LEAN PRACTITIONER 'S MEMORY JOGGER







Lean Improvement Handbook

IMPROVEMENT HANDBOOK

V3.0

Name: _____

Company: _____

Address: _____

_____

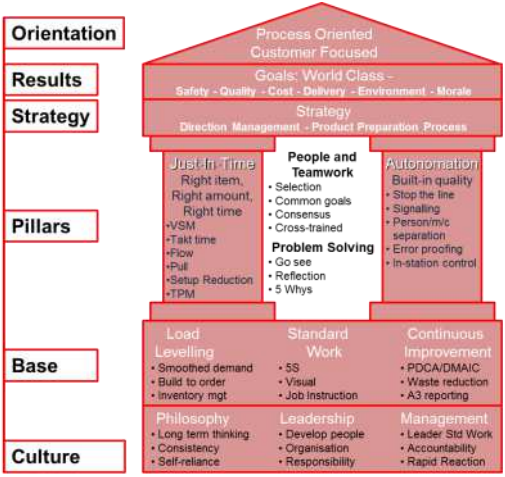
_____

Tele: _____

Email: _____

CONTENTS

THE HOUSE OF LEAN



- Lean is not a tool kit, it is a way of life
- Customer focused
- Process oriented
- Always changing
- Always evolving

* Adapted from J. K. Liker

THE FIVE STEPS AND FOUR RULES OF LEAN

The Five steps to Lean*

1. Precisely specify **customer value** by specific product/service;
2. Identify the **value stream** for each product/service;
3. Make value **flow** without interruptions;
4. Let the customer **pull** value from the producer;
5. Pursue **perfection**.

The Four Rules**

Rule 1 – All work to be highly specified in content, sequence, timing and outcome

Rule 2 – Every customer-supplier connection must be direct, with an unambiguous yes-or-no way to send requests and receive responses

Rule 3 – The pathway for every product and service must be simple and direct

Rule 4 – Improvements must be made in accordance with the scientific method, under the guidance of a teacher, at the lowest possible level in the organisation

All rules require that activities, connections, and flow paths have built-in tests to signal problems automatically

* Lean Thinking – Womack & Jones
** Toyota Production System – Taiichi Ohno

THE LEAN TRIANGLE

TECHNICAL
- Value Stream Mapping
- JIT
- Takt Time
- Flow – Pull
- Setup Reduction
- Effective Maintenance
- Autonomation
- Error proofing
- Load Levelling
- Standard Work
- Improvement Workshops

CULTURE
- True North
- Management behaviour
- Tools for focus
- Go see
- Problem solving
- A3 thinking
- Project management

PHILOSOPHY/BASIC THINKING
- Customer first
- Value added vs. waste
- People are most important asset
- Go see – give feedback – grow people
- True condition (vs. apparent)
- Team involvement (vs. individual)

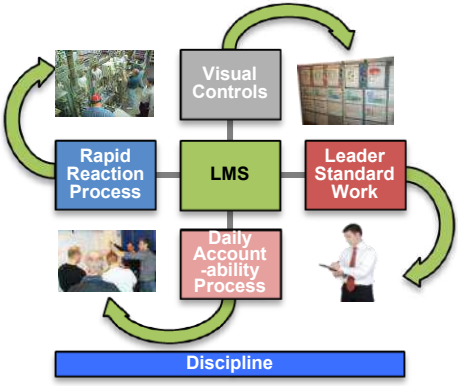
* The Toyota Way – J. K. Liker

THE 14 LEAN WAY PRINCIPLES

1. Base decisions on long-term philosophy even at the expense of short term goals
2. Create flow to surface problems
3. Use 'pull' to avoid overproduction
4. Level out the workload
5. Build a culture of stopping to fix problems - right first time
6. Standard operations are the foundation for continuous improvement and employee empowerment
7. Use visual control so no problems are hidden
8. Use only reliable, tested technology
9. Grow leaders who understand your work, live the philosophy and can teach it to others
10. Develop exceptional people and teams
11. Respect partners and suppliers, challenge and help them to improve
12. Go see and understand for yourself
13. Make decisions slowly, by consensus, consider all options then implement fast
14. Become a learning organisation by reflection and continuous improvement

* The Toyota Way – J. K. Liker

LEAN MANAGEMENT SYSTEM



Lean Management System

1. Visual Controls
2. Leader Standard Work
3. Daily Accountability Process
4. Rapid Reaction Process
5. Discipline

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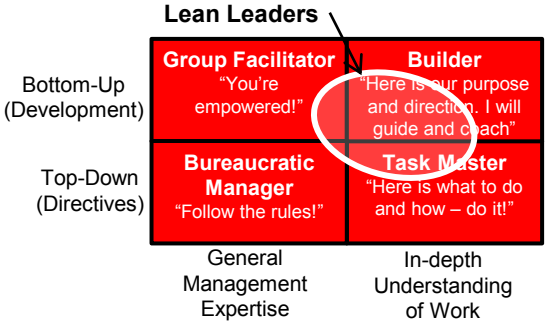
PRACTICE EVERY DAY USING A CASCADED REPORTING STRUCTURE

