is being overproduced? Can it be stored and reused later? What is causing overproduction? Who authorizes overproduction?
Rejects	Poor outcomes from the process? What are they and how are they measured? Who is responsible for outcomes?
Motion	Who or what is in motion? How often? Does motion perform circular or cyclical or linear motion patterns? Are theyjustified or reasonable?
Processing	Are there confusing, excessive, or extra steps? Can they be eliminated?
Inventory	Is inventory involved in the process? If yes, how is inventory managed? How often does inventory go missing and expire?
Transportation	Is anything being transported? If so, how often and what? Do the costs of transporting justify the service/quality expectations? Are things lost in transportation? Do items arrive late?
Talent	Are there distinct roles and responsibilities defined in the workplace? Do roles and responsibilities match individual's skillset, licensure, and values? Are roles fulfilling?

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Waste Auditing

Waste Auditing

Performing Waste Audit

Planning:

1. Gather Resources
2. Review Current Performance

Assessing:

3. Culture and Individuals
4. Shadow Process Steps

Reporting:

5. Quantify Results
6. Create Problem Statement

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Organizational Transformation

5S

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5S Organizational Transformation

Sort	Straight	Shine	Standardize	Sustain
Phase 1				
1. All items or materials in workspace are reviewed: • Tag all items red that are to be discarded due to expiration date • Tag all items yellow that are to be recycled or donated • Tag all items blue that are to be sold • Tag all items green that are to stay 2. Remove unneeded items appropriately				

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5S Organizational Transformation

Sort	Straight	Shine	Standardize	Sustain
Phase 1	**Phase 2**			
1. All items or materials in workspace are reviewed: • Tag all items red that are to be discarded due to expiration date • Tag all items yellow that are to be recycled or donated • Tag all items blue that are to be sold • Tag all items green that are to stay 2. Remove unneeded items appropriately	1. Organize items or material into groups of likeness 2. Review storage space and overall real estate 3. Plan out best location for items or materials based on usage rate • Items and materials with unique, fixed dimensions, place first • Higher usage, most convenient locations, place next • Lower usage, most inconvenient location, place last 4. Label all areas • Material locations labelled • Unique, items taped off where located when not in use • Don't over label obvious items			

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5S

5S in Sterile Processing

Before

After

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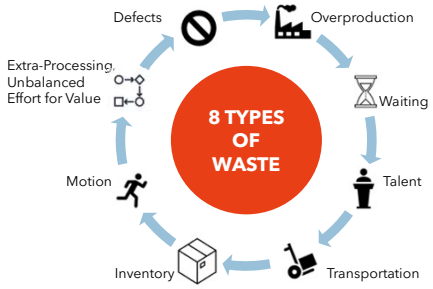
Transformative Cohesion Summary



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Cohesive Value

Purpose:

To introduce the learner to the fundamental components of Value Transformation through Six Sigma philosophies.

Objectives:

- Understand the elements of Value Transformation from Six Sigma Principles
- Introduce measuring defects and variation in processes
- Introduce tools and calculations to quantify six sigma performance and perform initial root cause analysis

Outcomes:

By the end of this lesson, the learner will be able to:

- Successfully complete the unit quiz as evidenced by a minimum score of 80%.

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Value Transformation (VT)

Six Sigma for Front-Line Operations

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Value Transformation Introduction

Reducing Defects

These Devices Sickened Hundreds. The New Models Have Risks, Too.

Duodenoscopes — tubular cameras threaded into the intestine — with disposable parts were supposed to be safer. But the parts can fall off in the body, the F.D.A. warned.

Defective Birth Control Blamed for Scores of Unplanned Pregnancies in Chile

The public health system delivered, and then quietly recalled, 276,890 potentially flawed packets of birth control pills. At least 140 women believe they got pregnant because of the error.

U.K. Paid $20 Million for New Coronavirus Tests. They Didn't Work.

Facing a global scramble for materials, British officials bought millions of unproven kits from China in a gamble that became an embarrassment.

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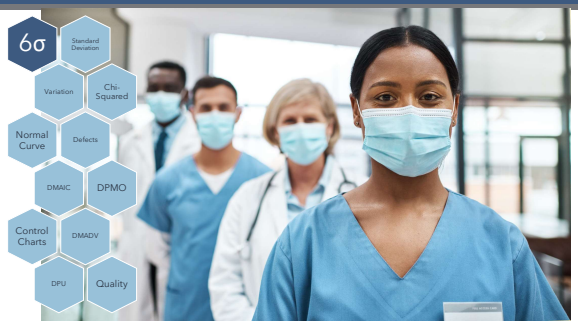
Intro to Six Sigma



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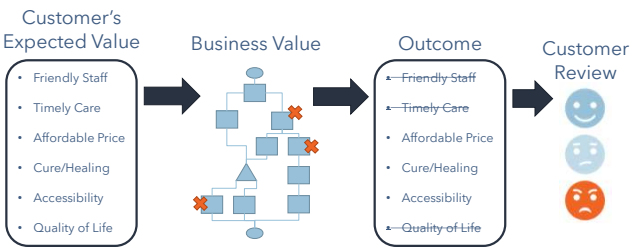
Intro to Six Sigma



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Intro to Six Sigma

1. https://www.cdc.gov/hai/eip/antibiotic-use.html
2. https://www.cdc.gov/hai/pdfs/hai/scott_costpaper.pdf
3. https://www.jstor.org/stable/25750596

Overview

- HAIs are infections resulting from complications of healthcare. They are linked with high morbidity and mortality.
- On any given day, 1 in 31 hospital patients has an HAI (an infection while being treated in a medical facility). Additional infections occur in other healthcare settings[1].
- Many HAIs are caused by the most serious antibiotic-resistant bacteria and can lead to sepsis or death.

Economic Burden

- HAIs in U.S. hospitals have direct medical costs of at least $28.4 billion each year[2].
- They also account for an additional $12.4 billion in costs to society from early deaths and lost productivity[3].

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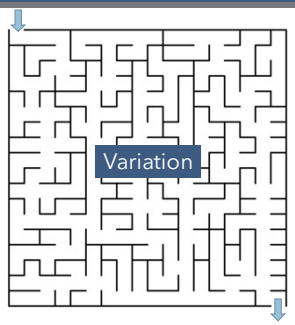
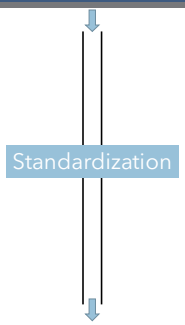
Understanding Variation





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Understanding Variation

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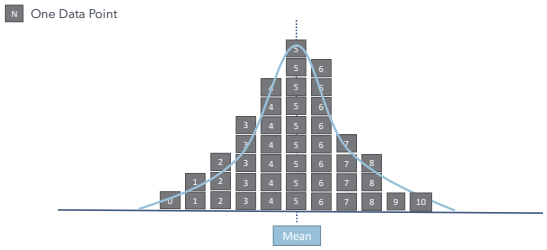
Understanding Variation



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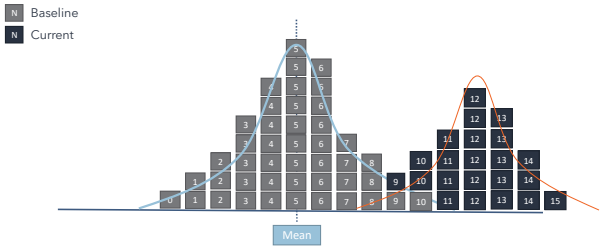
Understanding Variation



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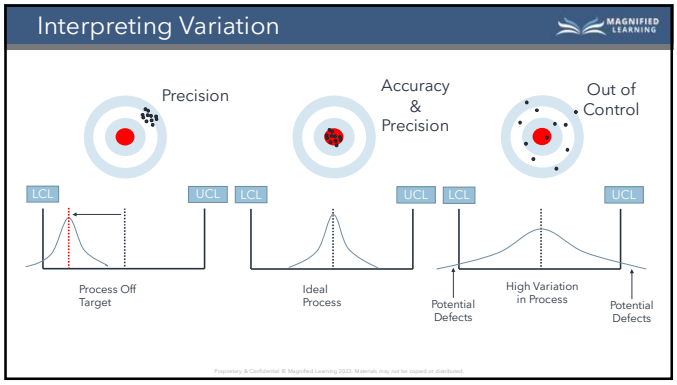

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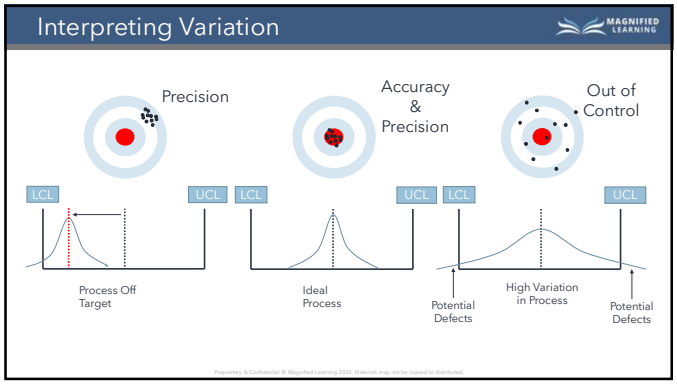

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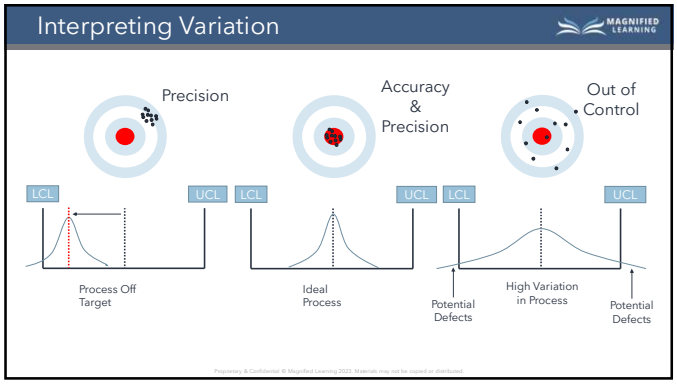
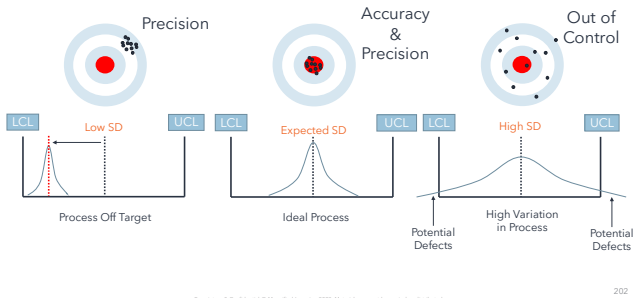


201

Interpreting Variation



202

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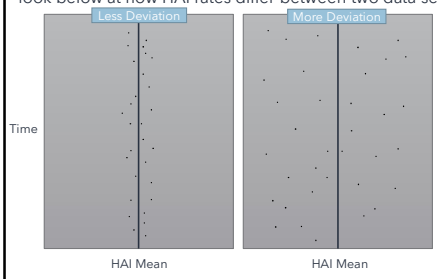
Interpreting Variation

Variation can be visually expressed in several ways. For illustrative purposes, look below at how HAI rates differ between two data sets from the mean:



- The solid lines in both images represents the average HAI ratio for each data set. The image on the far-left yields less variation than it's sister on the right.
- Lean Six Sigma standard deviation calculations can be used in two different scenarios: population data or sample data.

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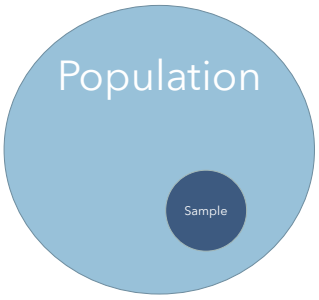
Population vs Sample Data



Population Data
All Data is Known and Available

Sample Data
All Data is Unobtainable and Requires Statistically Valid Proportion Sampling

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Standard Deviation – Population Data

To calculate standard deviation using population data, use the following equation:

$$\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2}$$

σ = *standard deviation*
mu or μ = *mean*
Σ = *add up the results of all calculations for items listen in the parentheses*
N = *number of data elements for which you calculated standard deviation*
x = *a place holder for each data element*

Let's assume we were asked to evaluate the number of HAIs in our hospital. According to the CDC, 1 in 25 U.S. hospital patients is diagnosed with at least 1 HAI[1]. For illustrative purposes, let's assume our hospital provided us with the last 30 days of HAI data from their EHR data warehouse.

