Lean Training

Fundamental Concepts and Practices

Course Outline

MODULE # 1
- Course Outline & Objectives
- What is a Culture of Quality?
- Quality defined?

MODULE # 2
- Creating a Framework for Transitional Change
- Overcoming Barriers to Change

MODULE # 3
- What is Lean?

MODULE # 4
- Lean Terminology & Lingo

MODULE # 5
- Lean Tools & Techniques Basics

MODULE # 6
- Lean Tools within Tools

MODULE # 7
- Defining Your Improvement Framework

MODULE # 8
- Team Formation & Group Dynamics
Continuous Performance Improvement

“Insanity is doing the same thing over and over again and expecting a different result.”
- Albert Einstein

Course Objectives

• To promote Business / Service Industry / Manufacturing Excellence.

• To foster and perpetuate an attitude that grows – sustains – advances continuous improvement methodologies.

• To teach the use of improvement tools – techniques – methodologies to unleash the creativity and motivation of the workforce.

• To promote and develop collaborative environments that asks the right questions to identify problems.

• To learn how to identify and solve problems, as well as coach and teach others in problem solving techniques and Business Excellence.
Course Objectives

In other words, as said by Jeffrey Liker, author and professor of Industrial and Operations Engineering at the University of Michigan...

“We need to enlighten the workforce about what it really means to live a business transformation that puts customers first and does this through developing people. People who do the work have to improve the work. There are tools, but they are not tools for improving the process. They are tools for making problems visible and for helping people think about how to solve those problems.”

Lean Training

WHAT IS A CULTURE OF QUALITY?

QUALITY DEFINED!

“A Quality Culture” comprises a set of group values that guide how improvements are made to everyday working practices and consequent outputs.”

- M. Leighty DON
What is a Culture of Quality?

- Much can be said, and even more has been written about “Culture of Quality.”
- Achieving a “Culture of Quality” in any organization is a journey! Tools – Techniques – Methodologies exist to enable an organization to become “world class,” however, capturing the hearts and minds of the workforce as an enabling partner in the journey is more difficult.
- Creating a culture in which employees “live” quality in all their actions—where they are passionate about quality as a personal value rather than simply obeying an edict from on high is the hill we must climb.
- We define a “true culture of quality” as an environment in which employees not only follow quality guidelines but also consistently see others taking quality-focused actions, hear others talking about quality, and feel quality all around them.

What is a Culture of Quality?

- A “Culture of Quality” could be defined as a pervasive atmosphere in an organization where employees are trained, nurtured and expected to be contributors to the success of their customer, organization, self and even society as positive, empowered practitioners of continuous improvement.
- A successful “Culture of Quality” starts with a common language that an organization uses to talk about meeting the needs of its customers to ensure their satisfaction. A strong “Culture of Quality” is a key component to an organization's success.
What is a Culture of Quality?

• Organizations that choose to embed a “Culture of Quality” must first understand that to change a culture, employees must:

  • Have a standard definition of quality that fits their industry and the products or services provided...
  • Be included in all training that teaches how quality impacts the lives of those they serve—and themselves, and...
  • Be an active participant in making that change happen.

When moving toward a culture that “breathes” quality, the first critical step is to determine what “quality” means for your organization and make it a “defined policy” that will advocate a new paradigm.

Example – The Toyota Model

• **Pervasive** – every employee must contribute.

• **Customer is always the beneficiary of improvements** – Toyota says we owe it to the customer to make our operations “value added” so that we can provide the good or service at the best cost.

• **Toyota very rarely lays off employees** – they will provide training to employees during slow periods rather than let them go – a sign they value the worker.

• **Continuous improvement comes in the form of Kaizen** – employees are empowered because they enact their own solutions.
What is Quality?

• Two types of “quality”
  
  Qualitative - “The works of DaVinci are beautiful.”
  
  Qualitative tends to be subjective
  
  Quantitative – “My Maserati does 185.”
  
  Quantitative is objective

• Posited for industry per quality gurus:
  
  • Joseph Juran - “Fitness for use.”
  • Philip Crosby - “Conformance to requirements.”

So How Do We Improve Quality Without Raising Cost?

• One way is to employ the Toyota Production System (TPS), more commonly referred to as “lean” in the western hemisphere.

• Value Chain and Lean Working Together:
  
  • Lean should be looked at from a systemic point of view for optimum results.
  • In all cases, the customer determines what quality “is.”
  • Perspective should be from “what the customer is willing to pay for.”
  • Be careful when considering this:
    • For example, some people might think that a quality inspector is a value add element. It’s not; the customer expects it to be made right the first time, therefore negating the need for an inspector.
    • Remember too, you can’t inspect quality into the product
Quality Characteristics

**Critical to Quality (CTQ)**

- CTQ - are the internal critical quality parameters that relate to the wants and needs of the customer.
  - These parameters are not the same as Critical to Customer (CTC), and the two are often confused.
  - CTQs are what’s important to the quality of the process or service to ensure the things that are important to the customer.

**Critical to Customer (CTC)**

- CTC - is what is important to the customer.

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Quality Characteristics

**CTC / CTQ STATED ANOTHER WAY...**

- Critical to Customer is an *output*...
  - Consistent, even, shiny coat of metallic flake paint on their vehicle.

- Critical to Quality is an *input*...
  - The right color paint.
  - Correct and consistent pressure in paint system.
  - Well functioning, clean paint spray nozzles.
Does Quality = Inspection?

• NO! This is a misperception.

• Inspection may be necessary in some instances; however:
  • Inspection does not make the product better – it only identifies bad product to remove.
  • Inspection is costly – it takes time and effort to inspect product.
  • If inspection is done by someone other than the person who made the product or provided the service, the focus is in the wrong place.
    • People should have an interest in their work, and be proud of good work.
    • Inspection by another person can promote a punitive system.

**Remember - you can’t inspect quality into the product!**

Systems that Rely on Inspection

• This style of quality management is called “Quality Control”
  • Usually there are many inspectors.
  • It becomes more difficult to fix problems or find them (because the inspection may occur long after the point of defect).
  • Has a higher level of defects in the process.

• The “Quality Assurance” perspective maintains...
  • That people are responsible for their own work.
  • Very few inspectors – quality helps and supports people doing their own inspections, and audits the process, not the part or service.
  • A greater sense of ownership and pride of work.
  • That problems found can be resolved more quickly.

*In a lean culture we want to be here...*
Cost of Quality

• There is a cost associated with Quality Management.

• Three areas of cost exists:
  
  • **Prevention Costs** - good design / quality built in.
  
  • **Appraisal Costs** - a quality management system, tools to measure product or service.
  
  • **Failure Costs** - warranties, repairs, replacement etc.

**Prevention costs the least.**

**Failure costs the most!**

Cost Of Poor Quality, (COPQ)
COPQ Taken Together...

**COST OF QUALITY (COQ)**

**COST OF POOR QUALITY**
- Internal Failure, Non-conformance, Internal Deviation, Use AS-IS
- External Failure, Non-conformance caught at Customer Field Failures, Returns

**COST OF CONFORMANCE**
- Planning and Prevention Costs, Good Design, Quality Built In
- Appraisal Costs

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**Lean Training**
Fundamental Concepts and Practices

**CREATING A FRAMEWORK FOR TRANSITIONAL CHANGE**

‘Culture eats strategy for breakfast’

- Peter Drucker
Creating the Framework for Cultural Change

• When a business isn’t going well, its leaders often think about how to change the corporate culture. They’re right to recognize that the “soft” stuff – people’s beliefs and behaviors – is at least as important as hard stuff, such as organizational structure, if not more so. Making changes in strategy or structure by itself takes a company only so far.

• Most efforts at cultural change fail because they are not linked to improving the business’s outcomes. The ideas and tools of cultural change are fuzzy and disconnected from strategic and operational realities. To change a business’s culture, you need a set of processes – social operating mechanisms – that will change the beliefs and behavior of people in ways that are directly linked to bottom-line results.

Taken from: Execution, The Discipline of Getting Things Done by Larry Bossidy & Ram Charan

Creating the Framework for Cultural Change

THE HEART OF CHANGE

• The central challenge is changing people’s behavior.

• The central challenge is not strategy, not systems, not culture.
  • These elements and many others can be very important.

• But the core problem without question is behavior.
  • What people do, and the need for significant shifts in what people do.

• The Heart of Change begins with a single individual (YOU) and multiplies from there.
  • What are the behaviors that stand in the way of succeeding with your vision?
  • What behaviors are needed for your vision to succeed?

Adopted from: The Heart of Change by John P. Kotter & Dan S. Cohen
Creating the Framework for Cultural Change

**DVF MODEL FOR CHANGE**

\[ D \times V \times F > R \]

Dissatisfaction \hspace{1cm} Vision \hspace{1cm} First Steps \hspace{1cm} Resistance To Change

*(DISSATISFACTION X VISION X FIRST STEPS) MULTIPLIED WILL OVERCOME RESISTANCE TO CHANGE*

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**Creating the Framework for Cultural Change**

**DVF MODEL MISSING ELEMENTS - CHARACTERISTICS**

- If you have only Dissatisfaction, and lack Vision and First Steps, the result is usually complaining and moaning. Positive change will not happen.

- If you have Vision and Dissatisfactions, and lack First Steps, the result is usually a lot of thinking or talking ending in apathy and being "stuck in a rut". Positive change will not happen.

- If you have First Steps and Dissatisfactions, and lack a clear Vision, the results often include a lot of frenzied activity such as voluminous reports, frequent and/or urgent meetings (lacking clear a purpose), even training sessions.
  - This has been termed "Flavor of the Month", a result of choosing whatever is the latest breaking idea, or trend.
  - Eventually there will be a lot of frustration since using the latest trend or the classiest looking strategy is not enough to overcome resistance to change without the other elements.
  - Positive change will not happen.
Creating the Framework for Cultural Change

**DVF MODEL MISSING ELEMENTS - CHARACTERISTICS**

- If you lack definition or clarity of Dissatisfactions or Resistance to Change, the results may resemble "Flavor of the Month" listed above, perhaps at a slower pace.
  - Eventually the result will be an emergence of apathy and perhaps frustration since using the latest trend or the classiest looking strategy is not enough to overcome resistance to change without the other elements.
  - Positive change will not happen.

**WHY BE CONCERNED ABOUT BEHAVIOR?**

Alignment – Agreement – Assignment (3A) is about behavioral change that will bring people together and drive an organization along specific vectors.

... it is not about organizational re-arrangement or shifting wiring diagrams... it is about...

... how you will decide to interact with each other for maximum efficiency and effectiveness.

**STUDIES SHOW THAT ONE OF THE BIGGEST COMPLAINTS OF THE AMERICAN WORKFORCE TODAY IS THAT OF... “LACK OF COMMUNICATION.”**
Creating the Framework for Cultural Change

WHY BE CONCERNED ABOUT BEHAVIOR?

American industry has struggled or even failed in the past...

Good ideas, poor follow-through...

The Cultural Change we seek requires we understand and teach a way of managing business transitions...

Defining a new business model and new way of behaving that incorporates

Self-Awareness

Intention

Clarity

Trust

Creating the Framework for Cultural Change

MANAGING TRANSITIONS

“The single biggest reason organizational changes fail is that no one thought about endings or planned to manage their impact on people. Naturally concerned about the future, planners and implementers usually forget that people have to let go of the present first. They forget that while the first task of change management is to understand the destination and how to get there, the first task of transition management is to convince people to leave home.”

Phases are not separate stages with clear boundaries. You are in more than one of these phases at the same time, and the movement through transition is marked by a change in the dominance of one phase as it gives way to the next.

Lot of confusion in the Neutral Zone – some of the old, some of the new...

* William Bridges – Managing Transitions
Creating the Framework for Cultural Change

CHANGE vs. TRANSITION

- **Change** is situational and happens without people transitioning.
- **Transition** is psychological and is a 3 phase process where people gradually accept the details of the new situation and the change that comes with it.

- **ENDING**
  - Denial
  - Shock
  - Anger
  - Frustrations
  - Stress
  - Ambivalence

- **NEUTRAL ZONE**
  - Skepticism
  - Acceptance

- **NEW BEGINNING**
  - Enthusiasm
  - Hope

**CHANGE IS FAST**

**TRANSITION IS SLOW**

**THIS IS WHY CHANGE STARTS WITH PEOPLE FIRST…**

- **Strategy**
  - Core Approach

- **Structure**
  - People

- **Skills**
  - Capabilities

- **Systems**
  - Processes

- **Tools**
- **Techniques**
- **Controls**
- **Measurement**
- **Reporting**

Adopted from Aries Engineering, LLC – Viewing Work & Business Differently – The Lessons Learned
CREATING THE FRAMEWORK FOR CULTURAL CHANGE

THE TRANSFORMATION CYCLE

Act

Adjustments

Plan

Situation Appraisal

Transformation Design
Creating Alignment-Agreement Assignment to Maximize Performance (CAMP)

Leadership Team Formation / Renewal

Leadership CAMP Session

Organization-wide Information Sharing

“Learning Culture”

Workforce CAMP Session

Leadership Team Lead

Do

Implementation Management

Engage Middle Management

Performance Management System

Employee Empowerment

Reengineering

Continuous Process Improvement

Systems Management

Study

Planning Process Recycle & Renewal

Recycle & Renewal

Ongoing, Targeted Education, Training, and Development At All Phases

Adapted from Aries Engineering, LLC – Viewing Work & Business Differently – The Lessons Learned

OVERCOMING BARRIERS TO CHANGE

‘Motivation is what gets you started. Habit is what keeps you going.’

- Jim Ryun

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IVY TECH COMMUNITY COLLEGE
Overcoming Barriers to Change

• Research has shown that the best way to get the senior managers at all levels interested in the change initiatives is by...
  • Engaging them early and often, (Elevator Speak / Executive Planning) and...
  • Seeking their buy-in for the change management process.

• Studies have proven that the managers in the upper echelons buy into the change from a “strategic perspective” where the accent is on performance and hence radical or disruptive change is seen as part and parcel of an organizations development.

Overcoming Barriers to Change

• Managers at the middle level can be made to see the value inherent in change and hence they can be brought on board.
  • The frontline managers’ views and inputs can be sought and thereby their cooperation and participation in the change obtained.

• Making the middle managers the change drivers and change initiators is often the best way of securing their buy-in.
  • The point here is that by getting the managers to be the ones who are implementing change and by giving them center stage, it is possible to secure their participation.
Overcoming Barriers to Change

• By definition, senior and middle managers are highly capable, motivated and ambitious.

• By making them the stars of the change process, their innate abilities can be harnessed to the benefit of the organization.

• It is often better to have a close association with the management team to achieve the desired results.

Regardless of how you decided to deploy change remember, this is a “Team Sport” requiring much coaching and mentoring throughout the journey.

SO HOW DO WE START?

EXECUTIVE PLANNING SESSION

• With any far reaching organizational change turning a vision into an actionable plan requires effective and continuous dialog and communication at all levels.
  • Planning starts with alignment at the top and spreads from there.

• Executive Planning Session (EPS)... sometimes called Strategic Planning is not only a means of creating organizational alignment but it serves to...
  • Build trust...
  • Identify allies...
  • Determine gaps between vision and goals and current business model.
  • Develops a road map for implementation.
**EXECUTIVE PLANNING SESSION**

**SAMPLE SINGLE DAY EPS AGENDA**

<table>
<thead>
<tr>
<th>Business Context</th>
<th>Senior Leadership</th>
<th>Current State of the Business / Why are we here? / Where do we want to be? / Objectives &amp; Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product / Solution / Vision</td>
<td>Team Leadership</td>
<td>Vision and Prioritization discussions.</td>
</tr>
<tr>
<td>Architecture &amp; Development Practices</td>
<td>Session Facilitator</td>
<td>Architecture, Common Framework, etc... Speed, Agility, Tool Set, Timing, Methods...</td>
</tr>
<tr>
<td>Planning Requirements</td>
<td>Session Facilitator</td>
<td>Working Lunch / Explanation of Planning Process / Data Collecting / Team Breakouts /</td>
</tr>
<tr>
<td>Four Team Breakouts 3 Hours</td>
<td></td>
<td>Teams Brainstorm Draft Plans / Risk Assessment / Barriers to Change / Priorities / Refined Framework</td>
</tr>
<tr>
<td>Draft Plan Review</td>
<td></td>
<td>Teams present Draft Plans / Risks / Barriers / Priorities</td>
</tr>
<tr>
<td>Management Review / Way Forward</td>
<td>Session Facilitator</td>
<td>Decisions Made / Priorities Selected / Framework Identified / Countermeasures Defined</td>
</tr>
</tbody>
</table>

**ALIGNMENT - AGREEMENT - ASSIGNMENT**

**REGARDLESS OF APPROACH...**

- You can choose to initiate a transformation journey in dozens of ways.
- But remember there is one constant...

**SLIDE # 7 - STUDIES SHOW THAT ONE OF THE BIGGEST COMPLAINTS OF THE AMERICAN WORKFORCE TODAY IS THAT OF... “LACK OF COMMUNICATION.”**

- Therefore, regardless of approach being deliberate about communicating in a 3A – 3D methodology will assist you in gaining trust... building teams... and achieving rapid deployment of any business transformation.
ALIGNMENT - AGREEMENT - ASSIGNMENT

**ALIGNMENT** = Any process – problem – issue, collectively understood and properly framed provides clarity for all participants. The effect is the creation of - ALIGNMENT - in thought, opinion, and understanding. Such an alliance is initiated with open dialog and communication among leadership, management and the principle players involved in any improvement project.

**AGREEMENT** = With the essential - ALIGNMENT - secured, we reach a level of business partnership and collaborative - AGREEMENT - whereas the principle players have the makings of a common framework and are collectively in accord with the process – problem – issue and the resultant approach for solution development and actions required for forward movement.

**ASSIGNMENT** = Finally, with the necessary principle players - ALIGNMENT - recognized, and a common framework - AGREEMENT - tenable, a quantity of individuals regardless of position – status – title, understand the – ASSIGNMENT – before them and can move forward rapidly – confidently – collaboratively on solution Design – Development – Deployment 3D.

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DESIGN - DEVELOPMENT - DEPLOYMENT

**DESIGN** = With 3A secured a cross functional process improvement team can be chartered and initiate brainstorming activity relative to improvement methodologies, tools, and techniques – DESIGN – to tackle the process – problem – issue with speed and agility. This is all done with a continued reflection on the teams stated goals and objectives (e.g., Problem Statement).

**DEVELOPMENT** = Team make-up is critical to rapid solution – DEVELOPMENT –, whereas the improvement team requires the proper balance of “inside the process” and “outside the process” personnel to achieve the goals and objectives of – DESIGN. DEVELOPMENT – is an extension of the lessons learned during 3A activity and begins to hone in on the process – problem – issue to be improved unifying the improvement team in a common purpose.

**DEPLOYMENT** = DEPLOYMENT is the spring board for chartered improvement activity. It is at this stage an improvement team begins to move forward with team DESIGN & DEVELOPMENT with confidence knowing management and peers fully support the activity that is about to begin collaboratively on solution DESIGN – DEVELOPMENT – DEPLOYMENT 3D.

Adapted from Aries Engineering, LLC – Viewing Work & Business Differently – The Lessons Learned
UNDERSTANDING THE LINGO

CONSENSUS vs. AGREEMENT

During this course you will receive a ton of terminology that we understand is difficult to absorb in a short period of time. However, you should anticipate to be exposed to it and even teach it in your future transformational journey. As you proceed, remember...

*Change / Improvement efforts operate from a CONSENSUS frame of mind, meaning...*

While Team Members may not always AGREE with a proposed change or direction forward, team members openly acknowledge that you can live with a proposed change and continue to move forward, working together, towards the greater good.