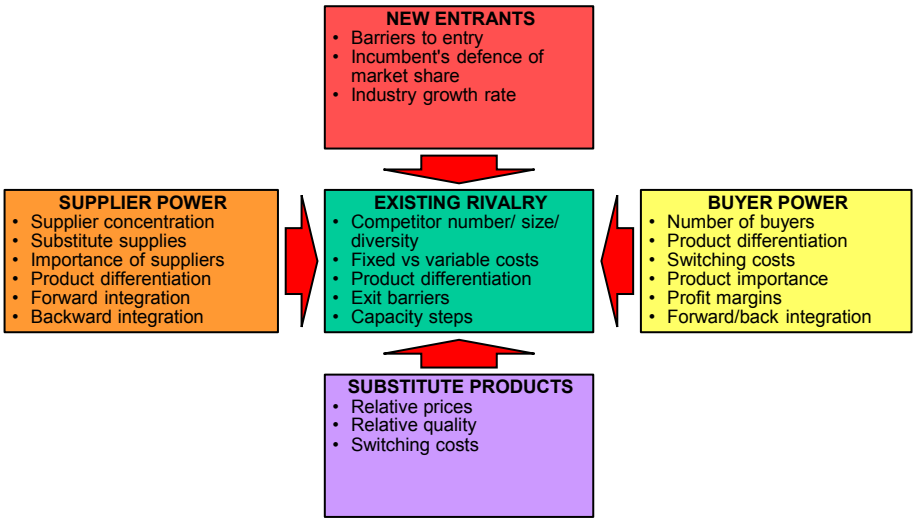
* Creating a Lean Culture – Mann

LEAN LEADERSHIP

- Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others
- Organise to support your people and their work
- Take responsibility for the processes you operate



PORTER'S FIVE COMPETITIVE FORCES



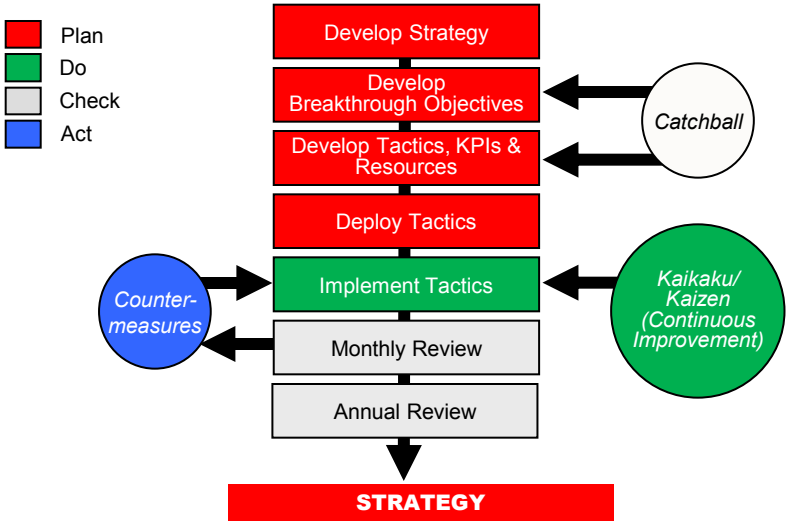
SWOT ANALYSIS

Framework for reviewing strategy, position and direction of a company or business proposition

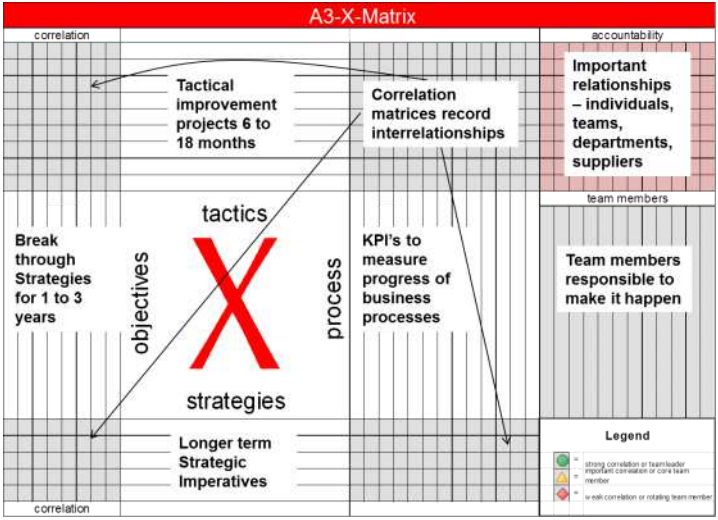
	Positive	Negative
Internal Factors	**Strengths** • Technological skills • Brands • Distribution channels • Customer loyalty/relations • Quality • Scale • Low cast position	**Weaknesses** • Absence of important skills • Weak brands • Poor access to distribution • Low customer retention • Unreliable product/service • Sub-scale • Poor management
External Factors	**Opportunities** • Changing customer tastes • Technological advances • Changing legal or politics • Liberalisation of geographics • Personal tax reductions • Population age structure • New distribution channels	**Threats** • Changing customer habits • Technological advances • Changes in legal or politics • Closing of geographic mkts • Tax increases • Population age-structure • New distribution channels