1. https://www.cdc.gov/winnablebattles/report/HAIs.html

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Standard Deviation – Population Data

- Let's review those days together:

Date	HAIs Acquired	Date	HAIs Acquired
1	16	16	32
2	27	17	20
3	25	18	22
4	32	19	24
5	21	20	20
6	31	21	19
7	19	22	19
8	18	23	17
9	19	24	25
10	22	25	25
11	21	26	34
12	24	27	33
13	27	28	34
14	33	29	36
15	35	30	20

To calculate standard deviation, do the following: $\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2}$

1. Calculate the Mean
    1. (16+27+25+32+21+19+18+19+22+21+24+27+33+35+32+20+22 +24+2+19+19+17+25+25+34+33+34+36+20)/30 days = 25 (mean)

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Standard Deviation – Population Data

- Let's review those days together:

Date set	HAIs	$(x_i - \mu)^2$	Date set	HAIs	$(x_i - \mu)^2$
1	16	81	16	32	49
2	27	4	17	20	25
3	25	0	18	22	9
4	32	49	19	24	1
5	21	16	20	20	25
6	31	36	21	19	36
7	19	36	22	19	36
8	18	49	23	17	64
9	19	36	24	25	0
10	22	9	25	25	0
11	21	16	26	34	8
12	24	1	27	33	64
13	27	4	28	34	81
14	33	64	29	36	121
15	35	100	30	20	25

To calculate standard deviation, do the following: $\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2}$

1. Calculate the Mean
    1. (16+27+25+32+21+19+18+19+22+21+24+27+33+35+32+20+22 +24+2+19+19+17+25+25+34+33+34+36+20)/30 days = 25 (mean)
2. Subtract the mean and square each number. We'll do this for the first number.
    1. 16 – 25 = -9
       -9 x -9 = 81

207

Standard Deviation – Population Data

- Let's review those days together:

Data set	HAIs	$(x_i - \bar{x})^2$	Data set	HAIs	$(x_i - \bar{x})^2$
1	16	81	16	32	49
2	27	4	17	20	25
3	25	0	18	22	9
4	32	49	19	24	1
5	21	16	20	20	25
6	31	36	21	19	36
7	19	36	22	19	36
8	18	49	23	17	64
9	19	36	24	25	0
10	22	9	25	25	0
11	21	16	26	34	8
12	24	1	27	33	64
13	27	4	28	34	81
14	33	64	29	36	121
15	35	100	30	20	25

To calculate standard deviation, do the following: $\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2}$

1. Calculate the Mean
   1. (16+27+25+32+21+19+18+19+22+21+24+27+33+35+32+20+22 +24+2+19+19+17+25+25+34+33+34+36+20)/30 days = 25 (mean)
2. Subtract the mean and square each number. We'll do this for the first number.
   1. 16 – 25 = -9
      -9 x -9 = 81
3. Find the mean of the results
   1. (81+4+0+49+16+36+36+49+36+9+16+1+4+64+100+49+25+9+1 +25+36+36+64+0+0+8+64+81+121+25)/30 = 37.26667
   2. 37.26667 is called the variance

208

Standard Deviation – Population Data

- Let's review those days together:

Data set	HAIs	$(x_i - \bar{x})^2$	Data set	HAIs	$(x_i - \bar{x})^2$
1	16	81	16	32	49
2	27	4	17	20	25
3	25	0	18	22	9
4	32	49	19	24	1
5	21	16	20	20	25
6	31	36	21	19	36
7	19	36	22	19	36
8	18	49	23	17	64
9	19	36	24	25	0
10	22	9	25	25	0
11	21	16	26	34	8
12	24	1	27	33	64
13	27	4	28	34	81
14	33	64	29	36	121
15	35	100	30	20	25

To calculate standard deviation, do the following: $\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2}$

1. Calculate the Mean
   1. (16+27+25+32+21+19+18+19+22+21+24+27+33+35+32+20+22 +24+2+19+19+17+25+25+34+33+34+36+20)/30 days = 25 (mean)
2. Subtract the mean and square each number. We'll do this for the first number.
   1. 16 – 25 = -9
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3. Find the mean of the results
   1. (81+4+0+49+16+36+36+49+36+9+16+1+4+64+100+49+25+9+1 +25+36+36+64+0+0+8+64+81+121+25)/30 = 37.26667
   2. 37.26667 is called the variance
4. Square Root the variance to get the standard deviation
   1. Sqrt(37.26667) = 6.104643

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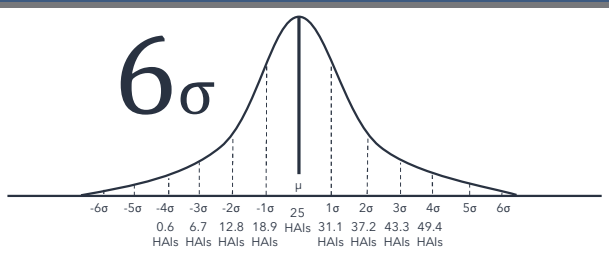
Standard Deviation – Population Data



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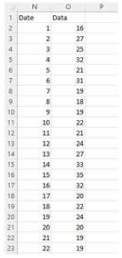
Standard Deviation – Population Data in Excel

Because Six Sigma agents deal in large data sets, it is crucial agents use software for statistical analysis, like Excel or Minitabs.

To calculate the Standard Deviation in Excel 2010 or newer versions…

1. Enter data in Excel as such



2. At bottom of data, type equation "=STDEVPA(

$$\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2}$$

3. Then click and drag the entire data set until you have all variables highlighted. In this example, the data is found in cells O2 through O31, expressed as O2:O31 in the parenthesis of the equation and hit enter

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Standard Deviation – Sample Data

To calculate standard deviation using sample data, use the following equation:

$$S = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \bar{x})^2}$$

$S = standard\ deviation\ of\ a\ sample$
$x - bar\ or\ \bar{x} = mean\ of\ the\ sample$
$\Sigma = add\ up\ the\ results\ of\ all\ calculations\ for\ items\ listen\ in\ the\ parentheses$
$N = number\ of\ data\ elements\ for\ which\ you\ calculated\ standard\ deviation$
$x = a\ place\ holder\ for\ each\ data\ element$

In healthcare, it is common for EHR systems to capture limited data, as they are only as good as they were built. For this reason, health systems invest millions every few years upgrading their EHR systems to the latest and greatest versions and features. Let's use the same data set as before, but assume that the data was captured via manual reporting, or sampling, of certain units in the hospital.

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Standard Deviation – Sample Data

- Let's review those days together:

Date set	HAIs	$(x_i - \bar{x})^2$	Date set	HAIs	$(x_i - \bar{x})^2$
1	16	81	16	32	49
2	27	4	17	20	25
3	25	0	18	22	9
4	32	49	19	24	1
5	21	16	20	20	25
6	31	36	21	19	36
7	19	36	22	19	36
8	18	49	23	17	64
9	19	36	24	25	0
10	22	9	25	25	0
11	21	16	26	34	8
12	24	1	27	33	64
13	27	4	28	34	81
14	33	64	29	36	121
15	35	100	30	20	25

To calculate standard deviation, do the following: $S = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \bar{x})^2}$

1. Calculate the Mean
   1. (16+27+25+32+21+19+18+19+22+21+24+27+33+35+32+20+22+24+2+19+19+17+25+25+34+33+34+36+20)/30 days = 25 (mean)
2. Subtract the mean and square each number. We'll do this for the first number.
   1. 16 – 25 = -9
      -9 x -9 = 81
3. Find the mean of the results
   1. (81+4+0+49+16+36+36+49+36+9+16+1+4+64+100+49+25+9+1+25+36+36+64+0+0+8+64+81+121+25)/(30 – 1) = 38.55172
   2. 38.55172 is called the variance
4. Square Root the variance to get the standard deviation
   1. Sqrt(38.55172) = 6.209003

Only part that differs when calculating

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Standard Deviation – Sample Data in Excel

Using a different equation in Excel allows us to easily calculate the standard deviation with sample data.

To calculate the Standard Deviation in Excel 2010 or newer versions…

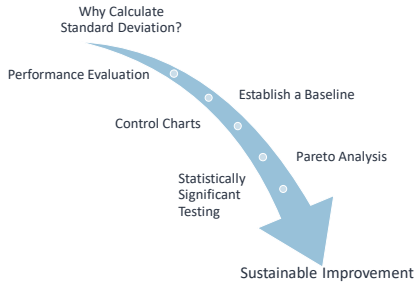
$$S = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \bar{x})^2}$$

1. Enter data in Excel as such

2. At bottom of data, type equation =STDEV(
3. Then click and drag the entire data set until you have all variables highlighted. In this example, the data is found in cells O2 through O31, expressed as O2:O31 in the parenthesis of the equation and hit enter

214

Pareto Analysis

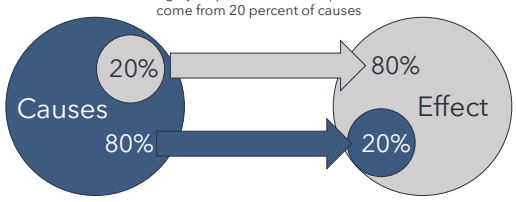


215

Pareto Analysis

Pareto Principle

Roughly 80 percent of consequences come from 20 percent of causes



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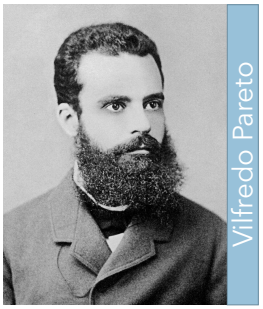
Pareto Analysis

Step 1 Brainstorming
- Review variables that are potential causes to issue.

Step 2 Compile Data
- Find data behind variables. How often do issues occur in variables.

Step 3 Graph Data
- Graph the number of incidents by incident type and the percent each incident totals within the variable data set.



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Pareto Analysis

Step 1 Brainstorming
- Review variables that are potential causes to issue.

Step 2 Compile Data
- Find data behind variables. How often do issues occur in variables.

Step 3 Graph Data
- Graph the number of incidents by incident type and the percent each incident totals within the variable data set.

Reasons for HAI results	# of **Incidents**
CLABSI	
CAUTI	
SSI	
VAP	
Hospital-onset (HO) MRSA	

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Pareto Analysis

Step 1 Brainstorming
- Review variables that are potential causes to issue.

Step 2 Compile Data
- Find data behind variables. How often do issues occur in variables.

Step 3 Graph Data
- Graph the number of incidents by incident type and the percent each incident totals within the variable data set.

Reasons for HAI results	# of **Incidents (DPMO)**
CLABSI	24,998
CAUTI	19,768
SSI	212,351
VAP	5,312
Hospital-onset (HO) MRSA	10

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Pareto Analysis

Step 1 Brainstorming

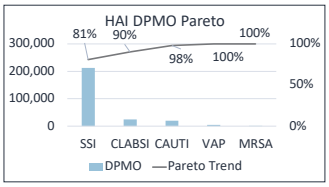
- Review variables that are potential causes to issue.

Step 2 Compile Data

- Find data behind variables. How often do issues occur in variables.

Step 3 Graph Data

- Graph the number of incidents by incident type and the percent each incident totals within the variable data set.



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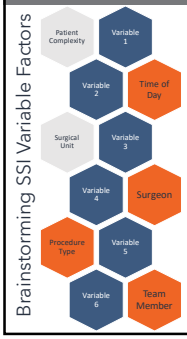
Pareto Analysis



What's Next?

Reasons for HAI results	Pareto Principle Met?
Procedure Type	Yes – 84/16
Surgeon	Yes – 92/8
~~Surgical Unit~~	No – 60/40
Time of Day	Yes – 78/22
Team Member	Yes – 82/18
~~Patient Complexity Index~~	No – 51/49

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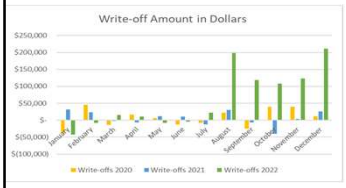
Pareto Analysis in Excel

Pareto Analysis Using Excel

Issue: Health System of America's accounts receivable is off from budget. Finance Director asks for assistance to understand what is going on.

Analysis: You ask for the general ledger and accounts receivable/accounts payable entries. You notice the number of write-offs dollars to be concerning and further investigate using the Pareto Principle.



Write-off Variable Factors	# of Claims
Late Submission	32,625
Duplicate Submission	10,356
No Beneficiary Found	8,025
Missing Required Info	1,526
Coverage Issue – not covered	1,522
Not Medically Necessary	1,321
Service Date Error	1,225

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Pareto Analysis in Excel

How to Create a Pareto Chart in Excel

First, enter data in Excel; calculate cumulative claim count and percent by variable. Remember to sort largest to smallest.

Reasons for Denials	# of Claims	Cumulative	Percent
Late Submissions	32,625	32,625	58%
duplicate Submission	10,356	42,981	76%
No Beneficiary found	8,025	51,006	90%
Missing Required Info	1,526	52,532	93%
coverage Issue - Not Covered	1,522	54,054	96%
not medically Necessary	1,321	55,375	98%
Service Date Error	1,225	56,600	100%

Next highlight the three columns labelled Reasons for Denials, Cumulative and Percent

Reasons for Denials	# of Claims	Cumulative	Percent
Late Submissions	32,625	32,625	58%
duplicate Submission	10,356	42,981	76%
No Beneficiary found	8,025	51,006	90%
Missing Required Info	1,526	52,532	93%
coverage Issue - Not Covered	1,522	54,054	96%
not medically Necessary	1,321	55,375	98%
Service Date Error	1,225	56,600	100%

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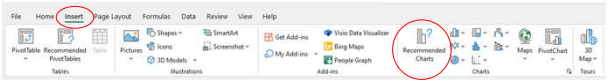
Pareto Analysis in Excel

How to Create a Pareto Chart in Excel

Third, click on the insert ribbon and select Recommended Charts



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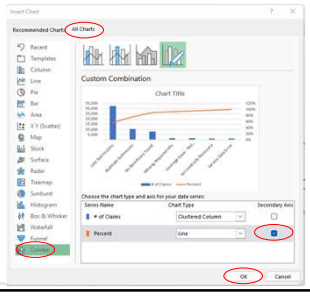
Pareto Analysis in Excel

How to Create a Pareto Chart in Excel

Last, click on the "All Charts" tab, then click "Combo", check Secondary Axis for Percent, and click OK



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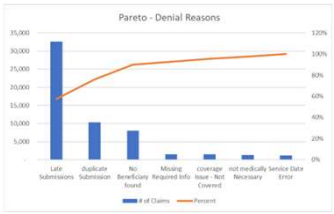
Pareto Analysis in Excel

Don't forget to label the graph appropriately!