CONSENSUS is a process for group decision-making. It is a method by which an entire group of people can come to an agreement. The input and ideas of all participants are gathered and synthesized to arrive at a final decision acceptable to all. Through consensus, we are not only working to achieve better solutions, but also to promote the growth of community and trust.

**Strategic Keys to Managing Organizational Change**

- **VISION** + **SKILLS** + **INCENTIVES** + **RESOURCES** + **ACTION PLAN** + **STANDARD WORK** + **KAIZEN** = **SUCCESS**
- **VISION** + **SKILLS** + **INCENTIVES** + **RESOURCES** + **ACTION PLAN** + **STANDARD WORK** + **MISSING** = **COMPLACENCY**
- **VISION** + **SKILLS** + **INCENTIVES** + **RESOURCES** + **ACTION PLAN** + **MISSING** + **KAIZEN** = **VARIATION**
- **VISION** + **SKILLS** + **INCENTIVES** + **RESOURCES** + **MISSING** + **KAIZEN** = **FALSE STARTS**
- **VISION** + **MISSING** + **INCENTIVES** + **RESOURCES** + **ACTION PLAN** + **STANDARD WORK** + **KAIZEN** = **FRUSTRATION**
- **VISION** + **MISSING** + **INCENTIVES** + **RESOURCES** + **ACTION PLAN** + **STANDARD WORK** + **KAIZEN** = **RESISTANCE**
- **MISSING** + **SKILLS** + **INCENTIVES** + **RESOURCES** + **ACTION PLAN** + **STANDARD WORK** + **KAIZEN** = **ANXIETY**
- **MISSING** + **SKILLS** + **INCENTIVES** + **RESOURCES** + **ACTION PLAN** + **STANDARD WORK** + **KAIZEN** = **CONFUSION**
Lean Training
Fundamental Concepts and Practices

**WHAT IS LEAN?**

*‘The risk of a wrong decision is preferable to the terror of indecision’*

- Maimonides
One Primary Focus of This Course is on Lean Methodologies – Tools – Techniques...

SO LET’S JUMP INTO THE ASPECTS OF LEAN FROM A 100K FOOT OVERVIEW, EXPLORING...

• Lean Definition...
• Lean History...
• Lean Principles & Approaches...
• The Toyota 4P Model.

What is Lean?

The core idea is to maximize customer value while minimizing waste. Simply, lean means creating more value for customers with fewer resources. A popular misconception is that lean is suited only for manufacturing. Not true! Lean applies in every business and every process. It is not a tactic or a cost reduction program, but a way of thinking and acting for an entire organization.

Lean manufacturing or lean production, often simply "lean", is a systemic method for the elimination of waste within a process. Lean also takes into account waste created through overburden and waste created through unevenness in work loads. Working from the perspective of the client who consumes a product or service, "value" is any action or process that a customer would be willing to pay for.
Roots of Lean: Back to the 1900’s

- Henry Ford: continuous flow production, waste elimination
- *TWI:* (Training Within Industry), 1940-1945
- Kiichiro Toyoda and Taiichi Ohno: low inventories, flexibility
- U.S. Supermarkets: pull systems
- Shigeo Shingo: mistake proofing, reduced set up times
- Toyota Production System (TPS)
- MIT and James Womack: bring Lean back to U.S.
- Motorola & others: developed Six-Sigma early 1990’s

Lean Thinking is About...

- Designing Product and Performance Efficiency...
- Continually Seeking Perfection...
- Eliminating Waste in Process...
- Changing the way we think about work.

*Lean is a proven methodology to improve both business and manufacturing processes through the elimination of unnecessary process steps, defects, and waste/variation within the process.*
What is a Lean Process?

• A Process which produces:
  • What the customer wants... **VALUE**.
  • In the quantity the customer wants... **DEMAND**.
  • When the customer wants it... **SCHEDULE**.

• While using minimum resources:
  • People
  • Operations
  • Equipment
  • Materials

• **Eliminates Bottlenecks** (Theory of Constraints Term)
  • Can only go as fast as your slowest process step.

Lean Principles

• **VALUE** has been specified...
  • From the customer’s perspective.

• The **VALUE STREAM or PROCESS FLOW** has been identified...
  • For each product/service.

• The product/service **FLOWS** without interruptions...

• The customer can **PULL** value from the process...

• Continuous pursuit of **PERFECTION**.
Why Seek Perfection?

Why Seek Perfection?

**A GOODNESS LEVEL OF 99% EQUATES TO...**

- 20,000 lost articles of mail per hour.
- 5,000 incorrect surgical operations per week.
- 200,000 wrong drug prescriptions each year.
- No electricity for almost 7 hours per month.

Approaches to Lean

- Kaizen – *just doing it*.
- Kaizen Blitz – *team inspired process improvement*.
- Plan-Do-Check-Act (PDCA) – *cyclical process improvement*.
- A3 Critical Thinking – *in process – real time – rapid improvement*.

TO NAME A FEW...

DURING THIS COURSE WE WILL FOCUS ON “TPS” AND THE TOOLS AND TECHNIQUES NECESSARY TO BEGIN YOUR JOURNEY.
Toyota Production System

- **Toyota Production System (TPS)** - is one of the best known continuous improvement methodologies available to help us achieve the goal of high quality without raising costs.

- TPS relies on the principle of 4P’s:
  - Philosophy
  - Process
  - People and Partners
  - Problem Solving

A Visual Aid to Toyota 4P’s

You have to start here!
Philosophy Defined

• The fundamental essence of Toyota philosophy:
  
  **HAVE A SENSE OF PURPOSE ORGANIZATIONALLY.**
  
• Base your management decisions on a long-term philosophy, even at the expense of short-term financial goals.

• Generate value for...
  
  • Customer
  • Society
  • Economy

• Accept responsibility for your conduct and maintain and improve the skills that enable you to produce added value.

Process Defined

• The right process will produce the right results.

• Create continuous process flow to bring problems to the surface.

• Use “pull” systems to avoid overproduction.

• Level out the workload... work like the tortoise, not the hare.

• Build a culture of stopping to fix problems, to get quality right the first time.

• Standardized tasks are the foundation for continuous improvement and employee empowerment.

• Use visual control so no problems are hidden.
People and Partners Defined

• Add value to the organization by developing your People and Partners.

• Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others.

• Develop exceptional people and teams who follow your company’s philosophy.

• Respect your extended network of partners and suppliers by challenging them and helping them improve.

RAISE THE BAR!

Problem Solving Defined

• Continuously solving root problems drives organizational learning.

• Go and See for yourself to thoroughly understand the situation.

• Make decisions slowly by consensus, thoroughly considering all options; implement decisions rapidly.

• Become a learning organization through relentless reflection and continuous improvement.
Why Does this Methodology Work?

- Continuous improvement is a way of life, not an activity.
- It touches all people in the process, and the benefits extend to the customer and community as well.

Process Focus

- Process focuses on where the key value-add activities take place.
  - In a production environment, this would be the shop floor.
  - In a hospital, it would be wherever the patient is being served.
  - In a service industry, it would be where the customer interacts with the Customer Service Representative (CSR).
Respect and Value People

• There are some fundamental meanings that complete this principle under the TPS model.
  • People have infinite potential.
  • To not use and develop this potential is waste.

• With this culture, people want to be engaged and contribute.

Continuous Improvement (Kaizen)

• Kaizen means to continuously improve or make better.

• Kaizen works by incremental improvement.
  • Bridges the gap between current situation and a desired improvement.
  • Can be about...
    • Safety
    • Quality
    • Productivity Improvement
    • Improved Morale
Customer Focus

• Toyota has a substantially different paradigm on product or service costing:

![Traditional Paradigm Chart](chart1)

![Lean Model Chart](chart2)

Explanation of Paradigm

• Rather than raising the price of the product or service to stay profitable or maintain a good margin, the TPS Model focuses on the belief that the customer sets the price.
  
  • The supplier must eliminate waste to become more profitable.
  
  • Lean methodologies help identify waste (which is often hidden) and provides clear direction on reducing it.
  
  • Elimination of waste actually makes a better product or service.

Simply raising the cost of the good or service does nothing to improve quality.
Eliminating Waste

- Eliminating waste is central to this idea, TPS methodologies:
  - Recognizes waste.
  - Deals with eliminating it (strategically).
  - Another term for waste would be “process variation.”

- Toyota also says that the key to processes are gaining stability. To understand process stability we need to understanding it’s contrast, “process variation.”

- Variation is the difference between the desired value and the actual value of a process or process outcome. There are two types:
  - Common Cause Variation
  - Special Cause Variation

- Sensei’s are trained in waste / variation elimination, and they will in turn train others.

By eliminating waste, we increase the value of the work that is being performed.
Some of the Lean Tools for Waste Elimination

WE WILL EXPLORE SEVERAL OF THESE IN DETAIL DURING THIS COURSE

Lean Tools

- SMED Quick Changeover
- Kanban Demand Pull
- Level Mix Model Production
- TPM Equipment Reliability
- One-Piece Flow Production
- 5S Visual Management
- Mistake-Proofing Poka-Yoke
- Point of Use Storage
- Standard Work
- Value Stream Mapping
- FMEA

Lean Training
Fundamental Concepts and Practices

LEAN TERMINOLOGY & LINGO

AS THE MANAGEMENT TEAM WOULD BEGIN BY FOCUSING ON
– ALIGNMENT – AGREEMENT – ASSIGNMENT –

THE WORKFORCE HAS A NEED TO GRASP THE BASIC LEAN TERMINOLOGY & LINGO TO BEGIN THE PROCESS OF SPEAKING A COMMON ORGANIZATIONAL LANGUAGE.
UNDERSTANDING THE LINGO

• GENBA (also Romanized as GEMBA):
  • Is a Japanese term meaning "the real place." In business, genba refers to the place where value is created; in manufacturing the genba is the factory floor.

• GO TO GEMBA:
  • The term means "go and see what is really happening" rather than talk about it, read about it, or try to recall it from memory. Nothing short of actually doing or observing the work gives one quite the same perspective on a process as seeing it firsthand. There is a feel to the flow of work that you can’t otherwise experience. This tool is most commonly used when problem solving turns to debating.

• GEMBA WALK:
  • A gemba walk is a form of management in which leaders and/or improvement team members walk around the work area to gain firsthand insight into how processes are done and observe problems in action. GEMBA Walks should be a scheduled activity.

UNDERSTANDING THE LINGO

• VALUE STREAM:
  • The detailed activities required to design, order, and provide a specific product or service from the point of product (or service) concept, through launch, ordering raw materials, production and placing the product (or service) in the hands of the customer.

• VALUE STREAM MAP (VSM):
  • A high-level, visual representation of all of the process steps required to transform a customer requirement into a delivered good or service. A VSM shows the connection between information flow and product flow, as well as the major process blocks and barriers to flow. VSM’s are used to document current state conditions as well as design a future state. One of the key objectives of VSM is to identify non-value adding activities for elimination. VSM’s, along with the Value Stream Implementation Plan are strategic tools used to help identify, prioritize and communicate improvement activities.

• PROBLEM STATEMENT:
  • A succinct statement of a business situation which is used to describe the problem the improvement tools – techniques – methodology is attempting to solve.
UNDERSTANDING THE LINGO

• KAIZEN / KAIZEN BLITZ:
  • A structured, team-based, problem-solving activity of short duration used to improve processes throughout an organization. Activities typically include:
    1. Team training...
    2. Current State analysis...
    3. Future State design...
    4. Prioritization of improvements...
    5. Train on new process...
    6. Implementing the selected improvements...
  • Duration is typically one to five days. The team is focused on the process 100% of time during the activity.

• PROJECT:
  • A well-defined, documented improvement effort that states a business problem in quantifiable terms and with known expectations for a specified improvement team to tackle. Projects have a specified start and end point, typically 2 to 6 months depending upon complexity. Kaizen activity can be nested within a project.

UNDERSTANDING THE LINGO

• KAIZEN / PROJECT CHARTER:
  • A written declaration of the purpose and expected result of an improvement activity.

• “SMART” GOALS
  • Method to establish performance expectations; acronym stands for Specific – Measureable – Agreed Upon – Realistic – Time-Specific.

• VOICE OF THE CUSTOMER (VOC):
  • Represents the expressed and non-expressed needs, wants, and desires of the recipient of a process output, a product, or a service. It is usually expressed as Specifications – Requirements – Expectations.

• STAKEHOLDER:
  • Anyone who has an interest in a process, typically as supplier, customer or one who actually performs the work.

• CUSTOMER:
  • Any entity or person who uses or consumes a product or service, whether internal or external to the providing organization.
UNDERSTANDING THE LINGO

• SUPPLIER:
  • An individual or entity responsible for providing an input to a process in the form of resources — material — information.

• PROCESS MEMBER:
  • An individual who is a key contributor or supporter for the successful completion of the deliverables from the process.

• PROCESS OWNER:
  • Process owners have responsibility for process performance and resources. They provide support, resources, and functional expertise to improvement activities. They are accountable for implementing developed improvements and solutions in their process.

• STANDARD WORK:
  • Documentation of the best known method for completing a task or activity. This becomes the way for everyone working on that process to perform the work. This also becomes the baseline for future work.

  In the words of Taichii Ohno, “where there is no standard, there can be no kaizen.”

UNDERSTANDING THE LINGO

• WASTE:
  • Any activity that consumes resources but does not provide value as defined by the customer. Also referred to as Non-Value Adding (NVA) activities. There are 8 common types of waste.

• CURRENT STATE:
  • All of the steps that are performed to complete the work as it is operating in “today’s environment” (this is often quite different from how a written procedure states it should be done) as well as the issues and performance (metrics) of the process.

• FUTURE STATE:
  • A plan for how a process is planned to be running at a defined point in time in the future. Serves as the primary input for the development of an implementation plan. Future State Value Stream Maps are usually developed looking 3 – 12 months into the future.
  • Also referred to as the Ideal State, Blue Sky State or Nirvana State.
UNDERSTANDING THE LINGO

• 80 – 20 RULE (Pareto Principal):
  • The concept that most of the effects in a situation can be traced back to a small number of contributors. In the early 1900’s Wilfred Pareto observed that 80% of the property in Italy was held by only 20% of the population. Joseph Juran later observed that this 80/20 relationship is in fact quite common, and coined this phenomenon as “The Pareto Principal.”

• PROCESS:
  • An operation or group of operations that receives inputs, performs an activity and then provides outputs to an internal or external customer.

• STABILITY (OF A PROCESS):
  • A process is said to be stable if it shows no recognizable pattern of change and no Special Cause Variation is present.

• OPERATION:
  • An activity performed on a product or service by a single resource. An operation is a component of Process. Also referred to as Task.

UNDERSTANDING THE LINGO

• INPUT
  • A resource consumed, utilized, or added to a process or system. Synonymous with X, characteristic, and input variable.

• OUTPUT:
  • A resource or item or characteristic that is the product of a process or system.

• REWORK:
  • Activity required to correct defects produced by a process. Rework is Waste!

• OUT OF CONTROL:
  • A process is said to be out of control if it exhibits variations larger than its control limits or shows a pattern of variation.

• CRITICAL TO QUALITY (CTQ):
  • Any characteristic that is critical to the perceived quality of the product, process, or system.
UNDERSTANDING THE LINGO

• CRITICAL TO “X”
  • An input to a process or system that exerts a significant influence on any one or all of the key outputs of a process.

• COST OF POOR QUALITY (COPQ):
  • The costs associated with any activity that is not doing the right thing the first time. It is the financial quantification of any waste that is not integral to the product or service which your company provides.

• CHANGE AGENT:
  • The leader of a lean conversion who has the willpower and drive to initiate fundamental change and make it stick. **In a business transformation ALL are Change Agents.**

• MONUMENT:
  • Any design, scheduling, or production technology with large-scale requirements and lengthy changeover times that requires designs, orders, or products to be brought to the technology and to wait in a queue for processing.

UNDERSTANDING THE LINGO

• VALUE ADDED (VA):
  • Any activity, which, from the ultimate customer’s perspective is of value, such that the customer is willing to pay for that activity, or that activity is a condition of doing business with that customer.

• NON-VALUE ADDED (NVA):
  • A task that the customer does not care about and would be unwilling to pay for if he/she knew the incremental cost of that task. The attribute of a task or activities that can be eliminated from a process without deterioration of the function, performance or quality of a product or service as viewed by the customer. Two types of Non-Value-Adding activity exist: Necessary NVA and Unnecessary NVA.

• NECESSARY NON-VALUE ADDED:
  • Activities that add no value from the customer’s perspective but are required in order to operate the business. This could include legal and regulatory requirements as well as certain internal business processes which would put the business at risk if eliminated in today’s environment.
UNDERSTANDING THE LINGO

• FLOW (PROCESS):
  • The smooth, uninterrupted movement of a product or service through a series of process steps. In true flow, the work product (information, paperwork, material, etc.) passing through the series of steps never stops.

• CONTINUOUS FLOW:
  • A work process management system wherein workers only work on one unit at a time and only one unit of work moves from process to process. Implementation of continuous flow can have significant impact on reducing throughput time, minimizing waste and improving value adding activity. This concept is also referred to as Single Piece Flow or One Piece Flow. Contrast with Batch and Queue.

• BARRIER TO FLOW:
  • Any barrier, physical or not, that prevents the passing of one unit of work directly to the next process without the work stopping.

UNDERSTANDING THE LINGO

• DOWNSTREAM:
  • As viewed from a reference point, downstream processes are activities that take place after the reference point (e.g. transmitting a quote to the customer is a downstream process from writing the quote). Contrast with Upstream.

• UPSTREAM:
  • As viewed from a reference point, upstream processes are activities that take place before the reference point.

• WORK IN PROGRESS (WIP):
  • Any work that has been initiated or available to be worked on and yet released to the downstream customer / process. Also referred to as Work in Process.

• PRODUCT FAMILY:
  • A group of products or services that pass through similar process steps. In the service sector, product families are often referred to as Service Families.
UNDERSTANDING THE LINGO

• PROCESS TIME:
  • The amount of time it takes to perform a task (or series of tasks) if one could work on it uninterrupted.
  • For example, if one enters data for two minutes, places a call to obtain additional information and waits for ten minutes for the call to be returned, talks with the information supplier for three minutes and finishes data entering in one minute, the process time is six (6) minutes ($2 + 3 + 1$).
  • Process Time plus wait time (or delays) = Lead Time. This time is related to Takt Time such that if every operation in a complete process has a Process Time equal to or less than the Takt Time, then the product or service can be made in One-piece Flow. Also referred to as Touch Time or Operator Cycle Time.

• WAIT TIME:
  • The amount of time that product, people, information or material waits to be worked on. Also referred to as “queue time.”

UNDERSTANDING THE LINGO

• CYCLE TIME:
  • The frequency, or interval, of work being completed. Compare to Process Time, contrast with Lead Time.

• TAKT TIME: (German for Pace)
  • The pace at which work must be completed to meet customer demand. To calculate, divide the available work time by the customer demand for that period.
  • For example, if a call center receives 900 calls per shift, and there are 27,000 seconds of available work time, the Takt Time is 30 seconds per call. Therefore, one call must be completed every 30 seconds to meet customer demand. Process Time divided by Takt Time yields the number of workers required to support a specific product.

• PUSH PRODUCTION:
  • A system where an upstream process produces as much as it can without regard to the actual requirements of the next process and sends them to the next process whether they have capacity to begin work or not. Push Production typically results in queues of work building up, which result in delays.
UNDERSTANDING THE LINGO

• PULL PRODUCTION:
  • A Work In Progress (WIP) management approach whereby the downstream process authorizes upstream production through the consumption of work. Common pull systems include One-piece Flow, Kanban and First In-First Out (FIFO) Lanes.