STRATEGY DEPLOYMENT

(Also Known as Hoshin Kanri or Goal Deployment)

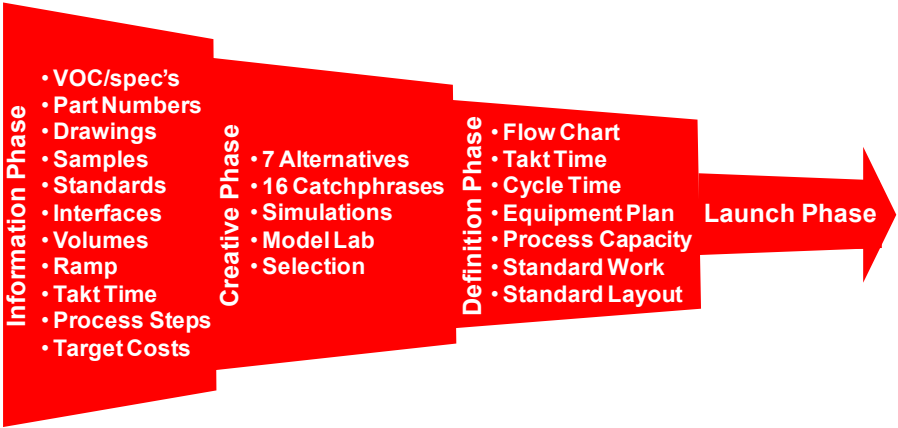


STRATEGY DEPLOYMENT X-MATRIX



3P – PRODUCTION PREPARATION PROCESS

- Process for new product or process development based on simultaneous engineering principles



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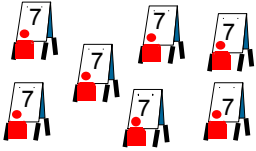
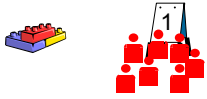
3P – PRODUCTION PREPARATION PROCESS

1 – Each team member individually draws 7 Alternatives	2 – Team gathers to group and evaluate ideas. Selects the top 7	3 – Team moonshines the 7 Alternatives
		

4 – Team evaluates each Alternative. Selects the top 3	5 – Team moonshines the top 3 Alternatives	6 – Team selects Top Alternative
		

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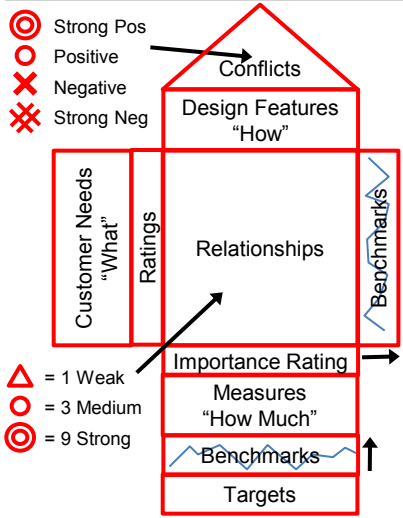
QUALITY FUNCTION DEPLOYMENT



- List "What" the customer needs are and ratings
- Decide "How" the needs will be met (Design Features) and their measures "How Much"
- Determine the relationships △○◎
- Calculate importance ratings What's to How's via Relationships scores
- Benchmark current performance by plotting relative positions
- Set targets
- Identify Conflicts in the How's
- Identify Conflicts in the Relationships between Benchmarks