What happens if the Pareto Principle is not met?

- Variable factors are not direct cause to problem
- Brainstorm new variable factors
- Acquire appropriate data behind variable factors
- If at first (or second or third) you don't succeed, try, try again.

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Intro to Six Sigma Metrics

Six Sigma Metrics

Metric	Used For	Benefits	Equation
Defects Per Unit (DPU)			
Defects Per Million Opportunities (DPMO)			
First Time Yield (FTY)			
Rolled Throughput Yield (RTY)			

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Intro to Six Sigma Metrics

Six Sigma Metrics

Metric	Used For	Benefits	Equation
Defects Per Unit (DPU)	Measuring number of defects in relationship to the number of units	Shows how many defects expected per service/product	# of defects found / number of units in the sample
Defects Per Million Opportunities (DPMO)			
First Time Yield (FTY)			
Rolled Throughput Yield (RTY)			

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Six Sigma Metrics

Metric	Used For	Benefits	Equation
Defects Per Unit (DPU)	Measuring number of defects in relationship to the number of units	Shows how many defects expected per service/product	# of defects found / number of units in the sample
Defects Per Million Opportunities (DPMO)	Measuring low volume defects	Apples-to-apples comparison Quantifies long term damages to sustaining waste	(# of defects in sample / opportunities for defect in sample) * 1,000,000
First Time Yield (FTY)			
Rolled Throughput Yield (RTY)			

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Six Sigma Metrics

Metric	Used For	Benefits	Equation
Defects Per Unit (DPU)	Measuring number of defects in relationship to the number of units	Shows how many defects expected per service/product	# of defects found / number of units in the sample
Defects Per Million Opportunities (DPMO)	Measuring low volume defects	Apples-to-apples comparison Quantifies long term damages to sustaining waste	(# of defects in sample / opportunities for defect in sample) * 1,000,000
First Time Yield (FTY)	Measuring ratio of units produced to units attempted to produce	Measures how effective processes are at first time output performance	# of good units produced / # of units entering process
Rolled Throughput Yield (RTY)			

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Six Sigma Metrics

Metric	Used For	Benefits	Equation
Defects Per Unit (DPU)	Measuring number of defects in relationship to the number of units	Shows how many defects expected per service/product	# of defects found / number of units in the sample
Defects Per Million Opportunities (DPMO)	Measuring low volume defects	Apples-to-apples comparison Quantifies long term damages to sustaining waste	(# of defects in sample / opportunities for defect in sample) * 1,000,000
First Time Yield (FTY)	Measuring ratio of units produced to units attempted to produce	Measures how effective processes are at first time output performance	# of good units produced / # of units entering process
Rolled Throughput Yield (RTY)	Measures probability of unit having no defects from process	Measures how effective processes are in overall output performance	$(FTY_1) * (FTY_2) * (FTY_3)...(FTY_N)$

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Intro to Six Sigma Metrics

Variables	Count	Notes
SSIs	98	# of Surgical Site Infections
# of Complications	3,215	# of estimated avoidable complications during procedures
# of Complication Types	35	Average # of potential complications per procedure
Pt Days - Inpatient	190,385	# of Inpatient Days
Pt Days - Outpatient	52,623	# of Outpatient Visits
# of Discharges	42,622	# of Inpatient Discharges
# of Procedures	4,954	# of Surgical Procedures Performed
1st Corrected Procedures	45	Of 98 SSIs, 45 required additional procedure; 15 infections remained; 10 signed up for additional procedure
2nd Corrected Procedures	10	Of the 10 infections; 3 infections remained; 0 signed up for additional procedure

Six Sigma Metric Application

Calculate DPU, DPMO, FTY, RTY

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Intro to Six Sigma Metrics

Variables	Count	Notes
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Six Sigma Metric Application

DPU = defects/units in sample

0.67 = [(98+3,215)/4,954]

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Intro to Six Sigma Metrics

Variables	Count	Notes
SSIs	98	# of Surgical Site Infections
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1st Corrected Procedures	45	Of 98 SSIs, 45 required additional procedure; 15 infections remained; 10 signed up for additional procedure
2nd Corrected Procedures	10	Of the 10 infections; 3 infections remained; 0 signed up for additional procedure

Six Sigma Metric Application

DPMO = (defects/opportunities) * 1,000,000

~19,107 = [(98+3,215)/(4,954 * 35)] * 1,000,000

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Intro to Six Sigma Metrics

Variables	Count	Notes
SSIs	98	# of Surgical Site Infections
# of Complications	3,215	# of estimated avoidable complications during procedures
# of Complication Types	35	Average # of potential complications per procedure
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1st Corrected Procedures	45	Of 98 SSIs, 45 required additional procedure; 15 infections remained; 10 signed up for additional procedure
2nd Corrected Procedures	10	Of the 10 infections; 3 infections remained; 0 signed up for additional procedure

Six Sigma Metric Application

FTY = Good Units Produced/Units Processed

0.9802 = (4,954 – 98) / 4,954

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Intro to Six Sigma Metrics

Variables	Count	Notes
SSIs	98	# of Surgical Site Infections
# of Complications	3,215	# of estimated avoidable complications during procedures
# of Complication Types	35	Average # of potential complications per procedure
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1st Corrected Procedures	45	45 required additional procedure; 15 infections remained; 10 needed additional procedure
2nd Corrected Procedures	10	10 required additional procedure; 3 infections remained; 0 needed additional procedure

Six Sigma Metric Application

$RTY = (FTY_1) * (FTY_2) * (FTY_3)...(FTY_N)$

0.4574 = (0.9802) * [(45-15)/45] * [(10-3)/10]

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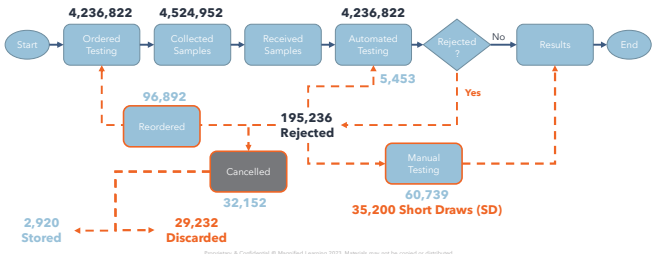
Six Sigma Metric Application

Six Sigma Metric Application

Calculate DPU, DPMO, FTY, RTY



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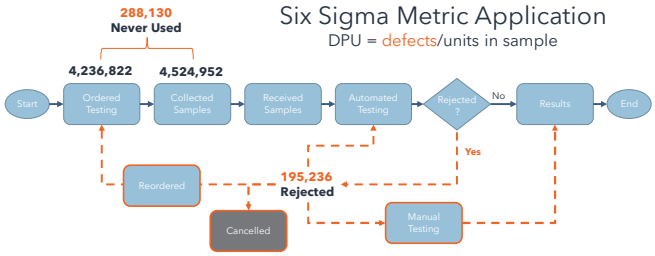
Calculating DPU



Six Sigma Metric Application

DPU = defects/units in sample

(288,130+195,236)/4,524,952= **0.1068 DPU**

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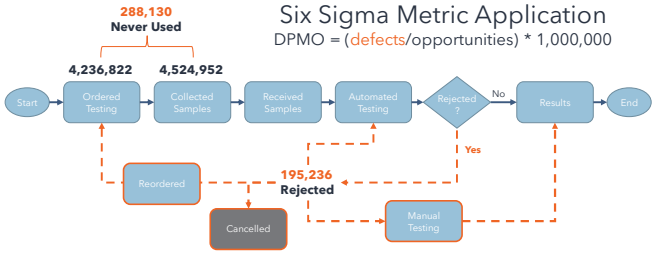
Calculating DPMO



Six Sigma Metric Application

DPMO = (defects/opportunities) * 1,000,000

(483,366/4,524,952) * 1,000,000 = 106,822.349 **106,823 DPMO**

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Calculating DPMO

Six Sigma Metric Application

What's the Sigma Level?

Sigma Levels	DPMO	Percentage Yield
6σ	3.44	99.99966%
5σ	233	99.977%
4σ	6,210	99.38%
3σ	66,807	93.3%
2σ	308,537	69%
1σ	691,462	31%

(1,000,000 - 106,823)/1,000,000 = **89.32%**

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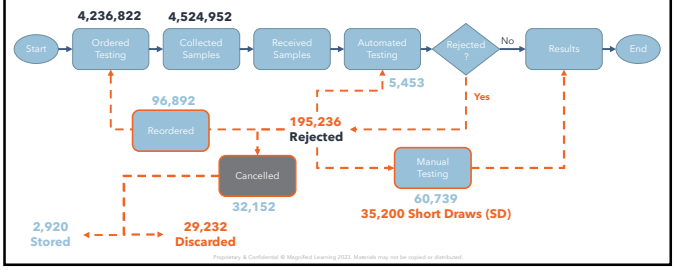
Calculating First Time Yield

Six Sigma Metric Application

FTY = Good Units Produced/Units Processed



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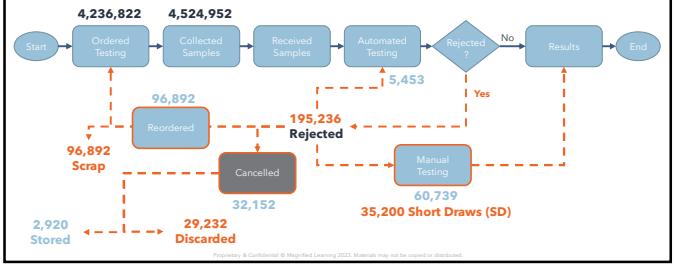
Calculating First Time Yield

Scrap: 96,892
Rework: 35,200 + 5,453 = 40,653
Goods Entering Process: 4,236,822 – 2,920 = 4,233,902
4,233,902 - 96,892 – 40,693 = **4,096,317 Good Units Produced**



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Calculating First Time Yield

4,096,317 Good Units Produced / **4,233,902 Units Processed** = **0.9675 or 96.75% FTY**

Sigma Levels	DPMO	Percentage Yield
6σ	3.44	99.99966%
5σ	233	99.977%
4σ	6,210	99.38%
3σ	66,807	93.3%
2σ	308,537	69%
1σ	691,462	31%

96.75% FTY

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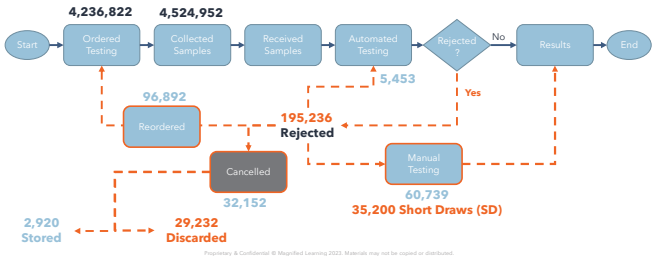
Calculating Rolled Throughput Yield

Six Sigma Metric Application

$RTY = (FTY_1) * (FTY_2) * (FTY_3)...(FTY_N)$



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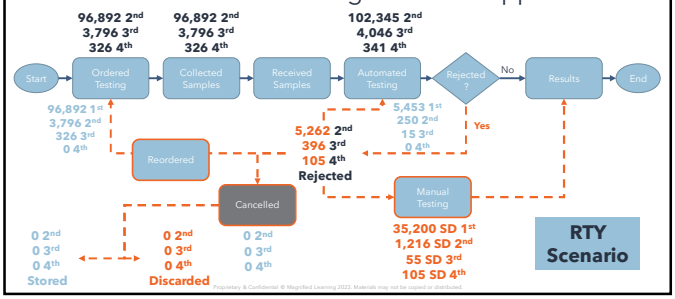
Calculating Rolled Throughput Yield

Six Sigma Metric Application



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Calculating Rolled Throughput Yield

Six Sigma Metric Application

$RTY = (FTY_1) * (FTY_2) * (FTY_3)...(FTY_N)$

$(FTY_1) = (4,096,317 / 4,233,902) = \underline{96.75\%}$
$(FTY_2) = (132,283 / 137,545) = \underline{96.17\%}$
$(FTY_3) = (4,866 / 5,262) = \underline{92.47\%}$
$(FTY_4) = (291 / 396) = \underline{73.48\%}$
$(FTY_5) = (105 / 105) = \underline{100.00\%}$

RTY Calculations

96.75% (FTY_1) * 96.17% (FTY_2) * 92.47% (FTY_3) * 73.48% (FTY_4) * 100% (FTY_5) = **63.22%**

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Calculating Rolled Throughput Yield

RTY Calculations

96.75% (FTY_1) * 96.17% (FTY_2) * 92.47% (FTY_3) * 73.48% (FTY_4) * 100% (FTY_5) = **63.22%**

Sigma Levels	DPMO	Percentage Yield
6σ	3.44	99.99966%
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1σ	691,462	31%

63.22% RTY

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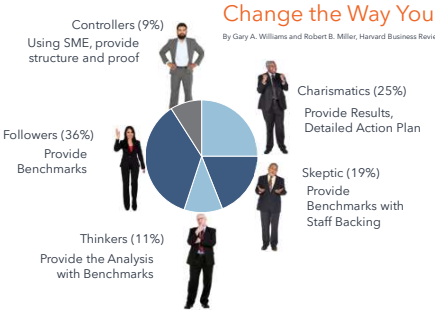
Communicating Six Sigma Outcomes

Change the Way You Persuade

By Gary A. Williams and Robert B. Miller, Harvard Business Review



How do we share the below?
DPU = 0.1068
DPMO = 106,823
FTY = 96.75%
RTY = 63.22%

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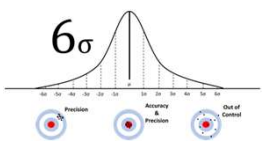
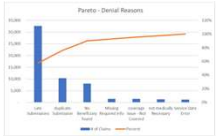
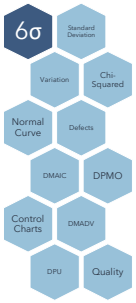
Value Transformation Conclusion





Metric	Result
DPMO	106k
DPU	0.10
FTY	93%
RTY	88%



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Approaching the Problem Objectives

Purpose:

To introduce the learner to approaching problem solving through the CVT Transformation Methodology.