• BATCH AND QUEUE:
  • A processing method where multiple pieces of work (often referred to as a “batch” or “lot”) are processed and/or passed together from one operation to the next. Upon arrival at the next process some or all of these pieces of work may wait in a “queue” to be worked on. Contrast with One-piece Flow.

• FIRST IN-FIRST OUT (FIFO):
  • A order sequencing and control approach which ensures that the first order entering the system is the first order to be worked on.

UNDERSTANDING THE LINGO

• FIRST PASS YIELD (FPY):
  • A quality metric of a processes performance. First pass yield is expressed as a percentage and is calculated by dividing the number of “right the first time” units of work by the quantity of work entering the process.

• VISUAL MANAGEMENT:
  • An approach to managing product, people and processes using low-cost, easy to understand visual devices. These devices, when properly utilized, will quickly and effectively communicate objectives, performance, operating conditions and problems. Allows for easily auditing work / processes without interrupting flow.

• FULL TIME EQUIVALENT (FTE):
  • Number of resources (usually people) required to run a process or series of processes if they were employed full time on that activity. For people, the number is usually based on 2080 hours per year (i.e. 2080 hours of work = one FTE) or 40 hours per week. Example: four people working 20 hours per week each on the same activity, equals two FTEs.
UNDERSTANDING THE LINGO

• CROSS TRAINING:
  • To train individuals to perform a variety of tasks and skills. In a lean environment, the focus of cross-training should be to increase competence along the Value Stream in order to optimize performance.

• CELL or WORK CELL:
  • The co-location of processes and/or equipment in sequence to permit one-piece flow and the flexible deployment of workers to operate multiple processes (resources). The resources found in cells are often cross-functional in nature. Also referred to as Layout for Flow, or Cellular Arrangement.

• KANBAN:
  • A type of Pull Production system whereby the downstream process signals the upstream process to replenish what has been consumed. Kanban’s typically pull by part number. Kanban means signboard in Japanese. Compare to FIFO Lanes.

UNDERSTANDING THE LINGO

• MISTAKE PROOFING:
  • A device or procedure designed to prevent the generation of defects. The English translations for this Japanese phrase are: poka means “error” and yoke is “to avoid.” Also referred to as Poka-yoke.

• METRIC:
  • A measure that is considered to be a key indicator of performance. It should be linked to goals or objectives and carefully monitored. Sometimes referred to as Health of Process (HOP).

• SPECIFICATION LIMITS
  • The “upper and lower” bounds of acceptable performance for a characteristic, part, process, or system.

• VARIABILITY or VARIATION:
  • A generic term that refers to the property of a characteristic, process, or system to take on different values when it is repeated. Variability or Variation is waste.
UNDERSTANDING THE LINGO

• PRODUCTION CONTROL:
  • The task of controlling and pacing production so that products and services flow smoothly and quickly to meet customer requirements.

• PRODUCTION CONTROL BOARD:
  • A visual display – often a large white board – located beside a process to show actual performance compared to planned performance. Should include Standard Work documents.

• RED TAGGING:
  • Labeling unneeded items for removal from a production or office area during a 6S exercise. Common practice is to define a Red Tag Area for the placement of Red Tagged materials.

• EFFECTIVE – MEASURE OF QUALITY:
  • How well is it done? All processes must be both efficient and effective. Contrast with Efficient.

• EFFICIENT – MEASURE OF SPEED:
  • How fast is it done? All processes must be both efficient and effective. Contrast with Effective.

DEFECT LOCATION CHECK SHEET:
• A defect location check sheet is a structured, prepared form for collecting and analyzing data that provides a visual image of the item being evaluated so that data can be collected visually rather than with words. Also known as a Defect Map, Measles Chart, Defect Concentration Diagram.

QUALITY:
• Two types of “quality” are defined. Qualitative which tends to be subjective. Quantitative which objective.

CULTURE OF QUALITY:
• An environment where employees “live” quality in all their actions—where they are passionate about quality as a personal value rather than simply obeying an edict from on high is the hill we must climb.
• A “true culture of quality” as an environment in which employees not only follow quality guidelines but also consistently see others taking quality-focused actions, hear others talking about quality, and feel quality all around them.
UNDERSTANDING THE LINGO

• BARRIER TO CHANGE:
  - It goes without saying that “he who rejects change is the architect of decay and the only human institution that rejects progress is the cemetery.” With this axiom in mind, it is critical to understand that unless change is actively embraced, organizations in the 21st century risk obsolescence.

• CONTAINMENT:
  - During the course of problem solving activities “containment” is the action necessary to isolate a process output that is producing a non-conforming product or service.

• PLAN-DO-CHECK-ACT (PDCA):
  - PDCA is an iterative four-step management method used in business for the control and continuous improvement of processes and products. It is also known as the Deming circle/cycle/wheel, Shewhart cycle, control circle/cycle, or Plan–Do–Study–Act (PDSA).
  - Another version of this PDCA cycle is OPDCA. The added "O" stands for observation or as some versions say “grasp the current condition." This emphasis on observation and current condition has currency with Lean Manufacturing/Toyota Production System literature.

UNDERSTANDING THE LINGO

• A3 - CRITICAL THINKING:
  - An A3 report is simply an 11 x 17 inch piece of paper outlined into several structured sections. The exact structure depends upon the type of A3 and the needs of the situation. A general one consists of the following pattern... 1-Background, 2-Current Situation & Problem, 3-Goal, 4-Root Cause Analysis, 5-action Items / Implementation Plan, 6-Check of Results, and 7-Follow Up. The report is used to standardized and simplify report writing, proposals, status updates, and other common methods of communication. The content follows the logic of the Plan-Do-Check-Act cycle.
  - Critical Thinking, also called Critical Analysis, is clear, rational thinking involving critique. Its details vary amongst those who define it, however, Critical Thinking in its purest form means making clear, reasoned judgments. During the process of A3 Critical Thinking, ideas should be reasoned and well thought out/judged.
  - The National Council for Excellence in Critical Thinking defines critical thinking as the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action.¹
UNDERSTANDING THE LINGO

• FAILURE MODES & EFFECTS ANALYSIS (FMEA):
  • Failure modes and effects analysis (FMEA) is a step-by-step approach for identifying all possible failures in a design, a manufacturing or assembly process, or a product or service.
  • “Failure modes” means the ways, or modes, in which something might fail. Failures are any errors or defects, especially ones that affect the customer, and can be potential or actual. “Effects analysis” refers to studying the consequences of those failures.

• STRATIFICATION (DATA):
  • Stratification is a technique used in combination with other data analysis tools. When data from a variety of sources or categories have been lumped together, the meaning of the data can be impossible to see. This technique separates the data so that patterns can be seen.

• X-Y MATRIX TOOL:
  • The objective of the X-Y Matrix is to numerically calculate the correlation of Y (output) which is equal to the frequency multiplied by X (input). This filters all possible scenarios and probable contributors to the problem at hand. The tool also studies and analyzes the relationship between what is being proposed in the process and what benefit the customer would get from it. The X-Y Matrix allows the group to determine areas of development and process gaps.

UNDERSTANDING THE LINGO

• JUST-IN-TIME MANUFACTURING (JIT):
  • Just-in-time (JIT) manufacturing is a production model in which items are created to meet demand, not created in surplus or in advance of need. The purpose of JIT manufacturing is to avoid the waste associated with overproduction, waiting, and excess inventory, three of the eight waste categories defined in the Toyota Production System (known in North America as the lean production model).

• MEASUREMENT SYSTEM ANALYSIS (MSA):
  • Measurement system analysis (MSA) uses scientific tools to determine the amount of variation contributed by the measurement system. It is an objective method to assess the validity of a measurement system and minimize the factors contributing to process variation that is actual stemming from the measurement system.

• CAPABILITY ANALYSIS:
  • Capability analysis is a graphical or statistical tool that visually or mathematically compares actual process performance to the performance standards established by the customer. To analyze (plot or calculate) capability you need the mean and standard deviation associated with the required attribute in a sample of product (usually n=30), and customer requirements associated with that product. Typically a Six-Sigma analysis tool.
UNDERSTANDING THE LINGO

• VALUE CHAIN:
  • A value chain is the whole series of activities that create and build value at every step. The total value delivered by the company is the sum total of the value built up all throughout the company. Michael Porter developed this concept in his 1980 book 'Competitive Advantage'.
  • The significance of the value chain: The value chain concept separates useful activities (which allow the company as a whole to gain competitive advantage) from the wasteful activities (which hinder the company from getting a lead in the market). Focusing on the value-creating activities could give the company many advantages. For example, the ability to charge higher prices; lower cost of manufacture; better brand image, faster response to threats or opportunities.

Lean Training
Fundamental Concepts and Practices

LEAN TOOLS AND TECHNIQUES BASICS

WE WILL START WITH AN OVERVIEW OF THE TOOLS & TECHNIQUES THAT ARE REQUIRED TO BEGIN A TRANSFORMATIONAL JOURNEY
Another Primary Focus of This Course is on Process

So let’s continue with a **50K FOOT OVERVIEW** into the tools and techniques that are required to begin a transformation.

- The Problem Statement...
- The Need for Containment...
- GEMBA – “Go See”...
- Visual Management...
- Data Collection Plan...
- Defect Location Check Sheets...
- 5 Why’s...
- Identifying Waste and Variation...
- Meet the 8 Wastes...
- 6S...
- Process Flow...
- Flow Time / Manual Cycle Time / Takt Time Defined...
- Work in Progress (WIP)...
- Standard Work...
- The Value Added - Non-Value Added Debate...
- Process Mapping...

Improvement Starts With a Problem Statement

- **Every improvement effort should start with a clear team plan.**
- **“3A” teaches we must** confirm there is a problem and an improvement team is aligned to solving it.
  - Go to the workplace and see for yourself.
  - This cannot be overstressed, for several reasons.
    - You want to do this right away, so that you are not relying on 2nd hand information.
    - You don’t want to fall victim to “the sky is falling” or be blindsided thinking a problem is minor when it is serious.
    - May need help from a Quality department to assess.
  - Develop a clear problem statement in quantitative terms (what specification or requirement does it fail to meet – in measurable terms).
Improvement Starts With a Problem Statement

It is often a good idea to categorize where the defect was found in order to know whether there is good detection at certain levels.

- Confirmation data should include:
  - Is the problem new, or longstanding?
  - Is the problem minor, major, critical?
  - If dealing with physical goods, what percent are affected? (results of a quality inspection audit).

- Was the problem caught (where and when):
  - At the producing department – considered an – A Defect.
  - At the next process in production – considered an – B Defect.
  - At final inspection – considered an – C Defect.
  - At the customer – considered an – D Defect.

Deploying Containment Measures

- Some problems may require the deployment of containment measures.

- If needed the suspect lot needs to be:
  - Isolated
  - Flagged or otherwise marked

- Other potentially bad lots need to be identified:
  - In process at other internal customers
  - In the warehouse
    - Components
    - Finished goods
    - At the external customer

- Any other material found non-conforming must be isolated and flagged as well.
Deploying Containment Measures

- Dispositioning authority must be notified.
- Planning and Scheduling must be made aware of potential impact.
- If there is an impact to the customer, they must be made aware as well.
- Quality should have already been involved at this point; they of course should be involved.
- Others as necessary (Engineering, Maintenance, etc.).

CLEAR COMMUNICATION UP AND DOWN THE VALUE STREAM IS CRITICAL.

Lean Tool - GEMBA - Go See

- The GEMBA Walk Tool is critical to team formation and problem understanding.
  - No two team members will see a problem the same.
  - Outside the process team member gain a greater understanding from seeing the process in action... opposed to having it explained to them.
  - Outside the process team members typically see things and ask questions that drive a team to greater understanding.
  - GEMBA Walks are the perfect time to use the 5 Why Tool.

- GEMBA Walk Tips:
  - Have an agenda. Know what areas you want to focus on before going into a work area. There will likely be a lot to see as you refine your powers of observation.
Lean Tool - GEMBA - Go See

MAKE SURE TO LOOK AT ALL THE EVIDENCE WITH A CRITICAL EYE...

GEMBA Walk Tips:

- Use a checklist. It is easy to get distracted when you dive into a process. Include a safety scan, morale checks, 6S screening, a once-over on inventory, and maintenance checks on tools.

- Avoid making it a disciplinary walk-through. You’ll see some people problems to fix, but deal with those issues independently of the *gemba* walk. Make this ritual a positive experience for team members so they open up to you.

- Bring paper and pen. Write down findings. Make sketches of what you see. Even if you are a poor artist, you’ll probably get more information packed into a picture than you can by writing paragraphs.

- Act on findings. Some should be dealt with on the spot. Others should be tracked and monitored to provide the basis for an improvement project.
Be creative in using Visual Management methods for building teams.
Lean Tool - Visual Management

VISUAL MANAGEMENT – TEAM BUILDING

WORK CELL LAYOUT SHEET

Andon

Backlog Claims to Next Available Person

Clean Claim Ready for Processing

Clean Claim

Claim to return

Takt Time:

(1 sheet per cell)

Clean Claim

Claim to return

To Backlog

Minimum/Maximum Levels Signals grab your attention!

FOOT PRINTING

What belongs where

CONTROL

Limits Behavior

SHADOW BOARDING

Allows correct response only
Lean Tool – Data Collection Plan

DATA SOURCES

Existing versus New

What data do you have?
What new data is needed?

Determine what you want to know = Y’s.
Determine the factors affecting this = X’s.
Determine what data you have / don’t have?

Lean Tool – Data Collection Plan

ASK THE FOLLOWING QUESTIONS:

• WHAT knowledge is desired about the process?
• WHAT are the potential sources of variation in the process? (X’s)
• WHAT are there cycles in the process?
• WHAT are data elements available? If none, HOW will the data be collected?
• HOW MUCH time is needed to collect data to capture a true picture?
• WHO will be collecting the data?
• HOW will the measurement system be tested?
• HOW are operational definitions being measured and are they detailed enough?
• WHERE could data collection errors occur? HOW will data collection errors be handled?
• HOW will the data be displayed?

THE FOCUS OF DATA IDENTIFICATION & COLLECTION IS ON THE...
WHO-WHAT-WHEN-WHERE- WHY-HOW-HOW MANY!

Adapted from Aries Engineering, LLC – Viewing Work & Business Differently – The Lessons Learned
### Lean Tool – Data Collection Plan

#### SIMPLE DATA COLLECTION TOOL

<table>
<thead>
<tr>
<th>Objective (Why)</th>
<th>Measures Data (What)</th>
<th>Data Collection Method (How)</th>
<th>Data Sources (Where)</th>
<th>Timing (When)</th>
<th>Responsible Party (Who)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achieve a positive reaction to the following:</td>
<td>Survey questions on a scale of 1 to 10</td>
<td>Class evaluation form</td>
<td>Students</td>
<td>At the end of the course</td>
<td>Instructor</td>
</tr>
</tbody>
</table>

**Example:** Measure Lean Course Success

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#### BEYOND THE SCOPE OF THIS COURSE

- Identify Measurement and Variation
- Determine Data Type
- Develop Data Collection Plan
- Perform Measurement System Analysis
- Perform Data Collection
- Perform Capability Analysis

Adapted from Aries Engineering, LLC – Viewing Work & Business Differently – The Lessons Learned
Lean Tool – Data Collection Plan

• Much information comes to us in qualitative form.
  • Task is too expensive or takes too long.

• Data and information is best collected in quantitative form by measurements and can represent:
  • Whether something happened or not (GO – NO GO).
    • Attribute or Discrete Data.
  • Specifics about what happened.
    • Variable or Continuous Data.

Lean Tool – Data Collection Plan

• Variable Data
  • Characterizes a product or process features in terms of a parameter such as...
    • Time
    • Dimensions
    • Weight
    • Temperature

VARIABLE DATA GIVES MORE INFORMATION THAN JUST KNOWING IF A PART IS GOOD OR BAD.
Lean Tool – Data Collection Plan

- Attribute Data
  - The number of times something happens or fails to happen.
  - It is measured as the frequency of occurrence.
  - It is also data that falls into categories such as production line, operating shift, or building location.

<table>
<thead>
<tr>
<th>EXAMPLES OF ATTRIBUTE DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Defects</td>
</tr>
<tr>
<td>Reject Counts</td>
</tr>
</tbody>
</table>

ATTRIBUTE DATA CANNOT BE MEANINGFULLY SUBDIVIDED INTO MORE PRECISE INCREMENTS.

Lean Tool – Data Collection Plan

GENERAL EXAMPLES OF DATA TYPES

<table>
<thead>
<tr>
<th>Qualitative</th>
<th>Quantitative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Attribute</td>
</tr>
<tr>
<td>This car has good acceleration.</td>
<td>Accelerated 0-60 MPH in less than 8 seconds.</td>
</tr>
<tr>
<td>This part is not good.</td>
<td>Does not meet specifications / deadline.</td>
</tr>
<tr>
<td>He / She is very tall.</td>
<td>He/She is tall enough to ride a roller coaster.</td>
</tr>
</tbody>
</table>

WHENEVER POSSIBLE, CAPTURE DATA IN VARIABLE FORM AND CHANGE QUALITATIVE DATA REQUIREMENTS TO QUANTITATIVE DATA REQUIREMENTS.
Lean Tool – Data Collection Plan

**DATA GROUPING / STRATIFICATION**

- A data analysis technique by which data is sorted into various categories in order to surface patterns and uncover differences in processes.

- Purpose: to examine the difference in measurement values between different subgroups in an attempt to understand potential variation.

- Example: From the decennial US Census economists are often breaking out their data based on region, age, ethnicity, etc.

---

Lean Tool – Data Collection Plan

**DATA GROUPING / STRATIFICATION**

- Stratification Considerations. Examples of different sources that might require data to be stratified:
  - Equipment
  - Shifts
  - Departments
  - Materials
  - Suppliers
  - Day of the week
  - Time of day
  - Products

- Survey data usually benefit from stratification.

- Always consider before collecting data whether stratification might be needed during analysis.
  - Plan to collect stratification information.
  - After the data are collected it might be too late.
Lean Tool – Data Collection Plan

**DATA GROUPING / STRATIFICATION**

- How do you decide what characteristics to stratify?
  - Use Critical to “X” (CTXs) as a discriminator.
  - What are the key items from your SIPOC analysis?
  - What does common sense or subject matter expertise tell you?

---

Lean Tool – Data Collection Plan

**DATA GROUPING**

- When applying data stratification, you should consider common factors.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>What Type</td>
<td>Complaints, Defects, Car Models</td>
</tr>
<tr>
<td>When</td>
<td>Year, Month, Week, Day</td>
</tr>
<tr>
<td>Where</td>
<td>Country, Region, City, Work Site</td>
</tr>
<tr>
<td>Who</td>
<td>Business, Department, Individual</td>
</tr>
</tbody>
</table>
Lean Tool - Location Check Sheet

- A defect location check sheet (also known as a defect map or a measles chart) is a structured, prepared form for collecting and analyzing data that provides a visual image of the item being evaluated so that data can be collected visually rather than with words.

- A common practice in quality assurance or even in Six-Sigma is to count the number of defects found.

- One could keep track of the defect rate, and maybe even use an attribute chart to monitor, control, and continuously improve upon defect rates.

Lean Tool - Location Check Sheet

- When to use a Check Sheet.

- When data can be observed and collected repeatedly by the same person or at the same location.

- When collecting data on the frequency or patterns of events, problems, defects, defect location, defect causes, etc.