Objectives:

- Introduce learner to CVT Transformation Methodology and VOC
- Set Up Problem Solving Using the y=f(x) Lean Six Sigma Problem-Solving Formula
- Define the process for setting up problem-solving within an organization

Outcomes:

By the end of this lesson, the learner will be able to:

- Successfully complete the unit quiz as evidenced by a minimum score of 80%.

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Intro to Voice of the Customer

Requirements

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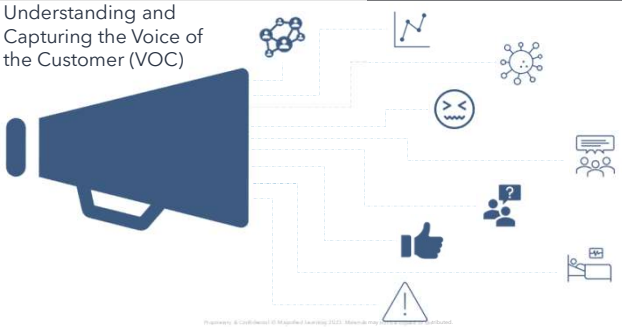
Intro to Voice of the Customer

Understanding and Capturing the Voice of the Customer (VOC)



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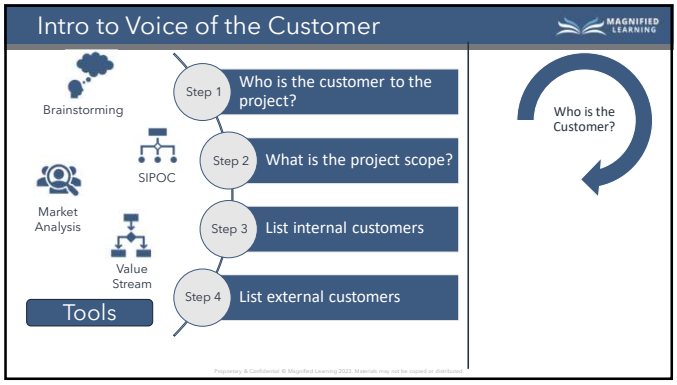

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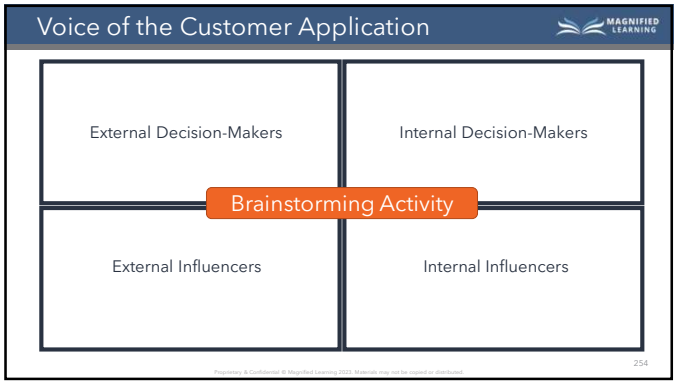

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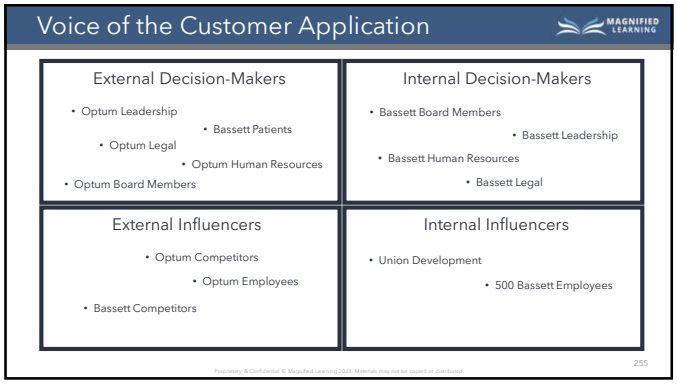

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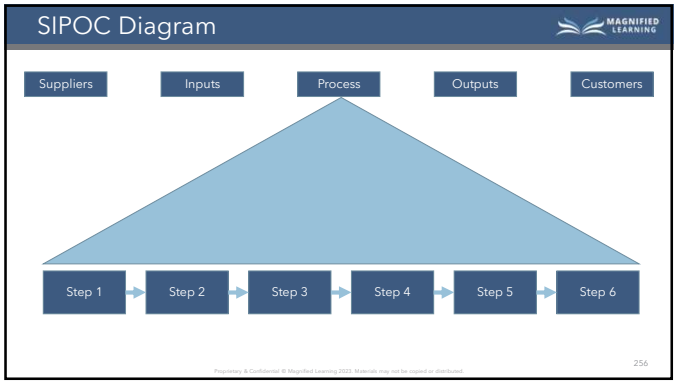

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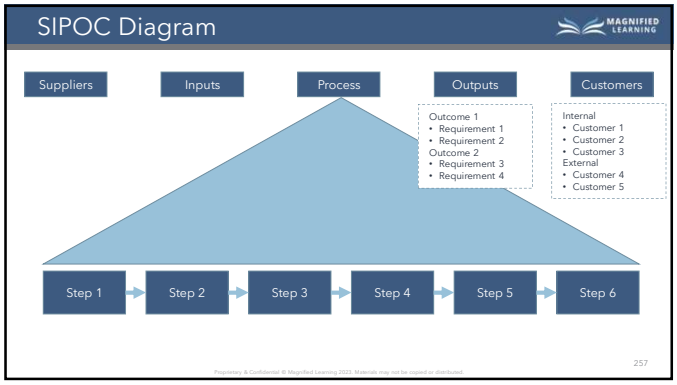

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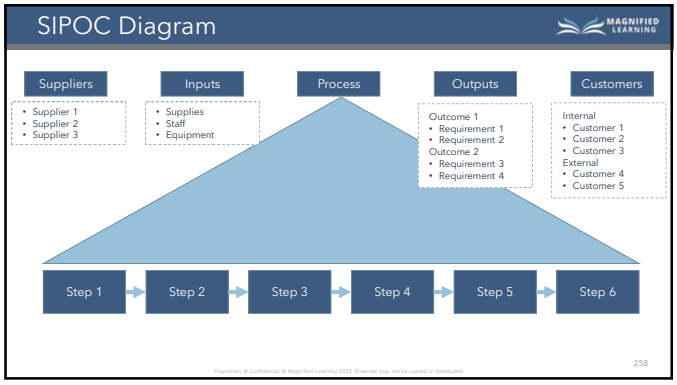

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SIPOC Diagram Application

Urgent Care SIPOC Exercise

Problem Statement:
In 2022, Urgent Care Plus experienced an 18% increase in overall visit turnaround times. As a result, patient sat scores have dropped 12% due to timeliness of care and feeling rushed through the process. If the decline continues, Urgent Care Plus is expected to lose 10% patient volume and $3.5M in patient revenues.

Project Scope:
Improve Service Levels
- TAT
- Customer Experience
- Throughput

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SIPOC Diagram Application

Suppliers	Inputs	Process	Outputs	Customers
• EMR Vendor • Supplies and Equipment Vendor • Corporate Real Estate • Cable/Internet Vendor • Human Resources – Staffing Recruiters	• EMR • Medical Supplies • Staff • Facility • Equipment • Office Supplies • Misc. Entertainment		Reimbursement • Payments – Copays Upfront • Payments – Payor 60 days AR Healing • Prescriptions • Bandages/Supplies • X-rays/Imaging • Lab Work Experience • Timely Care • Friendly Staff	• Patients • Patient Guardians • Payors • Primary Care Providers • Administration • Board Members

Patient Check-In → Verify Payment → Vitals/Med History → Provider Visit → Diagnosis → Check-Out

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Obtaining the VOC

Obtaining the VOC from the Customer(s)

- Internal vs External
- Age
- Location
- Industry
- Wealth

Categorize

Interact
- Social Media
- Phone Call
- Personal Interviews

- Statistically Valid
- Approach Audit
- Sample Size
- Benchmarking

Validate

Who is the Customer?

Collect Customer Data

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Obtaining the VOC

Obtaining the VOC from the Customer(s)

1. For Surveys – Use Likert Scaling
2. Limit Open-ended Questions to 1 per Topic
3. Be Concise and Respectful of Customer's Time
4. Consider Beta Testing, Feedback Forms, and Complaints as Source of Truth

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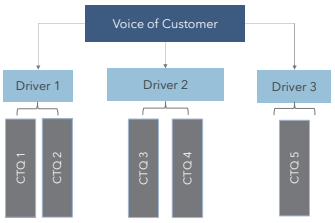
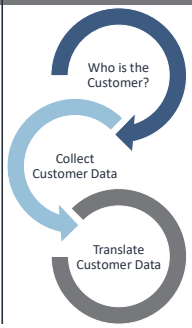
CTQ Tree

Critical to Quality (CTQ) Tree





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CTQ Tree

Customer Feedback		CTC Summary	CTC Driver
"I felt rushed and still have questions"	→	Quality Time	
"No one acknowledged me"	→	Friendliness	

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CTQ Tree

Customer Feedback	CTC Summary	CTC Driver
"I felt rushed and still have questions"	Quality Time	Duration
		Scripting
"No one acknowledged me"	Friendliness	Waiting Queue

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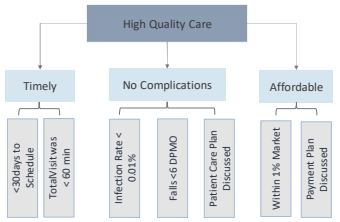
CTQ Tree

A CTQ Tree converts customer needs into quality metrics.

Creating a CTQ tree:

1. Identify **CTCs**. Tip: You can also use the outputs of your SIPOC diagram.
2. Identify all **Drivers** of quality.
3. List requirements for each Driver (**CTQs**)



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CTQ Tree

Business Quality Issues

CTC and CTQ misalignment stem from 2 situations:

1) Process does not meet original CTC and there are now a lot of customer complaints.
2) Expectations have changed- it was working well, but now it's not- and we need to either change CTQ measurements or processes to meet existing CTQs.

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Intro to Approaching the Problem

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Intro to Approaching the Problem

Situation

- Healthcare Corp for Life needs issues resolved around poor service. Need specialist to lead teams through change.

Background

- Hired as Quality Improvement Specialist for Healthcare Corp for Life (HCL)
- Complaints about ED throughput

Analyze

- What questions do we ask?
- Do we need data?
- Where do we start?

Recommendation

- What's the problem we are trying to solve that would reduce ED wait times?

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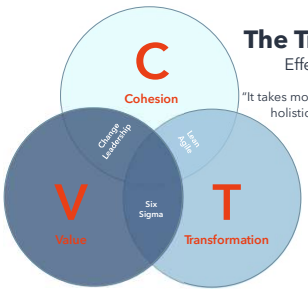
The Transformation Methodology



The Transformation Methodology

Effective Change = Empowerment + Value

"It takes more than a good idea to be effective. The right solutions build holistic results while the wrong solutions build limited results."

Jared Stanger, President Magnified Learning

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The Transformation Methodology

The Problem-Solving Formula

$$y = f(x)$$

y = the problem or outcome
f = the function(s) of x
x = the cause(s) or input(s) to the function

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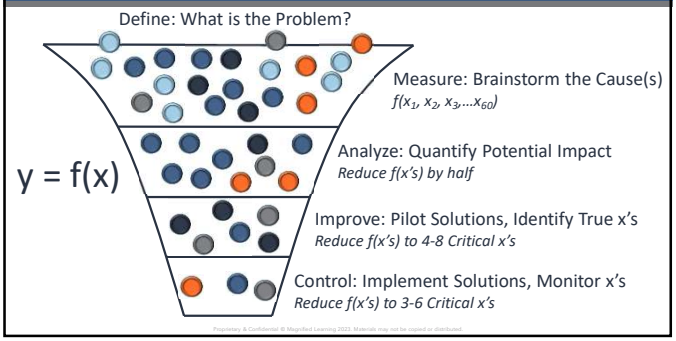
The Transformation Methodology



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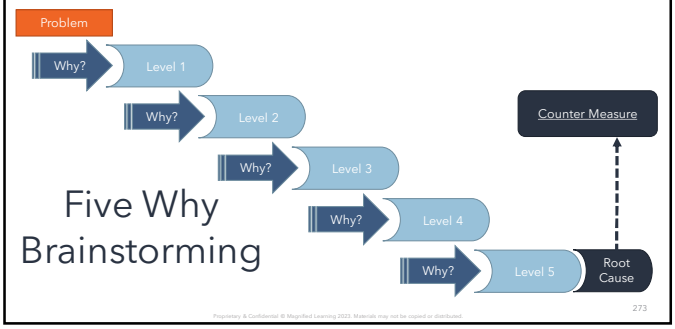
5 Why Brainstorming



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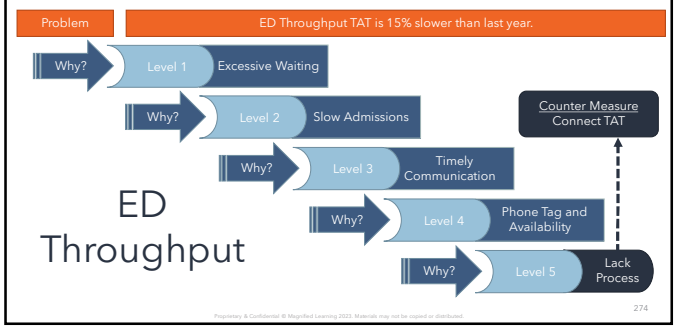
5 Why Brainstorming



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5 Why Brainstorming

5 Why Execution

First	Provide Visual for capturing thoughts and writing down questions	Whiteboard	
		Conference Screen	
		Easel Pad	
Second	Come prepared with data	Context	What's the background
		Assigning Value to Problem	What's the cost?
		Quantifying Problem	How often does it happen?
Third	Document Thoughts	Bring Supplies for Notes	Sticky Notes Sharpies
		Provide Chatroom for Virtual Setting	Video Conferencing Message Board
Fourth	Prepare and write a problem statement	Start generic but be directional	*ED waiting is too long* *Lab Results take too long*

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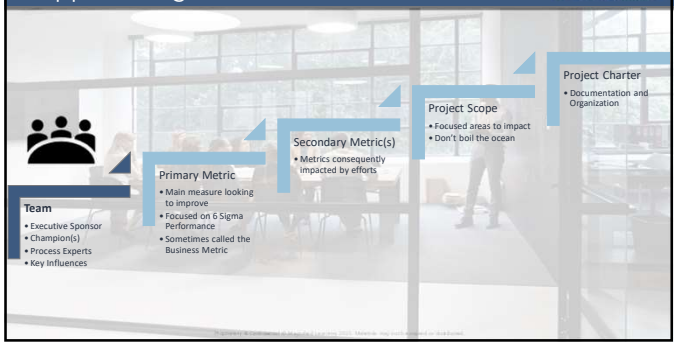
Approaching the Problem



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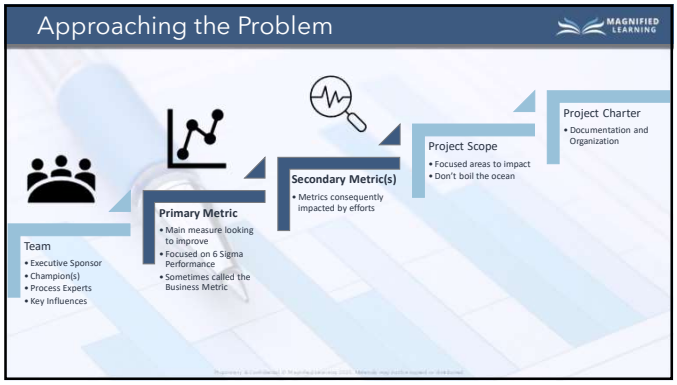

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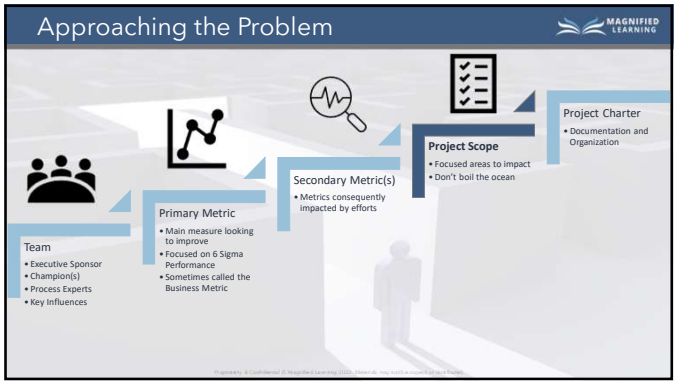

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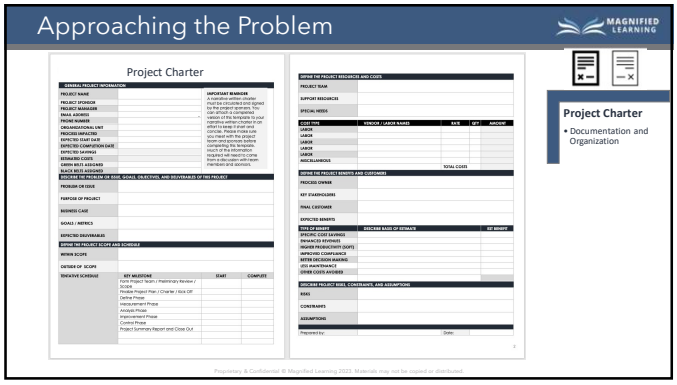

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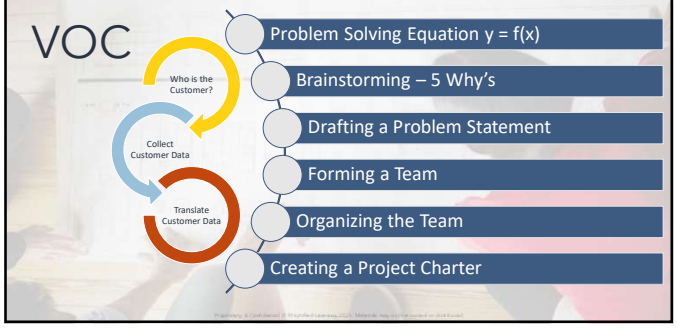
Approaching the Problem Conclusion



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Cohesive Value

Purpose:

To introduce the learner to intermediate process mapping techniques, tools, and calculations used for process improvement.

Objectives:

- Introduce learner to process mapping philosophies
- Provide an understanding of intermediate process mapping tools
- Learn process performance calculations in process improvement

Outcomes:

By the end of this lesson, the learner will be able to:

- Successfully complete the unit quiz as evidenced by a minimum score of 80%.

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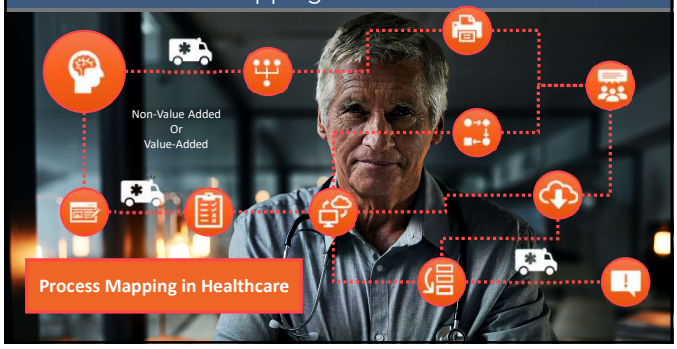
Intro to Process Mapping



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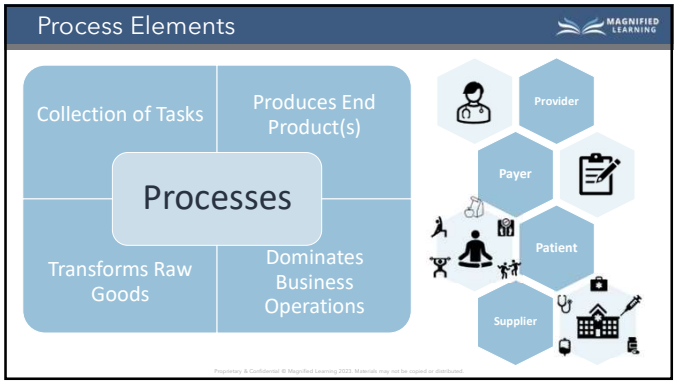

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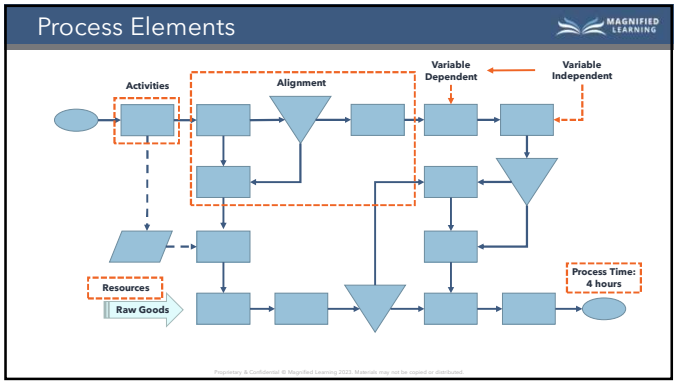

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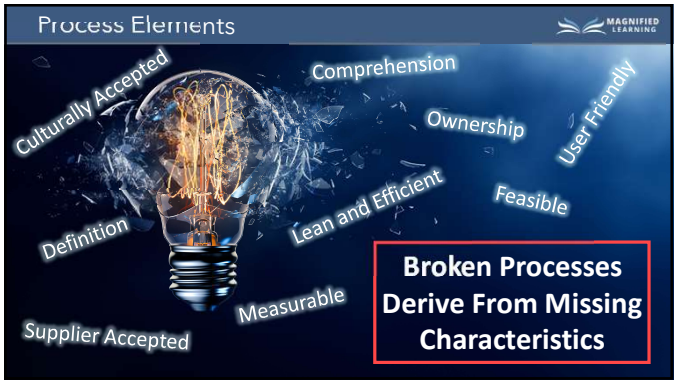

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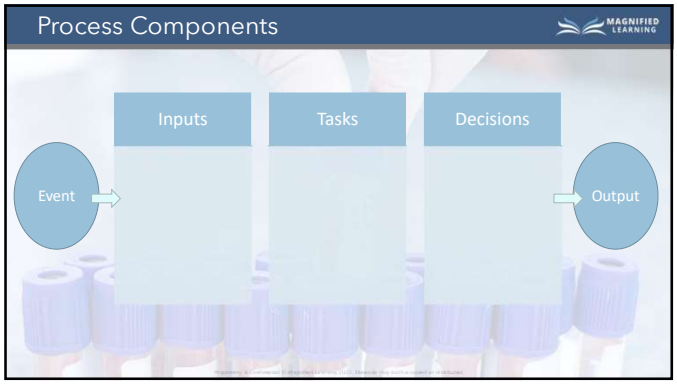

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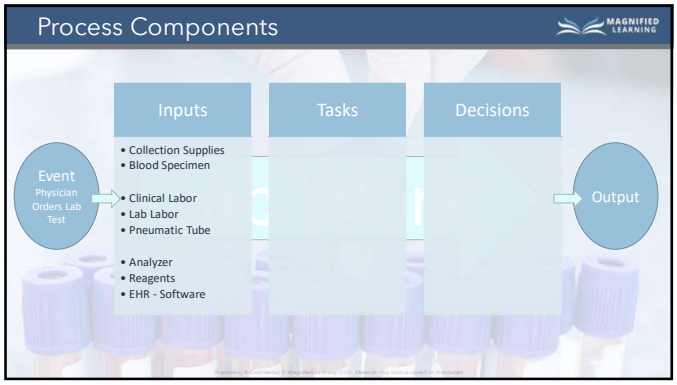

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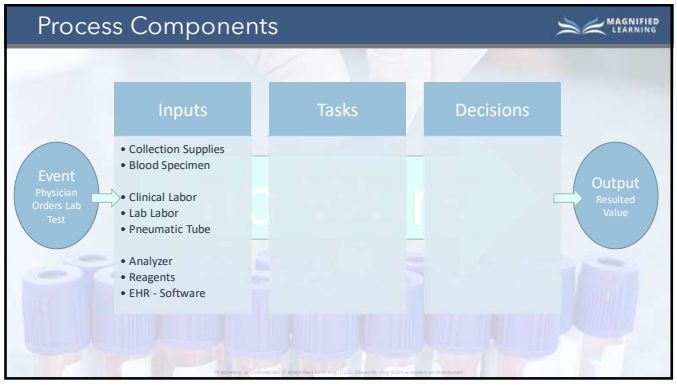

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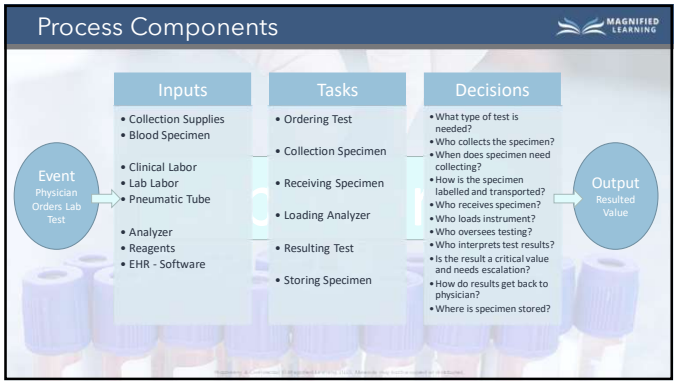

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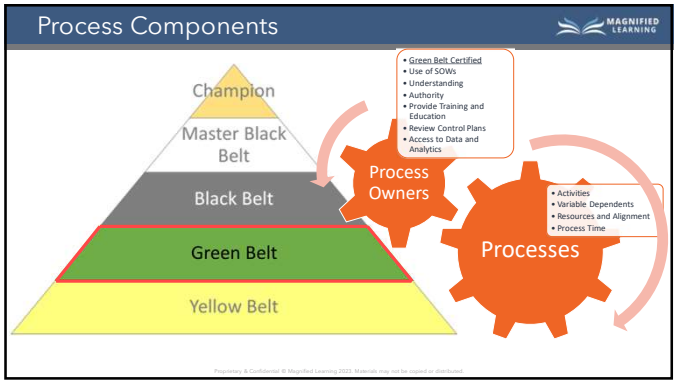

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Process Maps for Front-Lines

Which Should I use?