- When collecting data from a production process.
CONCENTRATION STUDY CHART OR LOCATION CHECK SHEET

MANUFACTURING EXAMPLE

Reject shirts Check Sheet

Shirts rejected

Front

Back

○ = flaw
□ = tear
△ = mark

Date: 22 - May
Batch: 23

Lean Tool - Location Check Sheet

CONCENTRATION STUDY CHART OR LOCATION CHECK SHEET

HEALTHCARE EXAMPLE

Accident Location and Frequency Related to Chain Saw Use in 1999

Head area - 2,886
Upper body - 2,452
Hand area - 10,200
Upper leg, knee, lower leg - 10,310
Foot area - 1,872
Total - 28,543
Lean Tool - 5 Why’s

- Very useful technique during both the GEMBA / Process Mapping / Cause & Effect Diagram / Failure Modes Effects Analysis (FMEA) and others.
  - Responses help build up several other tools.

- Effective questioning method: “Why?”
  - Open ended; answers can be very informative.
  - Single best question for process improvement.

- May only require 2-3 “Why” questions to get to the root cause, but more often 4-5.

- When the response is “because that’s the way it is” you’ve reached a root cause.
  - Typically some policy or other accepted standard.
  - May lead to a follow-on investigation, including another series of “5 Whys” with someone else.
Lean Tool - 5 Why’s

• Thought is that asking “why?” 5 times will usually take you to the root cause level.

• Can be more or less than 5; 5 is a general rule.

• If your 5 Why is done well, you should be able to start at the last (5th) answer and work your way back up stating, “Therefore,”

• Never assume an answer in the question...as in...
  • “Why don’t the employees follow the inspection method?”
  • Unless that’s the answer to the previous level question.

• You can have more than one branch, if there are several potential “whys.”
  • Let’s look at an example.

Lean Tool - 5 Why’s Scenario

• Joe was crossing the street carrying three packages.

• He tripped on a barrier and sprained his ankle.

• Investigate why he sprained his ankle.
**Cause & Effect Principle**:
For every effect there are causes.

**Lean Tool - 5 Why’s Scenario**

- Sprained Ankle
- Tripped on Barrier
- Stepping Over Barrier
- Carrying Boxes
- Going to Station #4

**Terminology – Waste vs. Variation**

**ANOTHER DESCRIPTIVE TERM FOR WASTE WOULD BE PROCESS VARIATION!**

- In lean there are 8 defined wastes... and there are 2 defined variations.
  - Common Cause Variation
  - Special Cause Variation

- In an environment where you are producing goods, **Common Cause Variation** is typically related to machines, design and the process.
  - An oven which has temperature variation, causing variation in heat treat outcome.
  - A drill press, which from wear has some issues holding concentricity due to wobble. Hole ranges from nominal to slightly oversized.
  - One operator uses high pre-heat on a cutting operation, another does not (standardization/operation issue).
    - Result is slightly different dimensions on cut parts.
Terminology – Waste vs. Variation

**IN THIS COURSE WE WILL FOCUS ON TRUE PROCESS VARIATION AS WASTE**

**OBSERVED PROCESS VARIATION**

**TRUE PROCESS VARIATION**

Processes That Produce a Product May Vary

**MEASUREMENT VARIATION**

**GAGE VARIATION**

**REPEATABILITY**

**BIAS**

**REPRODUCIBILITY**

**STABILITY**

**LINEARITY**

Process of Obtaining Measurements and Data May Vary and Produce Defects.

Measurement System Analysis (MSA) – a Six-Sigma Tool – Would Be the Path To Follow In This Case

---

**Terminology – Waste vs. Variation**

- **Common Cause Variation** in the Service Industry.
  - In an insurance industry, two adjusters are using two separate criteria for claims resulting in differences in payouts.
  - A more experienced Customer Service Representative (CSR) can look up the information more quickly, which gives a significantly shorter time on hold for customer.
  - Less proficient data entry clerks with higher levels of typing errors (transposition of numbers) resulting in non-delivery to intended addressee.
Terminology – Waste vs. Variation

• **Special Cause Variation** is due to unusual circumstances.  
  *It’s generally harder to find simply because it doesn’t occur that often.*

• Examples:
  
  • An new operator, who is not aware of procedure, fills the fountain solution tank in a printing operation with city water, not from the proper valve. The printing press crew fights ink/water balance issues all night.
  
  • Purchasing picks a new supplier of steel based on pricing. The old supplier ran to high side of industry tolerance, new supplier runs low. Fit up in assembly is now off.
  
  • A bent drill bit which should have been discarded is chucked up in the drill. An oversized hole results.

Terminology – Waste vs. Variation

• **Special Cause Variation** in the Service Industry.
  
  • The computer is down, so the Customer Service Representative (CSR) has to submit manual order tickets, making call times longer.
  
  • A Doctors handwritten prescription is hard to read, wrong medicine administered (this is extremely serious, so had better be specially assigned cause and not a routine occurrence).
Terminology – Waste vs. Variation

• How do we actually go about identifying and eliminating waste and variation in process?

• From a lean standpoint, we need to attack the problem using tools – techniques – methodologies proven for waste and process variation elimination.
  • Under lean, waste takes on a very specific meaning – in fact, 8 types of waste.

• Lean Tools such as...
  • GEMBA (observation)...
  • Data Collection (validation)...
  • 5 Why’s (root cause identification)...
  • Value Stream Mapping (process variation)... just to name a few.

• There are other methodologies such as Six-Sigma, but the scope of this training concentrates on Lean and TPS.

Terminology – Meet the 8 Wastes

OVERPRODUCTION  MOTION  DEFECTS  EMPLOYEE INJURIES
OVER-PROCESSING  WAITING/BOTTLE NECK  TRANSPORTATION  INVENTORY
Transportation Waste Defined

• Transportation comprises any movement involved in bringing materials or tools to the desired work area.
  • Some transportation is “necessary” but always treat it as a waste so that alternatives can be considered.

• Real life example of transportation elimination:
  • Some suppliers introduce materials right onto the shop floor at point of use, rather than warehousing it.
  • This takes advantage of “Just in Time” manufacturing principles and often utilizes a “kan-ban” system.

Inventory Waste Defined

• Why is inventory considered a waste?
  • Tying up capital in unsold parts or unsalable part.
  • Taking up floor space.
  • Makes for greater amounts of waste due to damage and spoilage.

• Idea is to have the minimum amount for reasonable usage.
Motion Waste Defined

• Motion is different from transportation in that it focuses on the person.

• Particularly related to ergonomics:
  • Lifting
  • Body twisting
  • Bending
  • Repetitive motion
  • Travel to retrieve items

Waiting Waste Defined

• Waiting is one of the more obvious wastes.

• It occurs whenever we are waiting for any resource:
  • Material
  • Tools or equipment
  • People
  • Another process to finish before we can start ours (can be ahead or behind)
Over-Production Waste Defined

• Over-production is producing more than is needed by the customer.
  • All of the wastes of inventory, plus:
  • Over-production can cut into other allocated resource time.
  • Over-production can deplete materials allocated to other jobs.

• Over-production is considered the worst waste because it creates other wastes:
  • Creates more inventory.
  • Can create waiting because we’re tying up resources making what we don’t need.
  • Can create scrap through obsolescence.

Over-Processing Waste Defined

• Repetitive steps or unnecessary steps:
  • Someone writes data on a sheet that is taken to someone else to type it into a Database.
  • Shot blasting the rust off of a part, setting it outside where it gets rusty, then having to shot blast it a second time.
  • Multiple inspection stations in a process.
Defects Waste Defined

• The other very obvious waste:
  • Does not conform to customer requirements therefore:
    • Is scrap
    • Requires rework
  • Remember, having to fill out paperwork to disposition the mess and the rework (if that’s the solution) make for over-processing waste.

Injuries Waste Defined

• Simply the loss of human potential.

• There are costs and countermeasures associated with lost-time injuries.

• All have a direct impact to production efficiency.
  • Remember, having to fill out paperwork associated with loss time injuries makes for over-processing waste.
Lean Tool – 6S

• 6S is a systematic approach to workplace organization.
  • But, it’s also much more than that.

• 6S is about efficiency, competitiveness and survival.
  • It is a deceptively simple system that creates an organized and productive workplace.

• 6S is not just about cleaning up and eliminating toolboxes.
  • 6S creates a workplace environment that can adapt and succeed.
  • Chaos and unproductivity are your enemies.
  • Organization and efficiency are your allies.

• The true power of 6S reveals itself when your whole organization embraces its ideals and your employees see that your business is transforming itself.

Lean Tool – 6S

1: **SORT**
   (get rid of what’s not needed)

2: **SET IN ORDER**
   (organize what belongs)

3: **SYSTEMATICALLY CLEAN**
   (clean up, see & solve problems)

4: **SAFETY**
   (see and fix unsafe conditions)

5: **STANDARDIZE**
   (who does what to keep it up)

6: **SUSTAIN**
   (be disciplined...keep it orderly)

BEFORE

AFTER

LET'S BREAKDOWN THE DIFFERENT ELEMENTS OF 6S
Lean Tool – 6S – Sort

• Sort is the first of the 6S’s.

• Concentration is on Sorting out the equipment or items which are:
  • No longer in use...
  • Need repair...
  • Are broken beyond repair.

• Items should be moved to a “red tag” area for review.

Lean Tool – 6S – Set In Order

• The catchphrase for this S is, “A place for everything, everything in its place.”

• Every single item is evaluated for:
  • How often used...
  • Weight...
  • Size.

• Based on these factors, placed in best spot for usage and ergonomics.

• Becomes a dedicated spot, either labeled or shadow board.
  • In manufacturing, includes raw materials, pallets and other consumables.
Lean Tool – Systematically Clean – Sweep and Shine

- Very straightforward title – but there are underlying reasons for the “deep clean.”
  - If a machine is dirty, you often can’t see it leak oil.
  - A machine leaking oil is a problem.
  - Clean it so you can see the leak, then fix the leak!
  - Dirty filters cause loss of effectiveness, or not work at all.
  - Bad for people if air filter is not functioning, bad for machine if its not keeping dust out of motor.
  - Clean the filter or replace!

Lean Tool – 6S – “Safety”

- Safety in facilities and work methods should never be far from an improvement teams mind.
  - Lost time injuries should be considered a waste of valuable human potential.

- In a rush to improve, safety can become an afterthought.

- OSHA and Industry compliance requirement are set in stone so why not use the 6S methodology to advocate and track safety compliance.
  - Keep in mind the organizations Safety Department can provide additional valuable resources in your strategic improvement activity.

Keep SAFETY Compliance in the Loop!
Lean Tool – 6S – Standardize

• In this step, now we want to make schedules for the activity we’ve done:
  • How often do we clean/replace filters?
  • Who takes on this function? Make it rotational.
  • When will it be done? Typically at end of work day – 15 minutes of concentrated cleaning activity.
  • Scheduling board is a good way to do this – everyone can see.
  • Cleaning stations with everything laid out (using the 2nd S).

Lean Tool – 6S – Sustain

• In order to keep the gains made in the other phases, we now use an audit system to ensure that all of the standardized tasks are being done.
  • This should be visual for everyone to see – accountability.

• This is very important in the ideology of continuous improvement.
  • You can’t continuously improve unless you sustain what you have.
Lean Tool – 6S

• Just to be clear...

• Be on the lookout for creative 6S Work Cell designs...

Terminology – Process Flow

• What is a Process Flow?
  • The continuous, progressive adding of Value in the eyes of the customer.
    • Or, the steps in a process from start to finish.

• How is a Process Flow measured?
  • **Cycle Time**: Time that elapses between one part coming off the process to the next part coming off process.
    • The time it takes for one widget to complete the process once it is started.
  • **Lead Time**: The total time from customer order to delivery of the desired product or service.
Terminology – Process Flow

• Cycle Time vs. Lead Time Example:
  • You go to Good Burger for lunch. Upon entering the restaurant, the young woman behind the counter asks, “How may I help you?”
  • After a few moments, you order a cheeseburger.
  • Two minutes after the order is placed, the order is sent to the back.
  • Three minutes later, the fry-cook begins making the cheeseburger.
  • The cheeseburger takes 2 minutes to cook and deliver to the young woman.
  • The young woman delivers the cheeseburger to you 30 seconds later.


<table>
<thead>
<tr>
<th>FLOW TIME</th>
<th>MANUAL CYCLE TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Similar to cycle time, but for all products.</td>
<td>• Time it takes to complete one step of the process.</td>
</tr>
<tr>
<td>• 24 Hour Clock.</td>
<td>• Uses an 8 hour clock.</td>
</tr>
<tr>
<td>• Begins upon request for service.</td>
<td>• Begins when a product is handed off from one step to the next.</td>
</tr>
<tr>
<td>• This clock does not stop, includes non-workdays.</td>
<td>• Does not include non-workdays, does not include wait time.</td>
</tr>
</tbody>
</table>

FOUR STEP PROCESS TO DELIVER 20 PRODUCTS

Flow Time: 30 Hours

FT: 30 Hours * 20 = 600 Hours
Total MCT: 5.7 Hours * 20 = 114 Hrs

Step 1
MCT: .5 Hours

Step 2
MCT: .7 Hours

Step 3
MCT: 2 Hours

Step 4
MCT: 2.5 Hours

Lean Tool – Takt Time

• Takt as stated is producing at the rate of customer demand.

• What does this mean, and why would we want to do this?

• It’s basically the reasons we don’t like over-production (one of the 8 wastes).
  • We only spend money for raw materials and/or components that we actually need.
  • We don’t tie up resources (machines, people) which could be utilized for different purposes.
  • Now let’s figure out Takt Time:
Lean Tool – Takt Time

• This is the formula we use to calculate the actual rate at which we need to produce:

\[ \text{Takt Time (same measure as time period)} = \frac{\text{Available time period}}{\text{customer demand}} \]

• So if the customer wants 500 pieces today.
• And we have 5 available production hours.
• Takt time = 36 seconds.

Lean Tool – Takt Time

• **Takt Time** is an adjustable time unit used to synchronize the rate of production with the rate of demand.

• Again, computed by dividing available production by the number of items to be produced.
  • Takt time provides a precise rhythm to run an entire process sequence that maximizes efficiency whereas minimizing waste.

• **Time available for work in given time period... or...**
  • The speed at which an area needs to operate during normal working hours in order to meet customer demand.
  • Takt time is independent of process capability and cycle time.
Lean Tool – Takt Time

- Example from our Flow Time / Cycle Time slide:
  - FT: 600 Hours; MCT: 114 Hours; Products Required: 20;
  - Must be delivered in 60 days (for simplicity, we are assuming we work weekends).
  - Lean uses 80% capacity, leaves 20% for meetings, breaks, phone calls, etc.

\[
TAKT = \frac{60 \times (8\times 0.8)}{20} = \frac{60 \times 6.4}{20} = 384 \div 20 = 19.2 \text{ Hrs.}
\]

- This calculation shows we need to produce 1 item every 19.2 Hours in order to meet demand.

Lean Tool – Takt Time – Bar Chart

![Bar Chart Image]
Takt Time can create confusion...

So if in the previous example we only have to run 100 pieces an hour, but the machine typically runs at 500 pieces an hour, does that mean I slow down the machine?

No! but we don’t want to produce more than we need, either.

So rather than run the machine for 5 hours at 500 pc/hr which gives us 2,500 pieces, we’re only going to run it for one hour and stop.

Common hindrance: cost accounting has priced the item based on a maximum set-up cost, which dictates the lot size.

Example...
  • Set up costs $100 based a one hour, one person set-up.
  • Cost accounting says based on the price of the item, the set-up cost should contribute no more than $.10 to the total cost. Therefore, the minimum lot size needs to be 1,000 pieces.
  • So how can we get closer to lean production if the customer only needs 500?

In this case, we need to target the set-up as an opportunity.
  • If we can reduce the set-up time to half an hour, then we can produce a lot size of 500 without raising the cost.
Terminology – Work in Progress

- Work In Progress (WIP) – is material that has entered the production process but is not yet a finished product.
  - Refers to all materials and partly finished products that are at various stages of the production process.
  - WIP excludes inventory of raw materials at the start of the production cycle and finished products inventory at the end of the production cycle.
- Most companies strive to keep the actual amount of WIP as low as possible, so as to reduce the amount of capital tied up in the production or manufacturing process.
  - Another reason to keep WIP low is to reduce the risk of obsolescence, especially in fast-moving sectors such as technology and consumer electronics.

Terminology – Work in Progress

- Work in Progress (WIP) are the unfinished products that reside within the process.

Areas of Work In Progress / Potential Bottlenecks
Standardized work is one of the most powerful but least used lean tools.

By documenting the current best practice, standardized work forms the baseline for Kaizen or continuous improvement.

As the standard is improved, the new standard becomes the baseline for further improvements, and so on.

Improving standardized work is a never-ending process.

• Standard Work:
  • The agreed-upon set of work procedures that establish the best and most reliable methods and sequences for each process and each worker.
  • Flexible enough to meet customer demand.

• Includes...
  • A prescribed sequence of steps.
  • Assigned to a single person.
  • Balanced to takt time.
  • With a standard work-in-progress level.
  • Represents the current best practice.

NOT YOUR TRADITIONAL STANDARD OPERATING PROCEDURE!!!
Lean Tool – Standard Work

• Standard work provides a reference for auditors.

• Should be used as the training document for new workers.

• Make as visual as possible, succinct.
  • Pictures aid people, especially those who are ESL or have difficulty reading.

• Basically, standardized work consists of three elements:
  • Takt time, which is the rate at which products must be made in a process to meet customer demand.
  • The precise work sequence in which an operator performs tasks within takt time.
  • The standard inventory, including units in machines, required to keep the process operating smoothly.

Lean Tool – Standard Work

• Standard Work is monitored / controlled / improved with three basic standards forms.

• Production Capacity Sheet.

• Standardized Combination Table.

• Standardized Work Chart.

• Plus visual controls.

The Three Documents of Standardized Work

• Production capacity sheet
• Standardized combination table
• Standardized work chart
## Lean Tool – Standard Work

### ADDRESSED IN STANDARD WORK

<table>
<thead>
<tr>
<th><strong>Elements</strong></th>
<th><strong>Operations</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Safety</td>
<td>• Cycle Time</td>
</tr>
<tr>
<td>• Takt Time</td>
<td>• Work Sequence</td>
</tr>
<tr>
<td>• Ergonomics</td>
<td>• Standard Inventory</td>
</tr>
<tr>
<td>• Parts Flow</td>
<td></td>
</tr>
<tr>
<td>• Maintenance</td>
<td></td>
</tr>
<tr>
<td>• Routines</td>
<td></td>
</tr>
<tr>
<td>• Quality or Inspection Points</td>
<td></td>
</tr>
</tbody>
</table>

### Communicating Change Through Standard Work

**ESSENCE OF STANDARD WORK**

- **Consistency** – do it the same way every time!
- **Best Practice** – this is developed with input from the team:
  - Process optimization...
  - Variability reduction...
  - Safe and most efficient method for the worker.
- **Standard Work** provides a **benchmark** so that you know when something is not in order:
  - Not as a punitive standard!
  - Help your team member get back to standard and discover cause of problem.
Terminology – Value Added vs. Non-Value Added

- The central difference between a value-added cost and a non-value-added cost is...
  - A value-added cost is money spent that increases a customer’s perception of the value of a given product or service.

- Value-added activities provide a number of benefits to your business, but some non-valued-added expenses are necessary.

- A value-added cost normally contributes to a significant change in the form, fit, style, visual appeal or function of a product or service.
  - Paying for a large-sized product, adding customized options to your solutions and developing more environmentally-friendly goods are examples of value-added activities that change the nature of your offering.
  - Paying for patent development and registration benefits your business, but doesn’t change the form of your solution.
Terminology – Value Added vs. Non-Value Added

SIMPLY STATED

**VALUE ADDED**

The Customer:

• Wants it **AND**...
• It Changes Form, Fit or Function **AND**...
• It is done right the first time.