Process Map Type	Definition	Best Used For...
Basic Flow Chart	The simplest of diagrams to map macro steps	Planning new projects, documenting company processes, solving issues, helping teams communicate ideas
SIPOC	Represents supplies, inputs, processes, outputs and customers used for to create an overview of the company process.	Defining a complex process, identifying the elements of a process, measuring the improvements of a process
Detail Process Map	**Is specific in showing all details that a business process involves to determine what events or tasks a company needs to complete in order to achieve the end result.**	**Documenting the decisions in a process. Determining all the details included in a business process**
Cross-Functional Map	**Also known as swim lane diagrams, a cross functional map defines the connections between steps of a process and identifies the people or systems that participate in the process.**	**Identifying the key roles taking part in a process and their relation to one another. Showing how a process operates throughout the business. Determining failures, redundancies and other issues that may affect the process**
Value Stream Map	**Detailed map showing the series of events that lead to delivering a product to consumers.**	**Documenting the flow of information and materials. Identifying the focus of future projects. Trying to understand decision-making processes**

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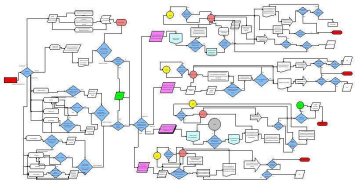
Detailed Process Maps

Detailed Process Mapping



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Detailed Process Maps

Steps for Detailed Process Mapping

- **Scope** – Identify problem or process
- **Document** – Through various means, capture the current state
- **Write-out Relations** – Identify depended activities
- **Illustrate** – Draw the flow chart using software
- **Distribute** – Share with SMEs for Validation

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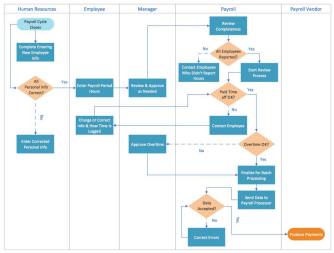
Cross-Functional Maps

Swim Lane Diagrams



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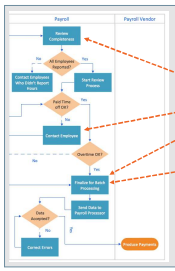
Cross-Functional Maps

Cautionary Advice

1. Avoid & Discourage Blaming
2. Note Issues, Do Not Solve At This Time
3. Finish Current State in Entirety Before Designing Future State



Parking Lot

- Training Issues
- Missing Steps
- Technology Functionality
- Defects Produced

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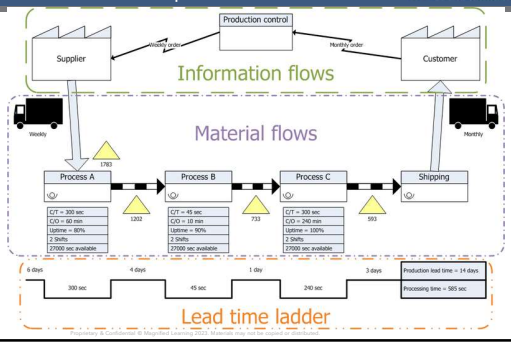
Intro to Value Stream Map

The Value Stream Map



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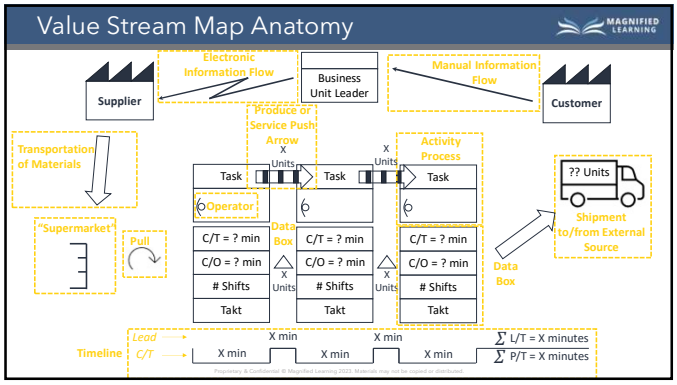

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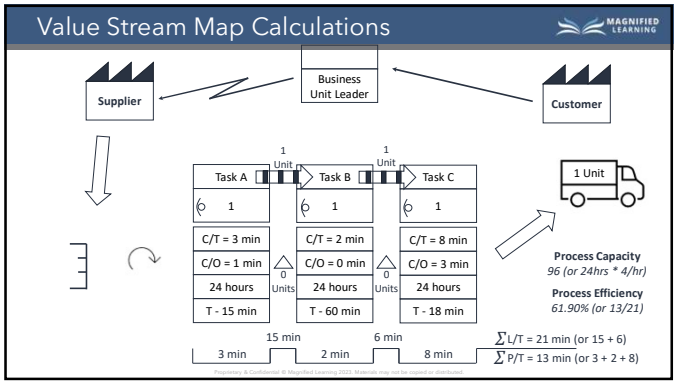

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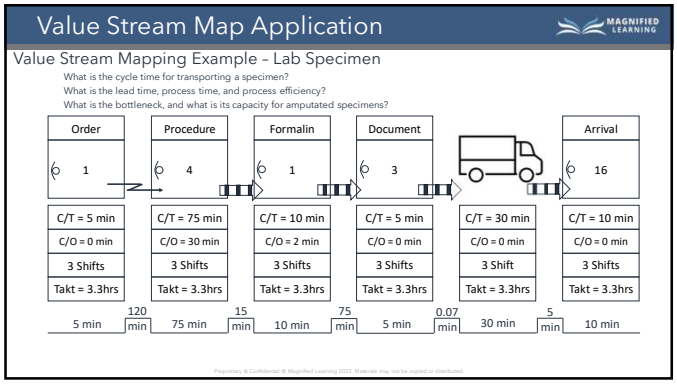

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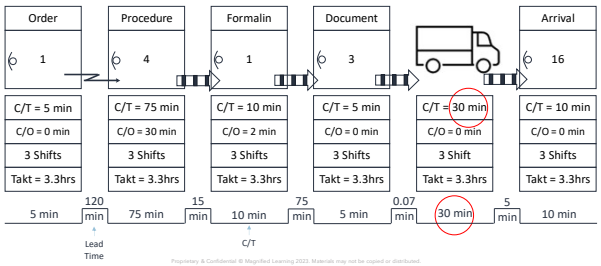
Value Stream Map – Cycle Time

What is the cycle time for transporting a specimen?



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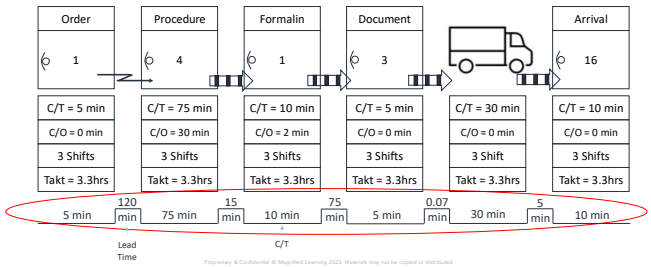
Value Stream Map – Lead, Process, & Efficiency

What is the process lead time, process time, and process efficiency?



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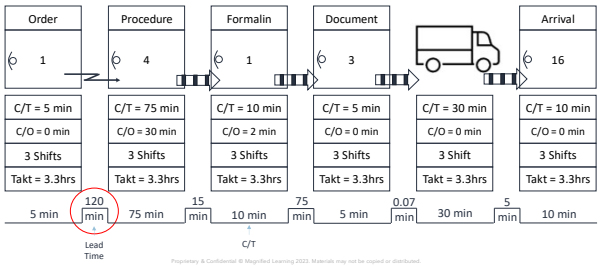
Process Mapping – Bottleneck and Capacity

What is the bottleneck, and what is its capacity for amputated specimens?



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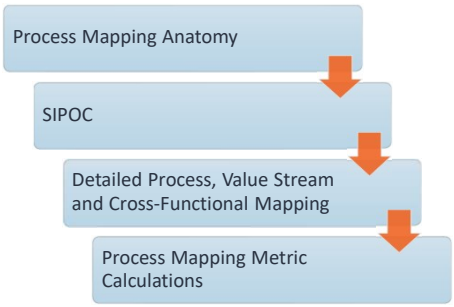
Process Mapping Conclusion



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Quality and Project Management Overview

Purpose:

To introduce the learner to the quality, project, and transformation management.

Objectives:

- Introduce Quality management & measurement
- Introduce Project management & prioritization
- Introduce Transformation and how to put it all together

At the end of this lesson, the learner will be able to:

- Successfully complete the section quiz as evidenced by a minimum score of 80%.

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QUALITY

Effective quality management and measurement helps organizations identify and quantify issues as they occur.

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Quality

Essential Characteristics Meeting Inherent Requirements Generated by Unique Interests

"I got what I wanted!" - Customer

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Critical to Quality

(CTQ)

CTC and CTQ misalignment stem from 2 situations:

1) Process does not meet original CTC and there are now a lot of customer complaints.
2) Expectations have changed- it was working well, but now it's not- and we need to either change CTQ measurements or processes to meet existing CTQs.

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CoPQ EXAMPLES

Can be divided into two separate buckets

Internal Failure Costs	External Failure Costs
• Scrapping work	• Lost Business
• Redo or Repair work	• Repairs
• Root Cause Analysis Activities	• Returns
• Reinspection or Reviews	• Rework
• Repurchasing of supplies	• Warranties
	• Poor Reputation

CoQ EXAMPLES

CoQ includes cost of poor *and* good quality:

Prevention Costs	Appraisal Costs
• Error-proofing	• Quality Control Specialist('s') Salary & Activities
• Quality Planning, Reviews, & Education	• Quality Audits
• Customer Surveys	• Measurement Equipment
• Creation of Technical Manuals	• Equipment Calibration
• Housekeeping	• Field Testing
	• Prototype Inspections,
	• Consulting Services
	• Financial Reporting & Auditing
	• Security & Safety Checks

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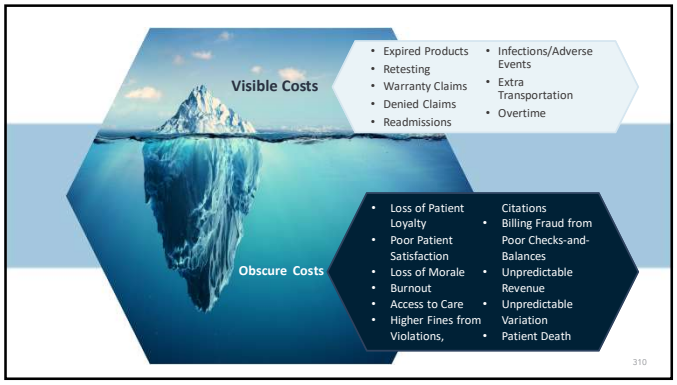

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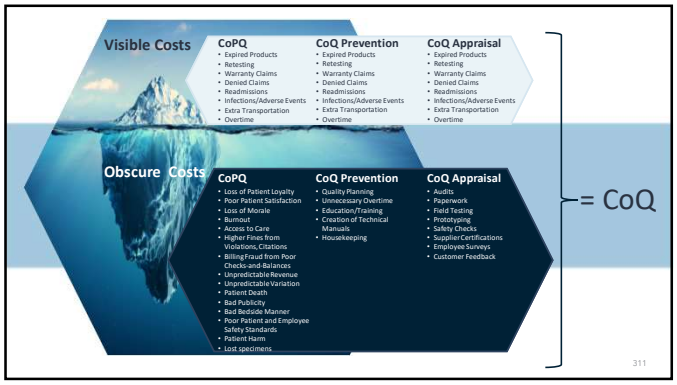