**NON-VALUE ADDED**

The Customer:

• Does Not want it **OR**...
• It **Does Not** Change Form, Fit or Function **OR**...
• It is **Not Done** right the first time.

Remember a Non-Value Added Step May Still Be Necessary!

Lean Tool - Value Stream Mapping

• **Value Stream Mapping (VSM)** is also known as Process Mapping or Flow Charting.

• It is one of the oldest, simplest and most valuable techniques for streamlining work.

• Is best executed by experienced facilitators.

• Some of the benefits (outputs) of Value Stream Mapping are:
  • Spotlights on waste.
  • Streamlines work processes.
  • Defines and standardizes.
  • Promotes deep understanding.
  • Builds consensus.

A FREE PDF COPY OF THE BOOK “LEARNING TO SEE” FROM LEAN ENTERPRISE INSTITUTE CAN BE OBTAINED AT THE FOLLOWING LINK...

Lean Tool - Value Stream Mapping

- VSM is a technique that compares how long it would take to theoretically produce one piece for a customer vs. the time it currently takes to produce a part.
  - We have to count the time items spend in inventory.
  - i.e. if the customer requires 10 parts a day, and we’ve produced a lot of 100, then we have 10 day’s worth of inventory.
  - So, it takes 10 days where making a single part might only take 4 minutes.

- We actually physically check the inventory for “families” of parts as each part has its own value stream.
Lean Tool - Value Stream Mapping

**WHAT IS THE GOAL OF MAPPING THE VALUE STREAM?**

• We can use the mapping process to create 3A and enable 3D.

• We use the Value Stream Map to identify and correct areas of “bottlenecks” or constraints to the process.

• As we “lean” out the process, bottlenecks should shift to other areas; we then work on those areas.

• A critical component to success depends on understanding customer demand requirements.
  • Producing at the rate of customer demand (*Takt Time*).

Lean Tool - Value Stream Mapping

• A VSM visually depicts the sequence of events to build a product or produce an outcome.

• It may include additional information such as cycle time, inventory, and equipment information.

• The purpose of VSM is to use diagramming to understand the process we currently use and ask what is expected of us...
  • What should we be doing to provide better customer focus and satisfaction.

• It will identify what best practices we need to incorporate and find appropriate benchmarks for measuring how we can arrive at better ways of communicating our services.
Lean Tool - Value Stream Mapping

WHY MAP THE PROCESS?

• Find mistakes which require extra processing, rework, or downstream errors.
• Uncover where people are working on low priority items at the wrong time, or completely non-value added items.
• Discover processing steps which really aren’t needed.
• Show where employees, information or goods move from one place or another without any purpose.
• Identify where people in the downstream activity are waiting because upstream activity has not delivered, or products are waiting in process (WIP).
• Show steps that ultimately don’t meet the need of customer.

BUT DOESN’T EVERYBODY ALREADY KNOW THE PROCESS?

• You might be surprised to learn that they usually don’t!
  • Every person at the mapping activity may be an expert in the process under investigation, but.....
    • No two people have the same view of the process flow.
    • This is particularly true of information flow streams.

• Mapping the process gets all the team members referring to the process steps in the same terms (3A-3D).
  • Improvement is greatly facilitated when everyone shares similar context.
Lean Tool - Value Stream Mapping

CONSTRUCTING A VALUE STREAM MAP / PROCESS FLOWCHART

Step 1: Determine the Boundaries
  • Where does a process begin?
  • Where does a process end?

Step 2: List the Steps
  • Use a verb to start the task description.
  • The flowchart can either show the sufficient information to understand the general process flow or detail every finite action and decision point.

Step 3: Sequence the Steps
  • Use post-it notes so you can move tasks.
  • Do not draw arrows until later.

Step 4: Draw Appropriate Symbols
  • Ovals show input to start the process or output at the end of the process.
  • Boxes or rectangles show task or activity performed in the process.
  • Arrows show process direction flow. Process - use subsets of processes in series or parallel.
  • Diamonds show points in the process where a yes/no questions are asked or a decision is required.
  • Usually there is only one arrow out of an activity box. If there is more than one arrow, you may need a decision diamond.
  • If there are feedback arrows, make sure feedback loop is closed; i.e. it should take you back to the input box.

Step 5: System Model
  • Draw charts using system model approach.
  • Input - use information based upon people, machines, material, method, and environment.
  • Process - use subsets of processes in series or parallel.
  • Output - use outcomes or desired results.
  • Control - use best in class business rules.
  • Feedback - use information from surveys or feedback.

Step 6: Check for Completeness
  • Include pertinent chart information, using title and date for easy reference.

Step 7: Finalize the Flowchart
  • Ask if this process is being run the way it should be.
  • Are people following the process as charted?
  • Do we have a consensus?
  • What is redundant; add what is missing.
Lean Tool - Value Stream Mapping

**BE SURE TO...**

- Go down far enough to see the waste...
- To show the rework loops...
- Complete the trigger tickets and other data collection...
- Capture all the steps...
- Reference or post policies, procedures at the proper steps...
- Be consistent in displaying data (hrs, minutes, days)...
- Remember flow days are always 24 hours and 7 days...
- Remember Manual Cycle Time (MCT) is always 8 hours or 5 days...

Lean Tool - Value Stream Mapping

- Follow the Mapping Process!!!
  - Remember that mapping and analysis is a process.
  - Avoid short-cuts... the steps are important!
  - Remind yourself and your team to be disciplined.

- Keep your ears open for...
  
  "We can skip this step"
  "We already know how we want to do this"
  "Let's not worry about that for now"
## Lean Tool - Value Stream Mapping

### TYPICAL PROCESS MAPPING ACTIVITY AGENDA

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kickoff / Intro / Intent / Purpose (3A)</td>
<td>Map Current State</td>
<td>Define Value Added / Non-Value Added Steps</td>
<td>Spaghetti Diagram Process Flow</td>
<td>Brainstorm Ideal State</td>
</tr>
<tr>
<td>Explain the Fundamentals / Team Objectives / Goals (3A)</td>
<td>Define Value Added / Non-Value Added Steps</td>
<td>Spaghetti Diagram Process Flow</td>
<td>Paradigm / Flow / 6S / Pull Training</td>
<td>Map Future State</td>
</tr>
<tr>
<td>Training / Determine the Level of Team Experience (3A)</td>
<td>Spaghetti Diagram Process Flow</td>
<td>Paradigm / Flow / 6S / Pull Training</td>
<td>Obstacles to Implementation Discussion</td>
<td>Map Future State</td>
</tr>
<tr>
<td>Develop Map Header (3D)</td>
<td>Spaghetti Diagram Process Flow</td>
<td>Paradigm / Flow / 6S / Pull Training</td>
<td>Obstacles to Implementation Discussion</td>
<td>Revisit Goals / Are We On Track</td>
</tr>
<tr>
<td>Determine Ideal Goal (3D)</td>
<td>Map Future State</td>
<td>Obstacles to Implementation Discussion</td>
<td>Revisit Goals / Are We On Track</td>
<td>Map Future State</td>
</tr>
<tr>
<td>Establish Must Haves / Data and Information (3D)</td>
<td>Map Future State</td>
<td>Obstacles to Implementation Discussion</td>
<td>Revisit Goals / Are We On Track</td>
<td>Map Future State</td>
</tr>
<tr>
<td>Measurements / How Will We Know We Improved (3D)</td>
<td>Map Future State</td>
<td>Obstacles to Implementation Discussion</td>
<td>Revisit Goals / Are We On Track</td>
<td>Map Future State</td>
</tr>
<tr>
<td>Define Process Inputs / Outputs (3D)</td>
<td>Map Future State</td>
<td>Obstacles to Implementation Discussion</td>
<td>Revisit Goals / Are We On Track</td>
<td>Map Future State</td>
</tr>
<tr>
<td>GEMBA–Go See–Data/Observations (3D)</td>
<td>Map Future State</td>
<td>Obstacles to Implementation Discussion</td>
<td>Revisit Goals / Are We On Track</td>
<td>Map Future State</td>
</tr>
<tr>
<td>Day 1 Hot Wash-Up / Review</td>
<td>Map Future State</td>
<td>Obstacles to Implementation Discussion</td>
<td>Revisit Goals / Are We On Track</td>
<td>Map Future State</td>
</tr>
</tbody>
</table>

Adopted from Aries Engineering, LLC – Viewing Work & Business Differently – The Lessons Learned

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## Lean Training

Fundamental Concepts and Practices

### LEAN TOOLS WITHIN TOOLS

The previous module reviewed some of the basic tools & techniques to start your Lean journey.

Now let's take a deeper dive into the tools & techniques and look at the "Tools Within the Tools" to advance your transformational journey.

*These tools would be used in support of a Value Stream Mapping Process.*
Lean Tools - Within the Tools

- As tools and techniques such as GEMBA and 5 Why’s support Data Collection efforts... there are several tools and techniques utilized to support or create greater understanding within a Value Stream Mapping effort.

- For example...
  - Trigger Tickets...
  - SIPOC Diagram...
  - RACI Tool...
  - Spaghetti Diagram...
  - Pareto Diagram...
  - Cause & Effect Diagram...
  - Work Cell Design...
  - FMEA...
  - X-Y Prioritization Matrix...
  - Measurement System Analysis (MSA)...

LET’S EXPLORE A FEW OF THESE

Lean Tools - Within the Tools

MAPPING DATA TICKETS

- A data collection tool used to gather specific processing data during Value Stream Mapping.

- Place a trigger ticket under each step in the process for both Current State and Future State maps.

<table>
<thead>
<tr>
<th>Step Number</th>
<th>Process Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand</td>
<td>How many items the customer wants per ___</td>
</tr>
<tr>
<td>Trigger</td>
<td>What tells you to begin this step?</td>
</tr>
<tr>
<td>Done</td>
<td>What tells you the step is finished?</td>
</tr>
<tr>
<td>Flow Time</td>
<td>Entire time it takes to complete step? (There are 24 hours in a day and in FLOW TIME)</td>
</tr>
<tr>
<td>Manual Cycle Time</td>
<td>Actual time working on the product</td>
</tr>
<tr>
<td>People</td>
<td>Number of people required to complete the step?</td>
</tr>
<tr>
<td>Shifts</td>
<td>How many places this step is performed</td>
</tr>
<tr>
<td>No. Defects</td>
<td>Number of defects per unit time (% defective may also be accepted)</td>
</tr>
<tr>
<td>WIP</td>
<td>How many items have been started but not completed</td>
</tr>
<tr>
<td>Distance Traveled</td>
<td>Use standard method for all data blocks. This could be Personnel or Product travel.</td>
</tr>
<tr>
<td>Changeover</td>
<td>Time between last step of current job to first step of next job</td>
</tr>
<tr>
<td>Flow Stoppers</td>
<td>Problems that keep you from doing your job</td>
</tr>
</tbody>
</table>

Adopted from Aries Engineering, LLC – Viewing Work & Business Differently – The Lessons Learned
Lean Tools - Within the Tools

**SIPOC**

- A SIPOC identifies - Supplies / Inputs / Process / Outputs / Customers
  - The SIPOC allows the team to identify its stakeholders within the process.
  - SIPOC creates understanding among team members unfamiliar with the process.

<table>
<thead>
<tr>
<th>SUPPLIERS</th>
<th>INPUTS</th>
<th>PROCESS</th>
<th>OUTPUTS</th>
<th>CUSTOMER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

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**RACI TOOL - ROLE & RESPONSIBILITY CHARTING**

<table>
<thead>
<tr>
<th>LIST TASK BELOW</th>
<th>MOM</th>
<th>DAD</th>
<th>JOHN</th>
<th>SALLY</th>
<th>BOBBIE</th>
<th>KIDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed The Dog</td>
<td>A</td>
<td>C</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Play With The Dog</td>
<td>I</td>
<td>I</td>
<td>A</td>
<td></td>
<td></td>
<td>R</td>
</tr>
<tr>
<td>Take Dog To Vet</td>
<td>R</td>
<td>A / R</td>
<td>A / R</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morning Walk</td>
<td>C</td>
<td></td>
<td>A / R</td>
<td></td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>Evening Walk</td>
<td>C</td>
<td></td>
<td>A / R</td>
<td></td>
<td></td>
<td>R</td>
</tr>
<tr>
<td>Wash Dog</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean Up Mess</td>
<td>C</td>
<td>A</td>
<td>R</td>
<td></td>
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</tr>
</tbody>
</table>

RACI - used to document task assignments and as a visual communication tool.
Lean Tool - RACI Defined

**RACI TOOL - ROLE & RESPONSIBILITY CHARTING**

- **“R” = RESPONSIBLE… (“The Doer”)**
  - The “doer” is the individual(s) who actually completes the task.
  - The “doer” is responsible for action/implementation.
  - Responsibility can be shared.
  - The degree of responsibility is determined by the individual with the “A”.

- **“A” = ACCOUNTABLE… (“The Buck Stops Here”)**
  - The accountable person is the individual who is ultimately answerable for the activity or decision.
  - This includes “yes” or “no” authority and veto power.
  - Only one “A” can be assigned to an action.

- **“C” = CONSULT… (“In the Loop”)**
  - The consult role is individual(s) (typically subject matter experts) to be consulted prior to a final decision or action.
  - This is a predetermined need for two-way communication.
  - Input from the designated position is required.

- **“I” = INFORM… (“Keep in the Picture”)**
  - This is individual(s) who needs to be informed after a decision or action is taken.
  - They may be required to take action as a result of the outcome.
  - It is a one-way communication.
Lean Tools - Within the Tools

SPAGHETTI OR CIRCLE DIAGRAM TOOL

- A diagram representing the physical path taken by a product (or service) as it travels through all the steps required to transform a requirement into a deliverable.
- This can also be used to draw the path walked by those involved in completing the required activities to deliver the product (or service).
- The diagram derives its name from the way it commonly looks after mapping a process that within a function-based organization because the diagram looks much like a plate of spaghetti.

A circle diagram is a visual tool that shows all of the handoffs within the process.

Lean Tools - Within the Tools

PARETO ANALYSIS TOOL

- Team Problem Statement and Process Mapping, coupled with other tools and data collection provide for areas of improvement focus.

- Next you need to rank your problems in order of importance.

- For example, if your Problem Statement wants you to reduce non-conformances on a production line
  - Which non-conformances are the greatest?
  - Or perhaps the most costly?
Lean Tools - Within the Tools

**PARETO ANALYSIS TOOL**

- Pareto is a simple visual chart to show the relative make-up of studied categories by a variable metric.
  - Type of histogram.
  - It is used to rank problems.

- Named after Vilfredo Pareto.
  - He observed and reported the 80/20 rule.

- **DEFINITION of 80/20 Rule**
  - A rule of thumb that states 80% of outcomes can be attributed to 20% of the causes for a given event.
  - In business, the 80-20 rule is used to help managers identify problems and determine which operating factors are most important and should receive the most attention based on an efficient use of resources.

Lean Tools - Within the Tools

**PARETO ANALYSIS TOOL**

- The 80/20 Rule can be applied to almost anything:
  - 80% of customer complaints arise from 20% of your products and services.
  - 80% of delays in the schedule result from 20% of the possible causes of the delays.
  - 20% of your products and services account for 80% of your profit.
  - 20% of your sales-force produces 80% of your company revenues.
  - 20% of a systems defects cause 80% of its problems.
Lean Tools - Within the Tools

**PARETO ANALYSIS TOOL**

- Pareto charts do not actually identify the root cause, but they direct you to what should be worked on first.

**Pareto Analysis** is a simple technique for prioritizing problem-solving work so that the first piece of work you do resolved the greatest number of problems.

![Pareto Diagram](ParetoDiagram.png)

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Lean Tools - Within the Tools

**PARETO ANALYSIS TOOL**

- The value of the Pareto Principle for a project manager is that it reminds you to focus on the 20% of things that matter.

- Of the things you do during your project, only 20% are crucial.

- Those 20% produce 80% of your results.

- Identify and focus on those things first, but don't entirely ignore the remaining 80% of causes.
Lean Tools - Within the Tools

HOW DO YOU INTERPRET THIS DATA?

What about now?

Lean Tools - Within the Tools

WHAT ABOUT THIS DATA?

Note: Downtime costs the same, regardless of the type of event.

but frequency doesn't equal cumulative down time!
Lean Tools - Within the Tools
WRAP UP ON PARETO AND GRAPHS

• Helps us to identify the “worst of the worst”
  • Can be used to identify frequency, time or money, whichever makes the most sense.

• As items lessen on the chart, new ones take their place or old ones move to top of list – update frequently!

• When to Use a Pareto Chart:
  • When analyzing data about the frequency of problems or causes in a process.
  • When there are many problems or causes and you want to focus on the most significant.
  • When analyzing broad causes by looking at their specific components.
  • When communicating with others about your data.

Lean Tools - Within the Tools
POKA-YOKE - MISTAKE PROOFING FUNCTION

• What is it?
  • Ideally, poka-yokes ensure that proper conditions exist before actually executing a process step, preventing defects from occurring in the first place.
  • Where this is not possible, poka-yokes perform a detective function, eliminating defects in the process as early as possible.

• Why is it important?
  • Poka-yoke helps people and processes work right the first time.
  • Poka-yoke refers to techniques that make it impossible to make mistakes.
  • These techniques can drive defects out of products and processes and substantially improve quality and reliability.
Lean Tools - Within the Tools

POKA-IYOE - MISTAKE PROOFING FUNCTION

• Used as an extension of other tools.
  • More often than not deploying mistake proofing measures is an extension of a Pareto Analysis and/or a Failure Mode effect Analysis (FMEA).
  • Toyota has an average of 12 mistake-proofing devices at each workstation and a goal of implementing each mistake-proofing device for under $150.

• When to use it?
  • Poka-yoke can be used wherever something can go wrong or an error can be made.
  • It is a technique, a tool that can be applied to any type of process be it in manufacturing or the service industry.

Lean Tools - Within the Tools

POKA-IYOE - MISTAKE PROOFING FUNCTION

• Errors are many types...

1. PROCESSING ERROR:
   Process operation missed or not performed per the standard operating procedure.

2. SETUP ERROR:
   Using the wrong tooling or setting machine adjustments incorrectly.

3. MISSING PART:
   Not all parts included in the assembly, welding, or other processes.

4. IMPROPER PART/ITEM:
   Wrong part used in the process.

5. OPERATIONS ERROR:
   Carrying out an operation incorrectly; having the incorrect version of the specification.

6. MEASUREMENT ERROR:
   Errors in machine adjustment, test measurement or dimensions of a part coming in from a supplier.
Lean Tools - Within the Tools

POKA-YOKE - MISTAKE PROOFING FUNCTION

• Step by step process in applying Mistake Proofing:
  1. Identify the operation or process - based on a Pareto Analysis and/or FMEA.
  2. Analyze the 5-whys and understand the ways a process can fail.
  3. Decide the right Mistake Proofing approach, such as using a...
     • shut out type (preventing an error being made), or an...
     • attention type (highlighting that an error has been made) poka-yoke...
     • take a more comprehensive approach instead of merely thinking of poka-yokes as limit switches, or automatic shutoffs...
     • a poka-yoke can be electrical, mechanical, procedural, visual, human or any other form that prevents incorrect execution of a process step.

Lean Tools - Within the Tools

POKA-YOKE - MISTAKE PROOFING FUNCTION

4. Determine whether a...
   • contact - use of shape, size or other physical attributes for detection...
   • constant number - error triggered if a certain number of actions are not made...
   • sequence method - use of a checklist to ensure completing all process steps is appropriate.

5. Trial the method and see if it works.

6. Train the operator, review performance and measure success.

The combination of errors and defects are often connected. If we classify the two, we can apply the correct type of Poka-Yoke.
• The mistake proof device becomes your “inspector” for the characteristic it’s evaluating.

• Its design is to eliminate human error.