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CoQ vs CoPQ Application

MAGNIFIED LEARNING

Six Sigma Impact on the Cost of Quality

Variables	Baseline Expense	Controlled Expense	Notes
CoPQ:			
Employee OT	$ 35,864	$ 0	Elimination of OT due to decrease in defects by 35%
Wasted Reagents	$ 11,230	$ 555	Reagent reduction from 35% defect decrease
Reworked Reagents	$ 10,350	$ 530	Reagent reduction from 35% defect decrease
Wasted Supplies	$ 780	$ 120	Supplies reduction from 35% defect decrease
Reworked Supplies	$ 600	$ 116	Supplies reduction from 35% defect decrease
Employee Morale	$ 65,000	$ 0	Calculated using cost of recruiting/training by # of employees who quit as result of defects.
Prevention:			
Centrifuge at Collection Site	$ 10,000	$ 0	Eliminated centrifuge through improved processes
Added Labor	$ 86,260	$ 0	Eliminated wasted hourly paid labor from improved processes
Quality Planning and Edu.	$ 26,455	$ 500	Reduced quality planning and education from defect reduction
Appraisal:			
Consulting Fees	$ 60,000	$ 5,000	Reduced outside department consultation fees
Safety Checks	$ 85,000	$ 15,000	Reduced manual safety checks from purchasing software
Software Upgrade	$ 0	$ 10,000	Purchased software to increase visibility
CoQ Total	$ 391,539	$ 31,821	$360,000 CoQ reduction from Lean Six Sigma Initiative

312

312

CoQ vs CoPQ Application

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CoQ Total	**$ 391,539**	**$ 31,821**	$360,000 CoQ reduction from Lean Six Sigma Initiative
CoQ Expense Reduction	**$ 270,084**	**$ 16,321**	**$ 243,959 direct expense reduction post implementation**
CoQ Cost Avoidance	**$ 10,000**	**$ 0**	**$ 10,000 cost avoidance of having to repurchase equipment**

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Project Management Part 1

Problem Solving & Prioritization

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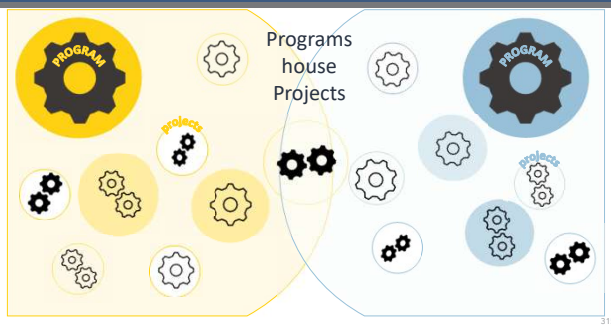
Project Management Intro



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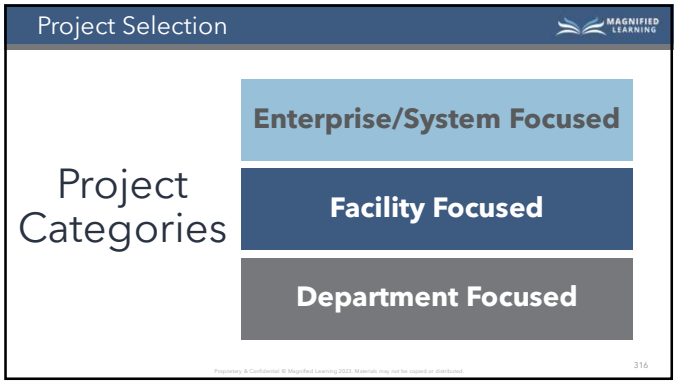

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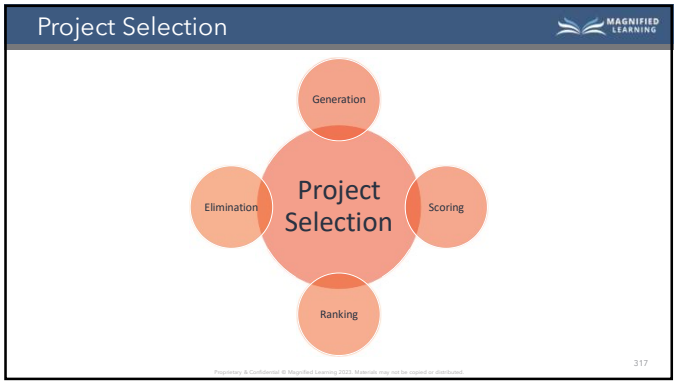

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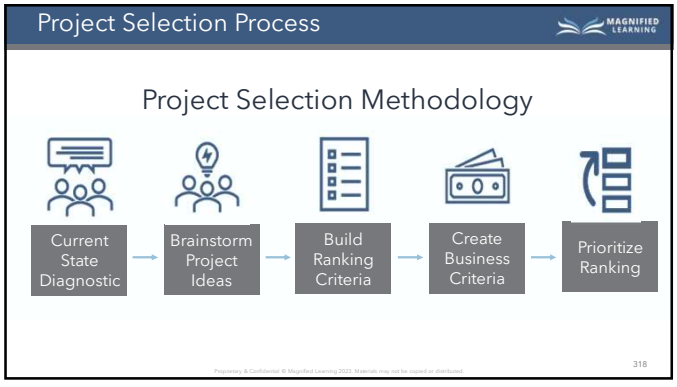

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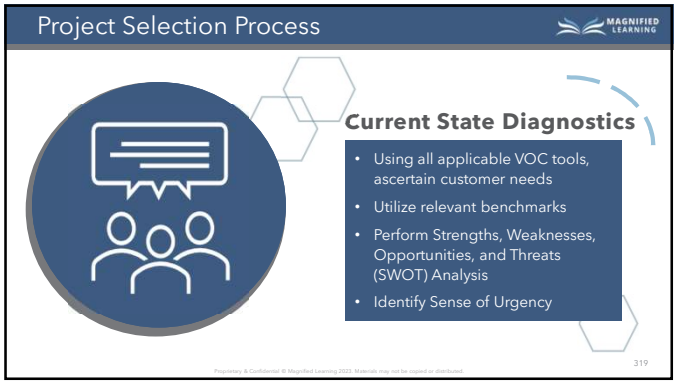

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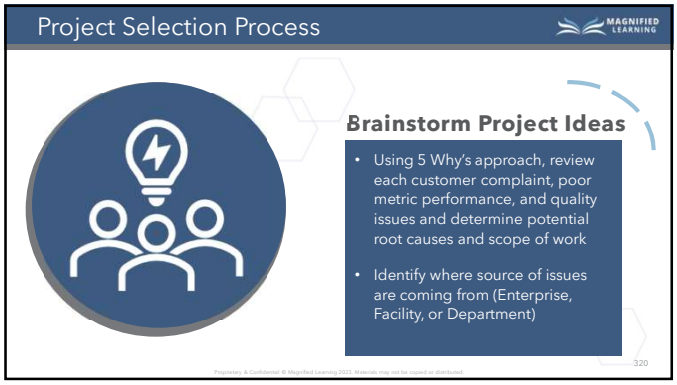

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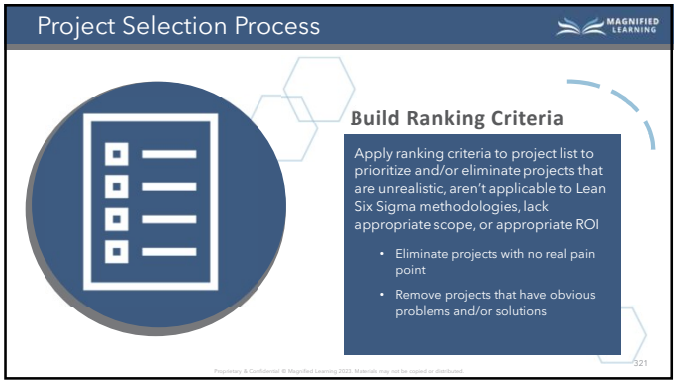

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Project Selection Process

Create Business Criteria

Apply relevant and unique business criteria to further rank project importance

- How will project impact revenue?
- What savings are expected?
- How is problem trending? Is it worsening, constant, or fluctuating?
- What are improvement costs?
- Resource requirements?
- Time commitments?
- Customer Needs?

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Project Selection Process

Project Ranking & Prioritization Grid

	Value (Ranking Criteria)						Effort (Business Criteria)			
	Growth	ROI	New Revenue	Customer Sat	Employee Sat	Total Ave Value	Expected Duration	Project Costs	Man Hours	Total Ave Effort
OR Optimization	4	7	5	4	9	5.8	9	4	5	6
Lab Optimization	6	10	4	8	3	6.2	8	2	4	4.7
Patient Throughput	3	5	5	8	2	4.6	2	2	3	2.3
Staffing Optimization	1	8	1	5	3	3.6	6	3	1	3.3

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Project Selection Process

Prioritize Ranking

- Finalize ranking categories and such as savings, project costs, market share/growth, revenue increases, employee or customer satisfaction improvements
- Consider value vs effort when ranking each project and list each ranking category under value or effort

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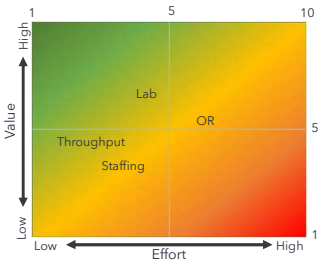
Value vs Effort Grid

Value vs Effort Grid

	Value	Effort
OR	5.8	6
Lab	6.2	4.7
Throughput	4.6	2.3
Staffing	3.6	3.3



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Project Scoring - Weighting

Weighted Project Ranking and Prioritization Grid

First
Apply a ranked percentage of importance to the variables within each criteria category. Value and Effort criteria to total 100%

	Value Criteria (Weighted Value)						Effort Criteria (Weighted Value)			
Sub Criteria / Project Category	Growth (15%)	ROI (25%)	New Revenue (20%)	Customer Sat (15%)	Employee Sat (25%)	Total Weighted Value (100%)	Expected Duration (20%)	Project Costs (40%)	Man Hours (40%)	Total Weighted Effort (100%)
OR Optimization	4	7	5	4	9		9	4	5	
Lab Optimization	6	10	4	8	3		8	2	4	
Patient Throughput	3	5	5	8	2		2	2	3	
Staffing Optimization	1	8	1	5	3		6	3	1	

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Project Scoring - Weighting

Weighted Project Ranking and Prioritization Grid

First
Apply a ranked percentage of importance to the variables within each criteria category. Value and Effort criteria to total 100%

Second
Multiply weighted percentage by the original score. Add all weighted scores together for Total Weighted Value.

	Value Criteria (Weighted Value)						Effort Criteria (Weighted Value)			
Sub Criteria / Project Category	Growth (15%)	ROI (25%)	New Revenue (20%)	Customer Sat (15%)	Employee Sat (25%)	Total Weighted Value (100%)	Expected Duration (20%)	Project Costs (40%)	Man Hours (40%)	Total Weighted Effort (100%)
OR Optimization	4*0.15	7	5	4	9		9	4	5	
Lab Optimization	6	10	4	8	3		8	2	4	
Patient Throughput	3	5	5	8	2		2	2	3	
Staffing Optimization	1	8	1	5	3		6	3	1	

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Project Scoring - Weighting

Weighted Project Ranking and Prioritization Grid

First Apply a ranked percentage of importance to the variables within each criteria category. Value and Effort criteria to total 100%

Second Multiply weighted percentage by the original score. Add all weighted scores together for Total Weighted Value.

Project Category	Value Criteria (Weighted Value)						Effort Criteria (Weighted Value)			
Sub Criteria	Growth (15%)	ROI (25%)	New Revenue (20%)	Customer Sat (15%)	Employee Sat (25%)	Total Weighted Value (100%)	Expected Duration (20%)	Project Costs (40%)	Man Hours (40%)	Total Weighted Effort (100%)
OR Optimization	0.6 +	1.75 +	1 +	0.6 +	2.25 =	6.20	9	4	5	
Lab Optimization	6	10	4	8	3		8	2	4	
Patient Throughput	3	5	5	8	2		2	2	3	
Staffing Optimization	1	8	1	5	3		6	3	1	

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Project Scoring - Weighting

Weighted Project Ranking and Prioritization Grid

First Apply a ranked percentage of importance to the variables within each criteria category. Value and Effort criteria to total 100%

Second Multiply weighted percentage by the original score. Add all weighted scores together for Total Weighted Value.

Third Evaluate Outcomes with Decision-Making Stakeholders

Project Category	Value (Weighted Value)						Effort (Weighted Value)			
Sub Criteria	Growth (15%)	ROI (25%)	New Revenue (20%)	Customer Sat (15%)	Employee Sat (25%)	Total Weighted Value (100%)	Expected Duration (20%)	Project Costs (40%)	Man Hours (40%)	Total Weighted Effort (100%)
OR Optimization	0.6	1.75	1	0.6	2.25	6.20	1.8	1.6	2	5.40
Lab Optimization	0.9	2.5	0.8	1.2	0.75	6.15	1.6	0.8	1.6	4.00
Patient Throughput	0.45	1.25	1	1.2	0.5	4.40	0.4	0.8	1.2	2.40
Staffing Optimization	0.15	2	0.2	0.75	0.75	3.85	1.2	1.2	0.4	2.80

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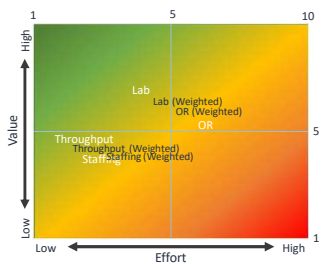
Project Scoring – Weighting Application

With our total weighted project ranking and prioritization scores, we can update the Value vs Effort grid to see the impact an Executive Sponsor can make on project selection.