• There are 5 basic types of mistake proofing:
  • Guide Pins
  • Error Detection and Alarms
  • Limit Switches
  • Counters
  • Checklists

**Lean Tools - Within the Tools**

**POKA-YOKE - MISTAKE PROOFING FUNCTION**

**Guide Pins**

What prevented you from putting the disk in upside down or backwards.

**GO / NO GO GAGE**

Green won’t fit in the hole – too small.
Red end fits in hole to large.
Green fits – Red does not... Just right.

Cam prevent oversized / undersized from entering the process. Can also prevent mis-orientation.

**LIMIT SWITCH**

Simple Limit Switch connected to a drill head. The drill won’t engage until the work is pushed up against the gate.
Lean Tools - Within the Tools

POKA-YOKE - MISTAKE PROOFING FUNCTION

PARTS COUNTER / SCALE

Best for small parts in high quantities. Good for parts containers. Must “tare” the container weight.

AUTOMATIC PARTS COUNTER USING LIMIT SWITCH

Best on continuous line where parts pass single file.

Lean Tools - Within the Tools

POKA-YOKE - MISTAKE PROOFING FUNCTION

• Alarms:
  • Temperature too high or low.
  • Dwell time too long or short.
  • Out of position.
  • Machine down (this is a failure – it’s not just for parts only).
  • Speed too fast or slow.
  • Pressure too high or low.

• Example:
  • Low pressure alarm on grind line – might indicate clogged filter.
  • Can prevent impending failure from happening (no air pressure) by allowing operator to clean filter.
  • Reduces extra work associated with reduced air pressure.
Lean Tools - Within the Tools

JUST IN TIME MANUFACTURING (JIT)

• Just In Time Manufacturing (JIT)
  • Only what is needed...
  • When it is needed...
  • Only the amount needed.

• JIT Strategy:
  • Is a strategy used in the manufacturing industry to reduce costs by reducing the in-process inventory level.
  • It is driven by a series of signals that tell the production line to make the next piece for the product and when it is needed.
  • The signals used are usually simple visual signals, such as the absence or presence of a piece that is needed in the manufacturing process.

Lean Tools - Within the Tools

JUST IN TIME MANUFACTURING (JIT)

• Quality Assurance is higher.
  • Unlike some other types of manufacturing processes, with just-in-time manufacturing, assemblers do not have a choice of which parts to use; every part has to fit correctly.
  • This means that the use of multiple suppliers usually is avoided, and quality assurance is higher.
  • The parts used are all of the same quality, which means that line stops for quality checks are almost eliminated, leading to higher productivity rates.
  • Just-in-time manufacturing principles have been applied to many industries and businesses with successful results.
**Lean Tools - Within the Tools**

**JUST – IN – TIME MANUFACTURING (JIT)**

• Benefits of JIT Manufacturing.
  
  • Inventory costs go down – you only carry the minimum necessary.
  
  • Transportation costs go down – now you don’t have to transport inventory to the warehouse.
  
  • It stays in *Kanbans* on the factory floor.
  
  • There are fewer defects due to spoilage, damage and obsolescence.
  
  • Waiting is reduced as the value stream start to finish is reduced.
  
  • Over-processing is reduced with inventory movements of storing in warehouse.

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**Lean Tools - Within the Tools**

**THE KANBAN PRINCIPLE**

• It starts with your brain.

• A picture is worth a thousand words for scientific reasons:
  
  • The brain processes visual information 60,000 times faster than text.
  
  • Forty percent of all nerve fibers connected to the brain are linked to the retina.
  
  • Visual information comprises 90 percent of the data that comes to our brain, suggesting that our neurological pathways might even prefer pictorial displays over text.

• Kanban helps you harness the power of visual information.
  
  • Seeing how your work flows within your team’s process lets you not only communicate status but also give and receive context for the work.
  
  • Kanban takes information that typically would be communicated via words and turns it into brain candy.
1. **Visualize Work**
   - By creating a visual model of your work and workflow, you can observe the flow of work moving through your Kanban system. Making the work visible—along with blockers, bottlenecks and queues—instantly leads to increased communication and collaboration.

2. **Limit Work in Process**
   - By limiting how much unfinished work is in process, you can reduce the time it takes an item to travel through the Kanban system. You can also avoid problems caused by task switching and reduce the need to constantly reprioritize items.

3. **Focus on Flow**
   - By using work-in-progress (WIP) limits and developing team-driven policies, you can optimize your Kanban system to improve the smooth flow of work, collect metrics to analyze flow, and even get leading indicators of future problems by analyzing the flow of work.

4. **Continuous Improvement**
   - Once your Kanban system is in place, it becomes the cornerstone for a culture of continuous improvement. Teams measure their effectiveness by tracking flow, quality, throughput, lead times and more. Experiments and analysis can change the system to improve the team’s effectiveness.
Lean Tools - Within the Tools

**WHY KANBAN?**

• Dramatic changes away from high product throughput and high capacity loads towards the new idea of lower production times and work-in-progress have lead to the idea of incorporating Kanban Systems in manufacturing industries (most notably in automotive industries).

• These systems are most commonly used to implement the pull-type control in production systems with aims at reducing costs by minimizing the WIP inventory.

• This allows an organization the ability to adapt to changes in demand, and therefore production more quickly.

Lean Tools - Within the Tools

**WHY KANBAN?**

• A pull-type production line is a sequence of production stages performing various process steps on parts where each stage consists of several workstations in tandem.
  - The flow of parts through the overall facility is controlled by a combined push/pull control policy, which is established by the Kanbans.

• A push-type policy is used for producing parts within each individual production stage.

• However, parts are pulled between the production stages in accordance with the rate at which parts are being consumed by the downstream stages.
The two most common types of Kan-bans used today are:

1. Withdrawal (Conveyance) Kanban.
2. Production Kanban.

The withdrawal Kan-ban layout can be designed many ways in order to display this information.

The withdrawal Kanban layout can be designed many ways in order to display this information.
Types of Kanban?

A withdrawal Kanban usually carries the following information:

- Part number
- Part name
- Lot size
- Routing process
- Name of the next process
- Location of the next process
- Name of the preceding process
- Location of the preceding process
- Container type
- Container capacity
- Number of containers released

The withdrawal Kanban layout can be designed many ways in order to display this information.

Types of Kanban?

Production Kanban:

- The primary function of the production Kanban is to release an order to the preceding stage to build the lot size indicated on the card.

The production Kanban card should have the following information:

- Materials required as inputs at the preceding stage
- Parts required as inputs at the preceding stage
- Information stated on withdrawals Kanban

The first two pieces of information are not required on the withdrawal Kanban as it’s only used for communicating the authorization of movement of parts between work stations.
Lean Tools - Within the Tools

**CAUSE & EFFECT DIAGRAM**
also known as Ishikawa Diagram or Fishbone Diagram

- Process inputs as influencers can be determined using a Cause & Effect Diagram.

- A visual root cause analysis tool used to brainstorm and document potential causes and sub-causes for an undesired effect.

- Utilizing this brainstorming activity helps a team think of all of the potential areas without hampering your thought process.

- Let’s learn about the Cause & Effect Diagram…

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Lean Tools - Within the Tools

**CAUSE & EFFECT DIAGRAM**
also known as Ishikawa Diagram or Fishbone Diagram

- The question we ask is directly related to the problem we want to analyze / solve:

- The possibilities are listed on the individual bones of the fish.

  Man  
  Method  
  Machine  
  Materials  
  Environment  
  Measurement  

  Don’t be afraid to define other categories to assist your improvement needs... such as

  Training Requirements  
  Documentation  
  Financial Concerns  
  Time  
  Supply Factors  
  Policy / Procedures...

  What ever suits the need
**Lean Tools - Within the Tools**

**CAUSE & EFFECT DIAGRAM**

Possible Areas of Consideration:

- **Training**
  - CTQ’s
  - Causality
  - Inspection methods

- **Time Constraints**

- **Perception Issues** – “I think the lead values numbers over quality.”

- **Ergonomics** – fatigue issues are sometimes an important consideration.
Lean Tool - Cause & Effect Diagram Defined

SHINGO AND 10 TYPES OF HUMAN ERRORS

• Forgetfulness
• Misunderstanding
• Identification Error
• Trainee Error
• Willful Error
• Inadvertent Error
• Slowness Error
• Lack of Standard
• Surprise Error
• Intentional Error

MANPOWER...

• Very Important:
  • Never use this category to bash people!
  • It is the process that is broken – not the people!
  • Approximately 90% of errors can be traced to management, so be sensitive to this fact.

• Virtually no one wakes up and thinks...
  • “I think I’ll go to work and do a lousy job today.”
Lean Tool - Cause & Effect Diagram Defined

**METHOD...**

• **Possible Areas of Consideration:**
  
  • **Lack of Standardization.**
    
    - Some follow their “best judgment”
    
    - Conflicting information (BOM spec and Inspection Method have different information).
  
  • **Method** – is followed but is incorrect.
  
  • **Method** – does not provide all information.
  
  • **Operation is New** – so there really isn’t a method established.

**MATERIAL...**

• **Possible Areas of Consideration:**
  
  • **Material** – does not meet our standards / specifications.
  
  • **Standards** – none / vague / outdated.
  
  • **Lots of Material** – have variation or lots are mixed.
  
  • **Material and Process** – are not very compatible.
Lean Tool - Cause & Effect Diagram Defined

**MACHINE...**

- **Possible Areas of Consideration:**
  - **Machine** – is not capable of holding the tolerance.
  - **Machine** – is not calibrated, or is out of calibration.
  - **Machine** – is not set at correct settings (speed, temperature, etc.)

**ENVIRONMENT...**

- **Possible Areas of Consideration:**
  - **Environmental Conditions** – on materials, such as humidity and heat.
  - **Environment Factors** – on workers (lighting, noise, dust, smell, etc.)
Lean Tool - Cause & Effect Diagram Defined

**MEASUREMENT...**

• Possible Areas of Consideration:
  
  • **Equipment** – miscalibrated or uncalibrated gages, meters, support equipment.
  
  • **Equipment** – does not measure down to the level of precision needed.
  
  • **Support Equipment** – gage or inspector error.
  
  • **Parallax Error** – on dial style tools.

Lean Tool - Cause & Effect Diagram Defined

**CAUSE & EFFECT DIAGRAM PROCESS STEPS...**

• The team using this tool should carry out the following steps:

1. **Agree on the problem statement / effect.**
   
   • Be as clear and specific as you can about the problem.
   
   • Beware of defining the problem in terms of a solution (e.g., we need more of something).

2. **Agree on the major categories of causes of the problem (written as branches from the main arrow).**

3. **Brainstorm all the possible causes of the problem. Ask “Why does this happen?”**
   
   • As each idea is given, the facilitator writes the causal factor as a branch from the appropriate category (places it on the fishbone diagram).
   
   • Causes can be written in several places if they relate to several categories.
Lean Tool - Cause & Effect Diagram Defined

CAUSE & EFFECT DIAGRAM PROCESS STEPS...

4. Again asks “Why does this happen?” about each cause. Write sub-causes branching off the cause branches.
   • Continues to ask “Why?” and generate deeper levels of causes and continue organizing them under related causes or categories.
   • This will help you to identify and then address root causes to prevent future problems.

• A question often asked...
  • “What if I have trouble figuring out which of two M’s under which I should place the suspected cause?
  • Put it in both places – there’s no problem having it on the diagram twice.

Lean Tool - Cell Design

WORK CELLS DON’T JUST HAPPEN - THEY EVOLVE

A Work Cell:

• is a work unit larger than an individual machine or workstation but smaller that the usual department.

• is typically 5-15 people in a compact arrangement.

• is designed around product or narrow range of products.

• is designed in such a way tasks move directly from process to process (or sit in mini-ques).
## Lean Tool - Cell Design Tracking

### COMPONENTS OF A MODEL CELL

<table>
<thead>
<tr>
<th>TOOL</th>
<th>PROGRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>STD. WORK</td>
<td>SW combo &amp; SW sheets displayed, Takt time is properly calculated, Standard WIP in place, Operator loading charts at mouth of cell, &quot;Playbook&quot; created, Cell manned as loading charts indicate</td>
</tr>
<tr>
<td>LAYOUT</td>
<td>U shaped cell, Product flows Counter clockwise, No barriers to operator flow, Proper tool presentation, Unobstructed view from mouth, Equipment adj to operator height</td>
</tr>
<tr>
<td>QUALITY</td>
<td>Pictorial method sheets, Sample product with Critical to Quality Characteristics, PPM measured at end of line, YTD tracked, Poka Yoke, Jidoka</td>
</tr>
<tr>
<td>TOTAL ASSOCIATE INVOLVEMENT</td>
<td>&quot;Several skilled&quot; operators, Operator cross-training matrix, Training plan in place, Communication board, Operators update visual mgmt. boards, &quot;Universal&quot; skilled operators, Cell members conduct Desolving</td>
</tr>
<tr>
<td>VISUAL CONTROLS</td>
<td>Andon, Aisle, equip, &amp; matl markings, Mat locations &amp; cont. labeled, Defective product area, Process map of cell</td>
</tr>
<tr>
<td>VISUAL MEASUREMENT</td>
<td>Production control board, Quality, Delivery, Cost tracking, Countermasures / newspaper, Performance Metrics</td>
</tr>
<tr>
<td>6S</td>
<td>No unnecessary items, A &quot;home&quot; for each item, Daily/Weekly/Monthly/Qtrly 6S activity with checklists, Cell free of debris, oil, etc, Item locations set by freq of use, No enclosed or nonvisible cabinets, Equip mod to reduce cleaning, Mgmt./cross cell audits</td>
</tr>
<tr>
<td>SMED</td>
<td>Changeover times tracked, Documented process, Internal converted to external, Internal tasks minimised, External tasks maximised, Changeover within TAKT Time</td>
</tr>
<tr>
<td>TPM</td>
<td>OEE (Operating Equipment Efficiency) tracked, Maintenance performed off shift, Scheduled (predicted) maint, Autonomous Maintenance</td>
</tr>
<tr>
<td>MATERIALS</td>
<td>Basic level loaded schedule, Point of Use material presentation, Adjacent storage (grocery store), Schedule level loaded within lead time, Kanban / sequencing, True mixed model scheduling</td>
</tr>
</tbody>
</table>

Grey = indicates minimum implementation
Lean Tools - Within the Tools

**FAILURE MODES EFFECTS ANALYSIS (FMEA) TOOL...**

- Failure modes and effects analysis (FMEA) is a step-by-step approach for identifying all possible failures in a design, a manufacturing or assembly process, or a product or service.

- **Failure Modes** - means the ways, or modes, in which something might fail.
  - Failures are any errors or defects, especially ones that affect the customer, and can be potential or actual.

- **Effects Analysis** - refers to studying the consequences of those failures.

---

Lean Tools - Within the Tools

**FAILURE MODES EFFECTS ANALYSIS (FMEA) TOOL...**

- Failures are prioritized according to how serious their consequences are, how frequently they occur and how easily they can be detected.
  - The purpose of the FMEA is to take actions to eliminate or reduce failures, starting with the highest-priority ones.

- FEMA also documents current knowledge and actions about the risks of failures, for use in continuous improvement.

- FMEA is used during design to prevent failures.
Lean Tools - Within the Tools

**FAILURE MODES EFFECTS ANALYSIS TOOL...**

- Later it’s used for control, before and during ongoing operation of the process.

- Ideally, FMEA begins during the earliest conceptual stages of design and continues throughout the life of the product or service.

<table>
<thead>
<tr>
<th>Process Step</th>
<th>Potential Failure Mode</th>
<th>Potential Failure Effect</th>
<th>SEV*</th>
<th>Potential Causes</th>
<th>OCC*</th>
<th>Current Process Controls</th>
<th>DET*</th>
<th>RPN*</th>
<th>Action Recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATM Pin Authentication</td>
<td>Unauthorized access</td>
<td>• Unauthorized cash withdrawal • Very dissatisfied customer</td>
<td>8</td>
<td>Lost or stolen ATM card</td>
<td>3</td>
<td>Block ATM card after three failed authentication attempts</td>
<td>3</td>
<td>72</td>
<td></td>
</tr>
<tr>
<td>Authentication failure</td>
<td>Annoyed customer</td>
<td></td>
<td>3</td>
<td>Network failure</td>
<td>5</td>
<td>Install load balancer to distribute workload across network links</td>
<td>5</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Dispense Cash</td>
<td>Cash not dispensed</td>
<td>Dissatisfied customer</td>
<td>7</td>
<td>ATM out of cash</td>
<td>7</td>
<td>Internal alert of low cash in ATM</td>
<td>4</td>
<td>106</td>
<td>Increase minimum cash threshold level of heavily used ATMs to prevent out-of-cash instances</td>
</tr>
<tr>
<td>Account debited but no cash dispensed</td>
<td>Very dissatisfied customer</td>
<td></td>
<td>8</td>
<td>• Transaction failure • Network issue</td>
<td>3</td>
<td>Install load balancer to distribute workload across network links</td>
<td>4</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>Extra cash dispensed</td>
<td>Bank loses money</td>
<td></td>
<td>8</td>
<td>• Bills stuck to each other • Bills stacked incorrectly</td>
<td>2</td>
<td>Verification while loading cash in ATM</td>
<td>3</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>

1. **Severity**: Severity of impact of failure event. It is scored on a scale of 1 to 10. A high score is assigned to high-impact events while a low score is assigned to low-impact events.
2. **Occurrence**: Frequency of occurrence of failure event. It is scored on a scale of 1 to 10. A high score is assigned to frequently occurring events while low occurrence is assigned a low score.
3. **Detection**: Ability of process control to detect the occurrence of failure events. It is scored on a scale of 1 to 10. A failure event that can be easily detected by the process control is assigned a low score while a high score is assigned to an inescapable event.
4. **Risk Priority Number**: The overall risk score of an event. It is calculated by multiplying the scores for severity, occurrence and detection. An event with a high RPN demands immediate attention while events with lower RPNs are less risky.
Lean Tool - FMEA Defined

FAILURE MODES EFFECTS ANALYSIS PROCEDURE...

This is a general procedure. Specific details may vary with standards of your organization or industry.

1. Assemble a cross-functional team of people with diverse knowledge about the process, product or service and customer needs. Functions often included are: design, manufacturing, quality, testing, reliability, maintenance, purchasing (and suppliers), sales, marketing (and customers) and customer service.

2. Identify the scope of the FMEA. Is it for concept, system, design, process or service? What are the boundaries? How detailed should we be? Use process maps to identify the scope and to make sure every team member understands it in detail. From here on, we’ll use the word “scope” to mean the system, design, process or service that is the subject of your FMEA.

3. Fill in the identifying information at the top of your FMEA form. The remaining steps ask for information that will go into the columns of the form.

FAILURE MODES EFFECTS ANALYSIS TOOL...

4. Identify the functions of your scope. Ask, “What is the purpose of this system, design, process or service? What do our customers expect it to do?” Name it with a verb followed by a noun. Usually you will break the scope into separate subsystems, items, parts, assemblies or process steps and identify the function of each.

5. For each function, identify all the ways failure could happen. These are potential failure modes. If necessary, go back and rewrite the function with more detail to be sure the failure modes show a loss of that function.

6. For each failure mode, identify all the consequences on the system, related systems, process, related processes, product, service, customer or regulations. These are potential effects of failure. Ask, “What does the customer experience because of this failure? What happens when this failure occurs?”

7. Determine how serious each effect is. This is the severity rating, or S. Severity is usually rated on a scale from 1 to 10, where 1 is insignificant and 10 is catastrophic. If a failure mode has more than one effect, write on the FMEA table only the highest severity rating for that failure mode.
Lean Tool - FMEA Defined

**FAILURE MODES EFFECTS ANALYSIS TOOL...**

8. For each failure mode, determine all the potential root causes. Use analysis tools, as well as the best knowledge and experience of the team. List all possible causes for each failure mode on the FMEA form.