	Value	Effort
OR	5.8 (6.20)	6.0 (5.40)
Lab	6.2 (6.15)	4.7 (4.00)
Throughput	4.6 (4.40)	2.3 (2.40)
Staffing	3.6 (3.85)	3.3 (2.80)



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Project Viability Modeling

The Project Viability Model is the last safety net for leaders in determining the feasibility of a project and its likelihood in being implemented successfully.

1. Sponsorship	Access to sponsor's influence and resources	9. Solution	Solution is not well known and difficult to find
2. Corporate Alignment	Goal alignment between project and business	10. Implementation is Likely	Once solution is defined, project will be implemented
3. Data	Data availability and accessibility	11. Required Investment	Project does not require a large amount of cash investment
4. Definition of Defect	Defect is specific and well-defined	12. Available Six Sigma Resources	Black and Green belts have capacity
5. Stability	Potential process stability – is not likely to be changed in near future?	13. Inputs Can Be Controlled	Process owners have control over outcome – limited external variables that effect project outcomes
6. Customer	Project's impact on customer satisfaction	14. Redesign	Process can be improved and does not require a complete redesign
7. Benefits	Cost-benefit ratio strength	15. Process Quality is Improved/Maintained	Improvements do not negatively impact quality of service or products along the value chain
8. Timeline	Project duration relative to business needs		

Project Viability Model Tool

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Project Viability Modeling

The Project Viability Model:

1. Score each project.

	OR (1-5)	Lab (1-5)	Throughput (1-5)	Staffing (1-5)
Access to sponsor's influence and resources	3	2	3	2
Goal alignment between project and business	5	5	5	4
Data availability and accessibility	3	3	2	5
Defect is specific and well-defined	5	4	5	5
Potential process stability – is not likely to be changed in near future?	5	4	5	5
Project's impact on customer satisfaction	4	4	1	1
Cost-benefit ratio strength	5	4	3	5
Project duration relative to business needs	4	3	4	4
Solution is not well known and difficult to find	5	5	5	3
Once solution is defined, project will be implemented	5	5	5	5
Project does not require a large amount of cash investment	2	1	2	5
Black and Green belts have capacity	3	3	4	5
Process owners have control over outcome – limited external variables that effect project outcomes	3	3	5	4
Process can be improved and does not require a complete redesign	5	5	5	4
Improvements do not negatively impact quality of service or products along the value chain	5	5	4	3

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Project Viability Modeling

The Project Model

2. Summarize scoring by value.

	Weight	OR	Lab	Thr.	Staff
1's		0	1	1	1
2's		1	1	2	1
3's		4	4	2	2
4's		2	4	3	4
5's		8	5	7	7

	OR (1-5)	Lab (1-5)	Throughput (1-5)	Staffing (1-5)
Access to sponsor's influence and resources	3	2	3	2
Goal alignment between project and business	5	5	5	4
Data availability and accessibility	3	3	2	5
Defect is specific and well-defined	5	4	5	5
Potential process stability – is not likely to be changed in near future?	5	4	5	5
Project's impact on customer satisfaction	4	4	1	1
Cost-benefit ratio strength	5	4	3	5
Project duration relative to business needs	4	3	4	4
Solution is not well known and difficult to find	5	5	5	3
Once solution is defined, project will be implemented	5	5	5	5
Project does not require a large amount of cash investment	2	1	2	5
Black and Green belts have capacity	3	3	4	5
Process owners have control over outcome – limited external variables that effect project outcomes	3	3	5	4
Process can be improved and does not require a complete redesign	5	5	5	4
Improvements do not negatively impact quality of service or products along the value chain	5	5	4	3

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Project Viability Modeling

The Project Viability Model:

3. Apply model weighting

	Weight	OR	Lab	Thr.	Staff
1's	0.3	0	1	1	1
2's	0.7	1	1	2	1
3's	1	4	4	2	2
4's	1.3	2	4	3	4
5's	1.7	8	5	7	7

	OR (1-5)	Lab (1-5)	Throughput (1-5)	Staffing (1-5)
Access to sponsor's influence and resources	3	2	3	2
Goal alignment between project and business	5	5	5	4
Data availability and accessibility	3	3	2	5
Black and Green belts have capacity	5	4	5	5
Process owners have control over outcome – limited external variables that effect project outcomes	5	4	5	5
Process can be improved and does not require a complete redesign	4	4	1	1
Improvements do not negatively impact quality of service or products along the value chain	5	4	3	5
	4	3	4	4
	5	5	5	3
	5	5	5	5
	2	1	2	5
	3	3	4	5
	3	3	5	4
	5	5	5	4
	5	5	4	3

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Project Viability Modeling

The Project Viability Model:

4. Calculate weighted value for each project.

	Weight	OR	Lab	Thr.	Staff
1's	0.3	0	1	1	1
2's	0.7	1	1	2	1
3's	1	4	4	2	2
4's	1.3	2	4	3	4
5's	1.7	8	5	7	7

	Weight	OR	Lab	Thr.	Staff
1's	0.3	0	0.3	0.3	0.3
2's	0.7	0.7	0.7	1.4	0.7
3's	1	4	4	2	2
4's	1.3	2.6	5.2	3.9	2.6
5's	1.7	13.6	8.5	11.9	11.9
Total Sum		**20.9**	**18.7**	**19.5**	**17.5**

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Project Viability Modeling

The Project Viability Model:

5. Calculate the viability score

	Weight	OR	Lab	Thr.	Staff
1's	0.3	0	1	1	1
2's	0.7	1	1	2	1
3's	1	4	4	2	2
4's	1.3	2	4	3	4
5's	1.7	8	5	7	7

Score	DMAIC Viability
<2.0	Not Viable
2.0 – 3.0	Further Validate
> 3.0	DMAIC Viable

	Weight	OR	Lab	Thr.	Staff
1's	0.3	0	0.3	0.3	0.3
2's	0.7	1.4	1.4	2.8	1.4
3's	1	12	12	6	6
4's	1.3	10.4	20.8	15.6	10.4
5's	1.7	68	42.5	55.9	55.9
Multi Sum		91.8	77	80.6	74
Total Sum		20.9	18.7	19.5	17.5
Viability Score		**4.39**	**4.12**	**4.13**	**4.22**

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Project Management Part 2

Building a Six Sigma Team

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Building a Six Sigma Team

Project Management- Building a Six Sigma Team

There are three types of team members:

Regular members – critical to day-to-day project success. Consist of SMEs, Process leads, champions, green belts, black belts, and project managers

Ad hoc members – provide expertise only as needed during key parts of project as they cannot leave day-to-day process functions

Resource members - included only when project leader feels they need expert information, counsel, or help in accessing resources, such as accounting, HR, or compliance.

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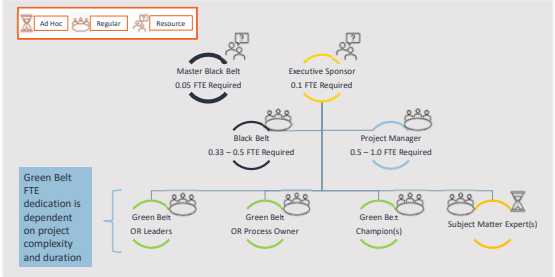
Building a Six Sigma Team



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Building a Six Sigma Team

Roles & Responsibilities

Role	Identity	Responsibilities		Interfaces
		Primary	Secondary	
Executive Sponsor	Dr. Exec Sponsor, COO	Oversee Engagement	Project Manager	Black Belt, Project Manager, Process Owner, Champion(s)
Master Black Belt	Jay K., VP Consultant	Consultant	Black Belt Leader	Black Belt, Process Owner
Black Belt	Mary T., Sr. Consultant	Day-to-day organization, project leader, facilitator	Task manager, data manager, data analyst	All Team Members
Project Manager	Spencer K., PMO	Task organizer, Manage Budget	Assist Black Belt	Core Team Members, Executive Sponsor
Champion(s)	Dr. Chen, Cardiologist Dr. Phill, Gen Surg	Change Manager, Subject Matter Expertise, Implementation Expert	Facilitator	Core Team Members, Executive Sponsor
Process Owner	Karen P., RN	Subject Matter Expertise, Decision Maker, Implementation Leader	Task Manager, Change Manager	All Team Members
Process Leader(s)	Jake K, Sterile Proc. John T, RN OR Lead Jason P, OR Lead Sue A, OR Scheduler	Subject Matter Expertise, Data Collection Implementation Support	Change Manager	Core Team Members
Process SME(s)	Jane D., RN Jenn K, RN Phil T, Room Turnover	Subject Matter Expertise	Data Collection	Core Team Members

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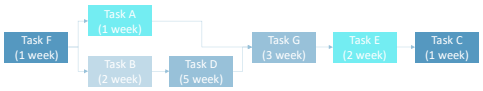
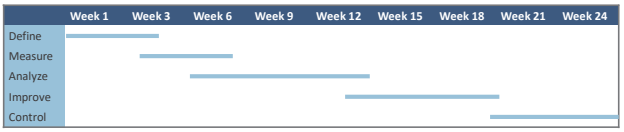
Project Timeline

Timelines and a Project's Critical Path





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Project Timeline

Organizing Tasks

1. F – Start
2. A & B follow F
3. D follows B
4. G follows A & D
5. E follows G
6. C ends

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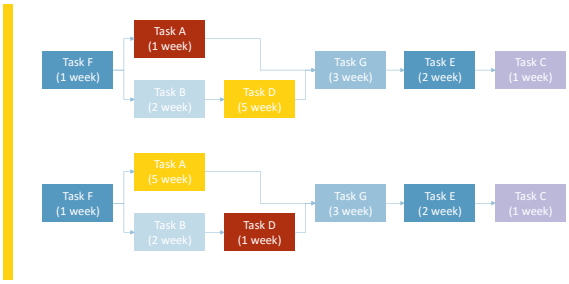
Project Timeline



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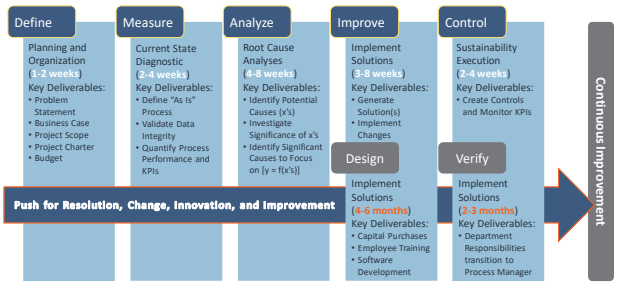
Lean Six Sigma Roadmap



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Lean Six Sigma Roadmap

Role	Capacity (FTE) per Project	Duration (months)	Total Project Capacity
Master Black Belt	0.05	6 – 12	20 – 40 projects
Black Belt	0.33	6 – 12	3 – 6 projects
Green Belt – Process Owner	0.2	3 – 6	10 – 20 projects
Yellow Belt – Executive	0.05 – 0.1	6 – 12	20 – 40 projects
Yellow Belt – SME	0.05	1	40 projects

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Lean Six Sigma Roadmap

Lean Six Sigma ROI

Name	Cost (Salary and Benefits)
Jason	$135,000
Terry	$120,000
John	$125,000
Jason	$115,000
Kimberly	$115,000
Tameka	$110,000
Jenny	$75,000
Tony	$75,000
Total Salary	$870,000
Total Other	$15,000
Grand Total	$885,000

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Lean Six Sigma Roadmap

Name	Cost (Salary and Benefits)	Total Expected Annual Projects	Expected ROI per project	Total Value	Delta
Jason	$135,000	N/A	N/A	-$135,000	-$135,000
Terry	$120,000	6	$60,000	$360,000	$240,000
John	$125,000	6	$60,000	$360,000	$235,000
Jason	$115,000	5	$60,000	$300,000	$185,000
Kimberly	$115,000	4	$60,000	$240,000	$125,000
Tamaka	$110,000	4	$60,000	$240,000	$130,000
Jenny	$75,000	13	$20,000	$260,000	$185,000
Tony	$75,000	15	$20,000	$300,000	$225,000
Total Salary	$870,000				$1,190,000
Total Other	$15,000				-$15,000
Grand Total	$885,000				$1,188,500

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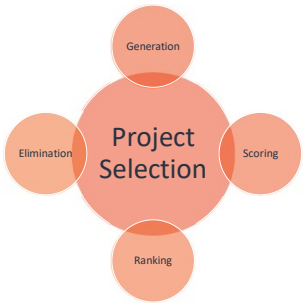
Quality and Project Management Summary

Summary

Lean Six Sigma agents are well versed in quantifying project values from various perspectives.

By fully understanding CoQ, CoPQ, Project Evaluations, Team Organization, and Approach Management, organizations can expect to see significant savings over years.

Lean Six Sigma agents should be familiar with how to best manage their time, and only select projects that will yield the appropriate return for role justification.



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