9. For each cause, determine the occurrence rating, or O. This rating estimates the probability of failure occurring for that reason during the lifetime of your scope. Occurrence is usually rated on a scale from 1 to 10, where 1 is extremely unlikely and 10 is inevitable. On the FMEA table, list the occurrence rating for each cause.

10. For each cause, identify current process controls. These are tests, procedures or mechanisms that you now have in place to keep failures from reaching the customer. These controls might prevent the cause from happening, reduce the likelihood that it will happen or detect failure after the cause has already happened but before the customer is affected.

11. For each control, determine the detection rating, or D. This rating estimates how well the controls can detect either the cause or its failure mode after they have happened but before the customer is affected. Detection is usually rated on a scale from 1 to 10, where 1 means the control is absolutely certain to detect the problem and 10 means the control is certain not to detect the problem (or no control exists). On the FMEA table, list the detection rating for each cause.

12. (Optional for most industries). Is this failure mode associated with a critical characteristic? (Critical characteristics are measurements or indicators that reflect safety or compliance with government regulations and need special controls.) If so, a column labeled “Classification” receives a Y or N to show whether special controls are needed. Usually, critical characteristics have a severity of 9 or 10 and occurrence and detection ratings above 3.

13. Calculate the risk priority number (RPN), which equals \( S \times O \times D \). Also calculate Criticality by multiplying severity by occurrence, \( S \times O \). These numbers provide guidance for ranking potential failures in the order they should be addressed.

14. Identify recommended actions. These actions may be design or process changes to lower severity or occurrence. They may be additional controls to improve detection. Also note who is responsible for the actions and target completion dates.

15. As actions are completed, note results and the date on the FMEA form. Also, note new S, O or D ratings and new RPNs.
Lean Tool - FMEA Defined

**SEVERITY – OCCURRENCE – DETECTION EXPLAINED**

- **Severity** – dropping your cell phone breaks it, so the otter box is created to lessen the severity of outcome from dropping.

- **Occurrence** – old style blenders would allow you to stick your hand into the vessel and still be able to engage the blades. Now all blenders have an interlock which prevents the blades from being engaged while the cover is off.

- **Detection** – a color change patch on items sterilized in an autoclave. The patch won’t change color unless it has been exposed to the proper temperature for the minimum period of time.

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**Lean Tool - FMEA Defined**

**FAILURE MODES EFFECTS ANALYSIS TOOL**

- **FMEA Example:**
  
  A bank performed a process FMEA on their ATM system. Previous visual 1 shows part of it—the function “dispense cash” and a few of the failure modes for that function. The optional “Classification” column was not used. Only the headings are shown for the rightmost (action) columns.

- **Notice that RPN and criticality prioritize causes differently.** According to the RPN, “machine jams” and “heavy computer network traffic” are the first and second highest risks.

- **One high value for severity or occurrence times a detection rating of 10 generates a high RPN.** Criticality does not include the detection rating, so it rates highest the only cause with medium to high values for both severity and occurrence: “out of cash.” The team should use their experience and judgment to determine appropriate priorities for action.

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Lean Tool - X–Y Matrix

**X–Y Prioritization Matrix... Also Known As Weighted Matrix**

- The X-Y Matrix illustrates the correlation of process inputs to customer’s outputs.
  - The table is illustrated using a group of columns and rows, with factor X (input) represented by the horizontal axis and factor Y (output) represented by the vertical axis.

- Most of the time a Process Map, which is the origin of related information, is used to rate the relation between two factors.
  - Numerical ranking is created to identify which amongst the proposed plan is the most feasible and least expensive.

---

Lean Tool - X–Y Matrix

**X–Y Prioritization Matrix... Also Known As Weighted Matrix**

- **Goal & Purposes:**
  - The objective of the X-Y Matrix is to numerically calculate the correlation of Y (output) which is equal to the frequency multiplied by X (input).
  - This filters all possible scenarios and probable contributors to the problem at hand.
  - The tool also studies and analyzes the relationship between what is being proposed in the process and what benefit the customer would get from it.
  - The X-Y Matrix allows the group to determine areas of development and process gaps.
Lean Tool - X–Y Matrix

**X–Y Prioritization Matrix... Also Known As Weighted Matrix**

- There are many purposes of the X-Y Matrix.
  - Since the process uses numerical ranking the most obvious use of this method is to narrow down several lists of imaginable inputs (Xs) into a more controllable one.

- X-Y Matrix is also an effective tool if the objective is to determine the few significant variables.
  - X-Y Matrix quickens the identification of the most probable solution.
Measurement System Analysis (MSA)

- Measurement system analysis (MSA) uses scientific tools to determine the amount of variation contributed by the measurement system.

- It is an objective method to assess the validity of a measurement system and minimize the factors contributing to process variation that is actual stemming from the measurement system.

Typically a Six-Sigma Analysis Tool

Lean Tool - Measurement System Analysis (MSA)

- The MSA is often a very time consuming component of the project and can slow the team’s quick progression through the process.

- Continue to focus on low hanging fruit that may be momentum "sustainers" and work vigorously through the MSA process.

- Most of this work can be done by a Green Belt or Black Belt outside of the team meetings.
Lean Training
Fundamental Concepts and Practices

DEFINING YOUR IMPROVEMENT FRAMEWORK

ESTABLISHING A CULTURE OF QUALITY THROUGH KAIZEN AND KAIZEN BLITZ

‘Just when the caterpillar thought the world was ending, he turned into a butterfly.’

Understanding an Improvement Framework

• As tools and techniques support each other and are selected based upon improvement direction and need...

• So too are there a variety of Improvement Frameworks that can be deployed to create change within a business model.

• For lean these are typically deployed under the framework of Kaizen and Kaizen Blitz which is simply a structured teaming effort.

• Regardless of what you call it... a consistent and long-term framework for management needs to be selected and deployed.
  • It must focus on an organizational culture conducive to having improvements come directly from the mind of every associate in the organization to get measurable, world-class results.
Understanding an Improvement Framework

• There are 6 basic keys to success in the framework selected:
  1. Ensuring quality at the source...
  2. Flowing value to the customer...
  3. Working with zero inventory...
  4. Practical – rigorous – continuous education of the workforce...
  5. Understand the true work situation by being at the work site, or “gemba”...
  6. Leadership must be ever the evangelist of process improvement.

• Deployment Pitfall – studies have seen first-hand how quickly tools only based organizations decline in their ability to sustain results.
  • On the other hand, organizations that anchor their improvement initiatives to principles – or understand the...

  “why” behind the “how” and the “what” – experience significantly better results.

Understanding an Improvement Framework

A Basic Framework for Achieving Process Excellent Should Include...

<table>
<thead>
<tr>
<th>DEFINE THE EFFORT</th>
<th>GO SEE &amp; GET BASELINE DATA</th>
<th>CURRENT / FUTURE STATE ANALYSIS</th>
<th>DETERMINE IMPROVEMENT STRATEGIES</th>
<th>MAKE CHANGE HAPPEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>• RECOGNIZE AN OPPORTUNITY,</td>
<td>• GO SEE,</td>
<td>• REFINE PROBLEM STATEMENT,</td>
<td>• TEST AND VALIDATE THEORIES,</td>
<td></td>
</tr>
<tr>
<td>• RIGHT SIZE THE EFFORT,</td>
<td>• UNDERSTAND THE PRINCIPLES OF WASTE &amp; VARIATION,</td>
<td>• DEPLOY APPROPRIATE TOOLS,</td>
<td>• IMPLEMENT CHANGE,</td>
<td></td>
</tr>
<tr>
<td>• DEFINE THE TEAM MEMBERS,</td>
<td>• ESTABLISH BASELINE DATA,</td>
<td>• DRIVE TO FUTURE STATE,</td>
<td>• TRAIN THE NEW PROCESS,</td>
<td></td>
</tr>
<tr>
<td>• DEVELOP A PROBLEM STATEMENT,</td>
<td>• ESTABLISH PROCESS BASELINE,</td>
<td>• TEST THEORIES WITH DATA,</td>
<td>• ESTABLISH NEW BASELINE METRICS,</td>
<td></td>
</tr>
<tr>
<td>• ESTABLISH THE VOICE OF THE CUSTOMER,</td>
<td>• STRATIFY DATA,</td>
<td>• MODEL CAUSE &amp; EFFECT,</td>
<td>• TRANSFER OWNERSHIP,</td>
<td></td>
</tr>
<tr>
<td>• MINE THE CTQ CHARACTERISTICS...</td>
<td>• SET GOALS FOR IMPROVEMENT OUTPUTS...</td>
<td>• IDENTIFY IMPROVEMENTS,</td>
<td>• ESTABLISH AUDIT / FOLLOW UP SCHEDULE,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• PREPARE STANDARD WORK...</td>
<td>• ELEVATOR SPEECH TO MANAGEMENT...</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• GO FIND ANOTHER IMPROVEMENT...</td>
<td></td>
</tr>
</tbody>
</table>

Adapted from Aries Engineering, LLC – Viewing Work & Business Differently – The Lessons Learned
Performance Improvement Over Time

“If there is no standard... there can be no improvement!”

Kaizen and Kaizen Blitz Defined

- The concept of Kaizen is recognized worldwide as an important pillar of an organization’s long-term competitive strategy.
- Kaizen is *continuous improvement* that is based on certain guiding principles:
  - Good processes bring good results...
  - Go see for yourself to grasp the current situation...
  - Speak with data, manage by facts...
  - Take action to contain and correct root causes of problems...
  - Work as a team...
  - Kaizen is everybody’s business.

Kaizen means everyone is involved in making improvements. While the majority of changes may be small, the greatest impact may be Kaizen’s that are led by senior management as transformational projects, or by cross-functional teams.
Kaizen and Kaizen Blitz Defined

• Kaizen is Japanese – two words which mean to continuously improve.
  
  • Kaizen is about incremental improvement – how can the existing process become better by the elimination of the eight wastes or process variation.

  • Kaizen is about drawing out and implementing ideas by the people who work in the process – they are the experts!

  • Unlike a suggestion process where the worker is removed after submitting the suggestion, the idea’s originator is often actively involved with the implementation.

• Kaizen and Kaizen Blitz - is a long-term approach to work that systematically seeks to achieve small, incremental changes in processes in order to improve efficiency and quality.

• Kaizen can be applied to any kind of work, but it is perhaps best known for being used in lean manufacturing.

• If a work environment practices Kaizen, continuous improvement is the responsibility of every worker, not just a selected few.

**It is through the Kaizen Methodology that the Tools & Techniques in the previous slides will be taught and deployed.**
Kaizen and Kaizen Blitz Defined

- As a general rule, Kaizen and Kaizen Blitz activities are considered in the following order:
  - Those that increase safety (always #1)...
  - Those that increase quality...
  - Those that lower the cost...
  - Those that improve efficiency...
  - Those that improve morale.

- Of course there is some consideration of cost, but the cost of implementing a Kaizen is not necessarily an overriding factor.

IN ALL CASES WE ARE LOOKING FOR “PROBLEMS”
A problem is any performance other than the desired performance at a given time.

Kaizen and Kaizen Blitz Defined

There are 14 key elements to the philosophy of continuous improvement:

1. Create constancy of purpose toward improvement of product and service, with the aim to become competitive and to stay in business and to provide jobs.
2. Adopt the new philosophy.
3. Eliminate the need for inspection on a mass basis by building quality into the product in the first place.
4. End the practice of awarding business on the basis of price tag. Instead, minimize total cost.
5. Improve constantly and forever the system of production and service to improve quality and productivity and thus constantly decrease costs.
6. Institute training on the job.
7. Institute leadership. The aim of supervision should be to help people and machines and gadgets to do a better job.
Kaizen and Kaizen Blitz Defined

8. Drive out fear so that everyone may work effectively for the company.

9. Break down barriers between departments. People in research, design, sales and production must work as a team to foresee problems of production and use of the product or service.

10. Eliminate asking for zero defects and new levels of productivity. Such exhortations only create adversarial relationships as the bulk of the causes of low quality and low productivity belong to the system and thus lie beyond the power of the work force.

11. Remove barriers that rob the hourly worker of his right to pride of workmanship.

12. Remove barriers that rob people in management and in engineering of their right to pride of workmanship.

13. Institute a vigorous program of education and self-improvement.

14. Put everybody in the company to work to accomplish the transformation. The transformation is everybody’s job.

Where To Start…

THE FOLLOWING ASSUMES MANAGEMENT IS ALL IN… SO LET’S GET STARTED.

• If your organization is new to the concept of Kaizen it is recommend that a slow approach be deployed.

• Remember in most cases you are training the tools and techniques as you go.

• There will be different levels of understanding throughout the organization, therefore be sensitive to this fact.

• Additionally, some will learn slower than others so learn the value of being an effective coach and mentor sensitive to the needs of others.
Where To Start...

**6S**
- **1 – STRUCTURE**
  - Work Environment
  - Procedures / Instructions
  - Abnormalities Visible

**KAIZEN**
- **2 – OVERVIEW & INSIGHT**
  - VSM
  - Visual Mgt. Performance Indicators
  - Establish a Continuous Improvement Culture

**LEAN**
- **3 – LEAN**
  - Stable Processes
  - Eliminating Waste
  - Flow & Pull

**SIX-SIGMA**
- **4 – CAPABILITY**
  - Reducing Variation
  - In Process Control
  - Statistical Tools

**DFSS**
- **5 – ROBUSTNESS**
  - Robust Processes
  - Design for Six-Sigma
  - QFD

**START WITH THE LOW HANGING FRUIT**

Where To Start...

**THE FOLLOWING ASSUMES MANAGEMENT IS ALL IN... SO LET’S GET STARTED.**

- Deploying the 6S methodology in select locations is a good place to start.
  - The workforce knows where the “low hanging fruit” is.
  - Not only will this begin to set things in order it will begin the process of sharing the lingo – building teams – and finding allies.
  - Additionally, it will begin to identify hidden problems for future team action.

- Most management and employees know were the problems are because they deal with them every day.
  - Use this information to your advantage.
Where To Start...
THE FOLLOWING ASSUMES MANAGEMENT IS ALL IN... SO LET’S GET STARTED.

• Use Value Stream Mapping as a catalyst for change.
  • This effort will begin to identify real problem areas by Subject Matter Experts (SME’). They have a vested interest to improve.
  • This will also begin to advance the learning and understanding in tool use and the transformation lingo.

Always remember there will be areas of the organization who will not be involved but watching closely.

Make it a positive experience for them as well as they journey – to and through – the Neutral Zone.

Where To Start...
THE FOLLOWING ASSUMES MANAGEMENT IS ALL IN... SO LET’S GET STARTED.

• The output of your VSM activity will generate multiple Kaizen activity. For example:
  • Just-Do-It Kaizen – fixing the obvious. Small gains that empower employees.
  • Kaizen Blitz Activity – follow on “team focused” activity to...
    • Focus on how to remove spotlighted waste with minimal work disruption.
    • Begin to streamline work processes.
    • Define and develop the necessary Standardized Work and supporting Visual Management.
  • While continuing to promote a deeper understanding of the journey and build consensus organizationally.

• The proper scope of Kaizen Blitz activity moving forward is critical to strategic success.
  • The following beginning structure would be recommended.
• The structure of Kaizen Blitz activity in the beginning should be planned and scheduled for a 3 to 5 day team activity.

• There is lots to do and even more to teach, such as...
  • Coaching from a 3A – 3D perspective...
  • Refining a solid Problem Statement...
  • GEMBA – Go See – activity...
  • Tools selection and training...
  • Data Collection...
  • Additional Process Mapping activity...
  • And actual “improvement” deployment.

• It will be during these efforts that the value of the “Belts” will be realized.

As the knowledge and health of the organization grows Kaizen activity will almost become second nature.

Improvement activity will move from a 3 to 5 day activity to being generated in real time – in process.

There are additional improvement methodologies to use in real time for a well trained organization.

We will touch on a few in the following slides.
Plan-Do-Check-Act (PDCA)

**USE PDCA...**

- As a model for continuous improvement.
- When starting a new improvement project.
- When developing a new or improved design of a process, product or service.
- When defining a repetitive work process.
- When planning data collection and analysis in order to verify and prioritize problems or root causes.
- When implementing any change.

**PLAN** – so, we’ve set a strategic goal.

**Now, what questions do we have to consider to get there?**
- How will the goals be met?
- What data collection do you need to consider?
- This is necessary to plan as we’ll need it in the check stage.

**DO** – actual execution. **Small scale is best to start.**
- One department...
- One process...
- Single item.
Plan-Do-Check-Act (PDCA)

**USE PDCA...**

- **CHECK** – is where benchmarking comes into play, and why the metrics we spoke about earlier are important.
- Did we make a *practical* difference?
- There are a variety of comparison tools you can use to test if you are on the right track.

- **ACT** – ASQ finds the act phase as comparable to “standardize.”
  - This is very true when the outcome is positive at the desired level.

- Act can also be the stage at which you go back to **PLAN** because you didn’t achieve the intended goal.
- Even if a positive outcome is achieved, remember that this is a cycle.

A3 Methodology

**USED BY EXPERIENCED TEAMS IN REAL TIME...**

- What is A3 Critical Thinking?
  - Is a management process to solve problems, gain agreement, mentor, and lead.
  - Primary method used by Toyota Production System (TPS).
  - A3 relates to the size of paper used (approx. 11 X 17).
  - Systems approach to problem solving.
  - Logical flow from one element of approach to the next.
A3 Methodology

**WHY PROMOTE A3 CRITICAL THINKING?**

- A3 Critical Thinking serves as a mechanism for leaders to mentor others in Root Cause Analysis and Scientific Thinking
  - A structured cycle of problem definition and improvement.
  - Aligns interests of individuals and the organization.
  - Encourages productive dialogue and collaboration.
  - Can generate productive disagreement.
  - Helps people learn from one another.
  - Creates transparent barriers to issues, problems and results.
  - Provides a framework for organized problem-solving.
  - Presents ideal opportunities for mentoring.
  - Becomes the basis for confident collaboration.
A3 Methodology

The Supporting Belt System

- Starting small and slow is key to organizational success.
- Over time you will discover the need for a structured approach to team leadership and continuous improvement.
- Many companies design and deploy a “belt” system to maintain momentum and to “sustain the gain.”
- There is no cookie cutter approach to this. It should be designed to your organizational need and strategic goals.
- For example...
The Supporting Belt System

- **BLACKBELT** TRAINED WITH AT LEAST 2 YEARS EXPERIENCE. TEACHES LEAN / SIX-SIGMA ORGANIZATIONALLY
- FULL TIME IMPROVEMENT ACTIVITY OR PROJECT LEADER
- FOCUSED ON TOOLS USAGE & LEAN / SIX-SIGMA PRINCIPLES APPLICATION
- LEAN / SIX-SIGMA AWARENESS & BASIS TOOLS APPLICATION

The Power of Lean / Six-Sigma

Lean Six Sigma combines efficiency and effectiveness, driving process excellence, customer satisfaction, and growth.

**Lean**

- Decrease cycle time
- Balance work flows
- Focus on high-value steps
- Eliminate waste
- Process efficiency is the driving force behind improvement efforts

**Six Sigma**

- Increase effectiveness
- Reduce variation
- Eliminate defects
- Reducing variation eliminating defects is the driving force behind improvement efforts

Customer-focused

As-Is Flow

Future State Flow

Critical Customer Requirement

Product or Service Outputs

Defects Service unacceptable to customer
Lean Training
Fundamental Concepts and Practices

TEAM FORMATION & GROUP DYNAMICS

TEAMWORK AND TEAM DYNAMICS

‘A team is not a group of people who work together.
A team is a group of people that trust each other.’

Solutions – Compromise – Kaizen

THE 3 APPROACHES TO SOLVING PROBLEMS

• Confrontation – Threats – Conflict... the Coercive Approach.
  • Using force.

• Negotiation – Concession – Compromise... the Conciliatory Approach.
  • Using kind-heartedness and consideration.

• The Kaizen Approach... where the method is changed.
  • Changing the way things are done...
  • Changing the way we “view work”...
  • Introducing new methods and tools...
  • Achieving consensus on a way forward...
  • Changing the organizational strategic and tactical view.

Changed Methodology
Types of Teams

Work Group:
People who have responsibility for the same process may form a work group, also referred to as a natural team, to identify the ways in which their process can best support the organization. Examples of work groups might include employees who work in the same department or on the same product. Work groups are often permanent teams that meet regularly. They're primarily self-managing, as each team member's accountability to the group encourages active participation.

Quality Team:
Quality teams, also known as quality circles or excellence teams, take a methodical approach to identifying and resolving workflow issues that have a negative and ongoing impact on the organization's efficiency and working conditions. Although quality teams generally are temporary, the scope of the issues they address determine whether they're short-term or ongoing. Quality teams are often cross-functional. They bring a unique perspective that may be overlooked by management.

Types of Teams

Problem-Solving Team:
A problem-solving team is a temporary, cross-functional group of people who come from different departments, and possess different roles, skills and interests. A fast, permanent solution to a specific problem is the problem-solving team's priority. The cross-functional makeup of the team means the problem can be analyzed from a variety of perspectives.

Virtual Team:
Technology allows people to participate in an organization's activities regardless of their geographic locations. Virtual teams communicate online, through various conferencing and collaboration technologies. Thanks to social-networking tools, virtual-team members can be in touch continually and access group projects, no matter where they are. It's important to choose virtual-team members able to work with minimal supervision. They should also have excellent communication skills, because they'll work within the limitations of communicating without benefit of seeing facial expressions and body language.
Types of Teams

**Functional Teams:**
These types of teams, perform specific functions in an organization. They include members from the same department or work area who meet regularly. A manager holds the primary responsibility, with subordinates reporting to this person. Often, these are permanent.

**Cross-Functional Teams:**
Workers across functions, or specialties, of the organization make up these types of teams. People with separate areas of expertise work together; they are usually at about the same hierarchical level and can often make decisions without management. Often, these are temporary.

**Self-Directed Teams:**
Also called self-managed teams, these groups operate without managers, and no one is in a position of authority. They are designed to give employees a feeling of empowerment and ownership of the job. These types of teams are newer: they’ve been around in the U.S. for decades and originated in Great Britain and Sweden in the 1950s. Research has shown that employees in self-managed teams have higher job satisfaction, increased self-esteem, and grow more on the job, but these teams aren’t without their drawback.

**Task Force / Tiger Team:**
These teams are experts—generally a cross-section of people—joined together to solve a well-defined and temporary assignment, typically in the field or a remote location. They have a sense of autonomy and don’t need to constantly consult superiors to get things done, however, need to establish a solid feedback loop for managing up results.
Six-Sigma Teams

• Typically are:
  • Cross functional...
  • Have at least one member trained in Six-Sigma methodology...
  • Are a temporary team – disband at end of project...
  • Assignment may be as a Task Force / Tiger Team to attack a critical corporate issue...
  • May have members on an “as needed” basis (might not have to attend every meeting)...
  • Have strong stakeholder involvement...
  • Have a champion...
  • Have the active support of the steering committee (usually senior management).

What We Hear Most Often...

THE CHALLENGE OF CREATING AND MAINTAINING ALLIES.
What We Hear Most Often...

**REMEMBER THE TRANSFORMATION PATH...**

- People typically want to stay busy...
- People are convinced they are busy and consequently cannot see the need to improve...
- It will take effort to convince them to step back and view work in a different way...

![Change Diagram]

Team Formation

**When Forming an Improvement Team Some Key Things To Remember...**

- Preparation..., Preparation..., Preparation... *Be ready for anything!*
  - Experienced facilitators present a professional – reliable image with every contingency covered.
  - Team members will place their trust in the process and you.

- Define and communicate clear goals and objectives (**3A**), including data elements required.

- Select a team that is cross functional and use the **1/3 Rule**...
  - 1/3 “Inside the Process” / 1/3 “Outside the Process” 1/3 “Outside the Function”
  - Identify “adhoc” membership (as needed basis).
  - A general rule of thumb: A team with 6 to 9 members is considered a manageable size for an experienced facilitator.
Team Formation

When Forming an Improvement Team Some Key Things To Remember...

• Establish **measurable goals** with targets (**3D**).
  • Where are we at now... Where are we going?

• Maintain a **structured improvement** process (**3D**).
  • Value Stream Mapping – GEMBA – Data Collection Plan are a MUST!
  • Inexperienced Teams – will need to be coached in choosing the right tools within the tools.
  • Experienced Teams – will probably have their “go to” tools they are most comfortable with.
  • In either case – apply and teach them consistently.

• **Always** assure necessary resources are available and **committed 100%**.
  • Nothing is more disruptive than floating team members who believe they are too busy to improve.

Team Essentials

MEASURABLE GOALS WITH TARGETS

• Utilize the **SMART Rule...** make them...

  • **Specific**  
    KNOW WHERE YOU ARE STARTING...
  
  • **Measurable**  
    KNOW WHERE YOU ARE GOING...
  
  • **Achievable**  
    TEAM MEMBERS WILL FEEL SECURE
  
  • **Relevant**  
    KNOWING THEY CAN IDENTIFY AND
  
  • **Time Bound**  
    MEASURE THE TEAMS PROGRESS.
**TEAM STAGES**

<table>
<thead>
<tr>
<th>DAY 1</th>
<th>DAY 2</th>
<th>DAY 3</th>
<th>DAY 4</th>
<th>DAY 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FORMING</strong></td>
<td><strong>STORMING</strong></td>
<td><strong>NORMING</strong></td>
<td><strong>PERFORMING</strong></td>
<td><strong>ADJOURNING</strong></td>
</tr>
<tr>
<td>CHARACTERISTICS</td>
<td>CHARACTERISTICS</td>
<td>CHARACTERISTICS</td>
<td>CHARACTERISTICS</td>
<td>CHARACTERISTICS</td>
</tr>
<tr>
<td>• Questioning</td>
<td>• Resistance</td>
<td>• Reconciliation</td>
<td>• Shift from task to process</td>
<td></td>
</tr>
<tr>
<td>• Socializing</td>
<td>• Lack of participation</td>
<td>• Relief – lower anxiety</td>
<td>• Sadness</td>
<td></td>
</tr>
<tr>
<td>• Displaying eagerness</td>
<td>• Conflict</td>
<td>• Members are engaged &amp; supportive</td>
<td>• Recognition of team &amp; individual effort</td>
<td></td>
</tr>
<tr>
<td>• Focusing on group identity &amp; purpose</td>
<td>• High emotions</td>
<td>• Developing cohesion</td>
<td>• • Demonstrations of interdependence</td>
<td></td>
</tr>
<tr>
<td>• Sticking to safe topics</td>
<td>• Moving towards group norms</td>
<td>• Healthy system</td>
<td>• Ability as a team to effectively produce</td>
<td></td>
</tr>
</tbody>
</table>

**STRATEGIES**

<table>
<thead>
<tr>
<th>STRATEGIES</th>
<th>STRATEGIES</th>
<th>STRATEGIES</th>
<th>STRATEGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Take “lead” individual contacts</td>
<td>• Normalize</td>
<td>• Recognize individual &amp; group efforts</td>
<td>• Celebrate</td>
</tr>
<tr>
<td>• Clear expectations &amp; consistent instructions</td>
<td>• Encourage leadership</td>
<td>• Provide learning opportunities and feedback</td>
<td>• Guide from the “side” – minimal intervention</td>
</tr>
<tr>
<td>• Quick response</td>
<td></td>
<td>• Monitor energy in the group</td>
<td>• Encourage group decision making &amp; problem solving</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Provide opportunities to share learning across team</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Provide opportunity for summative team evaluations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Provide opportunity for acknowledgement</td>
</tr>
</tbody>
</table>

**REEMPHASIZING THE LINGO**

**CONSENSUS vs. AGREEMENT**

During this course your will receive a ton of terminology that we understand is difficult to absorb in a short period of time. However, you should anticipate to be exposed to it and even teach it in your future transformational journey. As you proceed, remember...

*Change / Improvement efforts operate from a CONSENSUS frame of mind, meaning...*

While Team Members may not always AGREE with a proposed change or direction forward, team members openly acknowledge that you can live with a proposed change and continue to move forward, working together, towards the greater good.

**CONSENSUS is a process for group decision-making. It is a method by which an entire group of people can come to an agreement. The input and ideas of all participants are gathered and synthesized to arrive at a final decision acceptable to all. Through consensus, we are not only working to achieve better solutions, but also to promote the growth of community and trust.**
**Hallmarks for Consensus**

**Inclusive:** As many stakeholders as possible are involved in group discussions.

**Participatory:** All participants are allowed a chance to contribute to the discussion.

**Collaborative:** The group constructs proposals with input from all interested group members. Any individual authorship of a proposal is subsumed as the group modifies it to include the concerns of all group members.

**Agreement Seeking:** The goal is to generate as much agreement as possible. Regardless of how much agreement is required to finalize a decision, a group using a consensus process makes a concerted attempt to reach full agreement.

**Cooperative:** Participants are encouraged to keep the good of the whole group in mind. Each individual’s preferences should be voiced so that the group can incorporate all concerns into an emerging proposal. Individual preferences should not, however, obstructively impede the progress of the group.

---

**The Five Dysfunctions of a Team***

* Patrick Lencioni – *The FIVE Dysfunctions of a TEAM*
Conflict Management Strategies

**POSITIVE CONFLICT**
• Leads to mutual respect.
• Sharing of ideas.
• Blended solutions.
• True best idea implemented as people see beyond personal impact or ego.

**NEGATIVE CONFLICT**
• People retreat to their corners.
• Become further entrenched in paradigms.
• Growing hostility.
• Functional silos.
• No change made.

**Conflict Management Strategies**

**DEALING WITH FEUDING TEAM MEMBERS**

• Establish ground rules early:
  • Mutual respect/louder doesn’t make your more right.
  • Everyone has the right to be heard.
  • Agree to disagree, then let team decide best course.

• Pull team members aside after meeting:
  • Focus is on team objectives, not people.
  • See the big picture.
  • Disruption is time consuming, counterproductive and damaging.
Conflict Management Strategies

DEALING WITH OVERBEARING / KNOW IT ALL MEMBERS

• Show empathy...
• Pick your battles...
• Lead by example...
• Have your own facts researched...
• Sense of humor...
• Ask probing questions...
• Pull person aside after meeting...
• Leave the boss out of it!

<table>
<thead>
<tr>
<th>Style</th>
<th>Party #1</th>
<th>Party #2</th>
<th>Use When</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodating</td>
<td>I lose</td>
<td>you win</td>
<td>issue is small to you, and granting other is conciliatory</td>
</tr>
<tr>
<td>Avoiding</td>
<td>no winners or losers</td>
<td></td>
<td>timing is not right, need more info, saving face</td>
</tr>
<tr>
<td>Collaborating</td>
<td>win</td>
<td>win</td>
<td>foundation of trust and teamwork</td>
</tr>
<tr>
<td>Compromising</td>
<td>Big pic win, pers loss</td>
<td></td>
<td>when consensus is needed to move forward</td>
</tr>
<tr>
<td>Competing</td>
<td>I win</td>
<td>You lose</td>
<td>in crisis, when you are absolutely right and can't budge</td>
</tr>
</tbody>
</table>
5 Team Malfunctions – Costing You Results

BY STILL POINT LEADERSHIP...

Malfunction # 1: Not Speaking Up...
• The most common team-related challenge is “people don't speak up.”
• This is called “false harmony,” and identified it as one of the top reasons that a team will struggle to meet its goals.

Malfunction # 2: Bypassing Follow Through and Accountability...
• People didn't take personal responsibility for getting things done.
• Instead of being accountable, people blamed others – other team members, other divisions, management, the union, competitors.

Malfunction # 3: Avoiding Conflict with Triangulation...
• Triangulation is a common dynamic in organizational and team systems. When there's conflict between Person A and Person B..., A talks to Person C (usually in a complaining, criticizing kind of way) instead of dealing directly with B.
• In other words, instead of having open, honest conversations with the person involved in the conflict, people triangulate by venting their feelings and stories with other people.

Malfunction # 4: Letting Communication Gaps Fester...
• Two years. That's a long time to hold onto bad feelings but it happens.
• Communication gaps like this happen all the time. Much of the time, they go unnoticed by the majority of co-workers, and don't ever get resolved.
• Moreover, it turns out that misinterpretation of colleague's behavior lead to emotional reaction, and more times than not are based on incomplete information.

Malfunction # 5: Fixing the Wrong Problem...
• When teams go off track, the most common human response is to blame somebody.
• We tend to assume that if only Fred got his act together, everything would be fine.
• Our next favorite explanation is interpersonal conflict, or style differences: “well, Mary and Sally have never gotten along.”
• When these are our explanations for team breakdowns, our solutions tend to focus there as well. Maybe we send Fred to training, or bring in an outside mediator for Mary and Sally.
SO, WHERE DO YOU GO FROM HERE?

First we would encourage you to go to the link and read the full article.


• This article outlines 5 common ways that teams malfunction. Which of them are familiar to you? And, what action do you want to take?

• One place to start is to pick one team behavior that you would like to change. Get crystal clear about what you would like to be different about how your team operates, and what YOU need to do differently in order to elicit that new behavior.

• Then use the relevant action steps from the article and do them for one whole month. See what happens.

Other Team Dynamic Pitfalls...

GROUPTHINK

• Groupthink...
  
  • Psychological phenomenon that occurs within a group of people, in which the desire for harmony or conformity in the group results in an irrational or dysfunctional decision-making outcome.

• Janis has documented eight symptoms of groupthink:
  1. Illusion of invulnerability – Creates excessive optimism that encourages taking extreme risks.
  2. Collective rationalization – Members discount warnings and do not reconsider their assumptions.
  3. Belief in inherent morality – Members believe in the rightness of their cause and therefore ignore the ethical or moral consequences of their decisions.
  4. Stereotyped views of out-groups – Negative views of “enemy” make effective responses to conflict seem unnecessary.
Other Team Dynamic Pitfalls...

**GROUPTHINK**

5. **Direct pressure on dissenters** – Members are under pressure not to express arguments against any of the group’s views.

6. **Self-censorship** – Doubts and deviations from the perceived group consensus are not expressed.

7. **Illusion of unanimity** – The majority view and judgments are assumed to be unanimous.

8. **Self-appointed ‘mindguards’** – Members protect the group and the leader from information that is problematic or contradictory to the group’s cohesiveness, view, and/or decisions.

Lean Training
Fundamental Concepts and Practices

**TEAM FORMATION & GROUP DYNAMICS**

JUST A PEEK A SOME TEAMING TOOLS

‘A team is not a group of people who work together. A team is a group of people that trust each other.’
Tool to Narrow Down Multiple Solutions

STAKEHOLDER ANALYSIS

• Matrix Tool for Stakeholder Analysis:

• Purpose:
  • To identify stakeholders within a project or activity and be able to conduct appropriate approach and potential cooperation model with each identified stakeholder based on their importance and influence for the project/activity.

• Usage:
  • Stakeholder analysis should always be done at the beginning of a planning or change process, the scope can be project or activity.

• Steps:
  • List the stakeholders in reference to the project intervention or activity to be conducted.

  • Assess the Importance of the stakeholders. Importance indicates the extent to which stakeholder's needs and interest will be influenced by planned intervention/activity.

  • Assess the Influence of the stakeholders. Influence is the power which stakeholder have over planning and implementation of intervention/activity.

  • Plot the position of each stakeholder into Importance-Influence matrix, just as shown on the following slide:
## Tool to Narrow Down Multiple Solutions

### STAKEHOLDER ANALYSIS

<table>
<thead>
<tr>
<th>Importance</th>
<th>Influence</th>
<th>Stakeholder A</th>
<th>Stakeholder B</th>
<th>Stakeholder C</th>
<th>Stakeholder D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Low</td>
<td>PROTECT</td>
<td>LOW PRIORITY</td>
<td>GOOD RELATION</td>
<td>MONITOR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>This group will require special initiative to protect their interests.</td>
<td>May have some involvement, but relatively low in priority.</td>
<td>A close and good working relationship must be established with this group.</td>
<td>This group may be source of risk, and will require careful monitoring and management.</td>
</tr>
</tbody>
</table>

### STAKEHOLDER ANALYSIS EXAMPLE – CHILD VACCINATIONS

<table>
<thead>
<tr>
<th>Importance</th>
<th>Influence</th>
<th>Stakeholder A - Protect “Victims”</th>
<th>Stakeholder B – Low Priority</th>
<th>Stakeholder C – Good Relations</th>
<th>Stakeholder D - Monitor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>• Children</td>
<td></td>
<td>• Parents</td>
<td>• Irresponsible celebrities</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Researchers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Doctors</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Public Relations</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Non-Parents</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Tool to Narrow Down Multiple Solutions

**STAKEHOLDER ANALYSIS**

- Stakeholder A = Mid Importance, Low Influence
- Stakeholder B = Low Importance, Low Influence
- Stakeholder C = High Importance, High Influence
- Stakeholder D = Low Importance, High Influence

Based on the positions of stakeholders within the matrix, we can determine the approach and cooperation model for each stakeholder as depicted... Protect... Low Priority... Good Relations... Monitor.

From the matrix, approaches and strategy can be derived for all identified stakeholder. Practically in a community meeting, the project proponent can prioritize the stakeholders to be involved in, in the midst of resource/budget constraints.

---

**MULTIVOTING OR NOMINAL GROUP TECHNIQUE (NGT)**

**WHAT IS MULTIVOTING?**

A group decision-making technique used to reduce a long list of items to a manageable number by means of a structured series of votes.

Multivoting is preferable to straight voting because it allows an item that is favored by all, but not the top choice of any, to rise to the top.

**BENEFITS OF MULTIVOTING**

- Reduces a list...
- Prioritizes a list...
- Identifies important items.
When to Use Multivoting:

- After brainstorming or some other expansion tool has been used to generate a long list of possibilities.
- When the list must be narrowed down, and,
- When the decision must be made by group judgment

FACILITATING THE TECHNIQUE

- Number of ideas divided by 3 is general rule of thumb for number of votes.
- Members prioritize the voting (1 most important, 5 least, for example).
- If there is clear delineation between the items, you can make a decision and stop.
- If necessary, pare down the list again using same process
Tool to Narrow Down Multiple Solutions

FACILITATING THE TECHNIQUE

• 15 items on list from brainstorming:
  • Every member votes for 5 (n/3).
  • Based on the tallied outcome, there are 8 strong contenders.
  • However, the team can only support top 3.
  • 2nd multivote takes place based on the 8.
  • Top 3 are chosen from this.

Note: If the separation on the 8 leaves 3 clear winners and 5 weak contenders, you can stop there if everyone is in agreement.

Lean Training

Fundamental Concepts and Practices

TIME FOR OPEN DISCUSSION

BEFORE WE TEST YOUR LEARNING, LETS HAVE AN OPEN QUESTION & ANSWER SESSION

TO CLARIFY ANY POINTS OF THE TRAINING

Your instructor will be available after the test for any one-on-one collaboration.
On Behalf of

Ivy Tech Community College

Thank You for Participating

In

Lean Training

Fundamental Concepts and Practices