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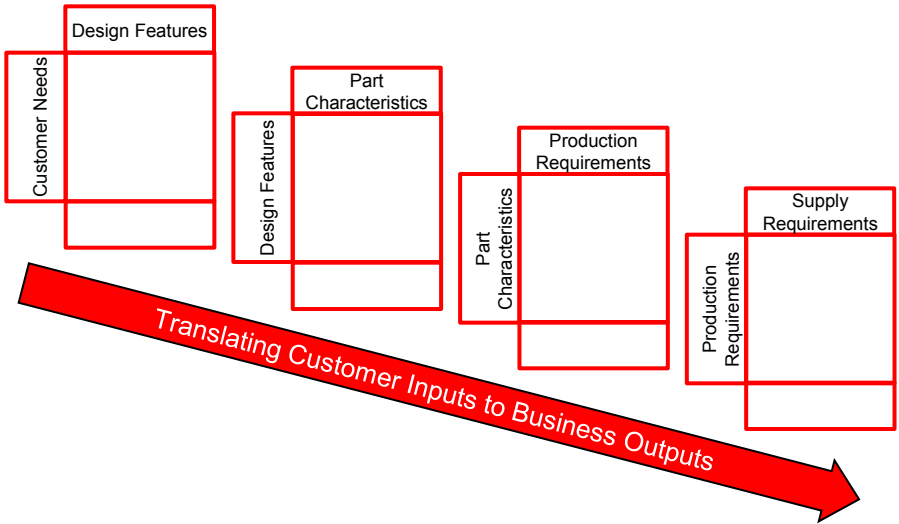
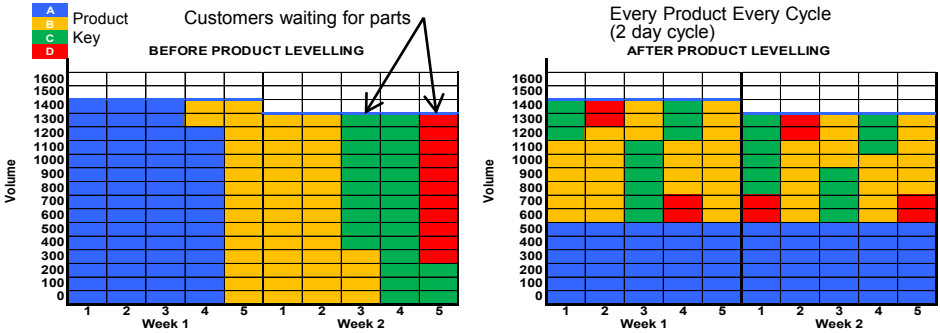
QUALITY FUNCTION DEPLOYMENT



LOAD LEVELLING (HEIJUNKA)



- Before product levelling: long set-up times, unstable processes, large batches, customers waiting for products
- After product levelling: make every part more frequently, fill in capacity with smaller volume parts

* Load levelling diagrams know as Yamazumi charts

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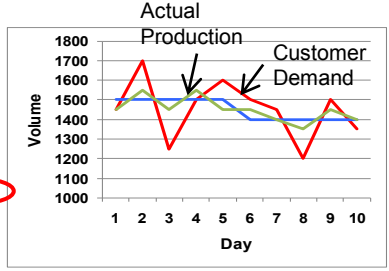
STRATEGIC WIP

- Standard work in progress (SWIP) is required to cover variations in customer demand and instability in the production process:

Week	Day	Customer Demand	Levelled Schedule	Produc-tion	Demand - Prod'n	Cum. Var.
1	1	1450	1500	1450	0	0
	2	1700	1500	1550	150	150
	3	1250	1500	1450	-200	-50
	4	1500	1500	1550	-50	-100
	5	1600	1500	1450	150	50
2	1	1500	1400	1450	50	100
	2	1450	1400	1400	50	150
	3	1200	1400	1350	-150	0
	4	1500	1400	1450	50	50
	5	1350	1400	1400	-50	0

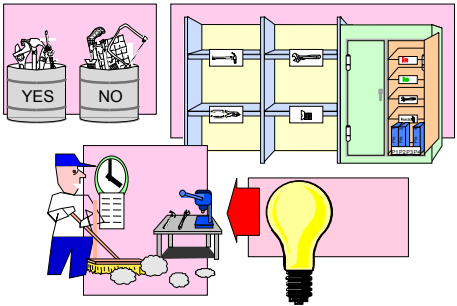


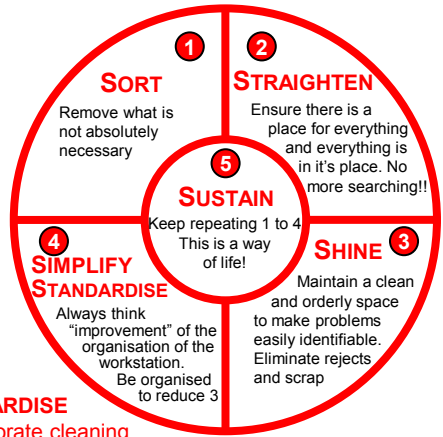
SWIP = maximum cumulative variance between customer demand and actual production rate

WORKPLACE ORGANISATION 5S

SORT
"If in doubt throw it out"

STRAIGHTEN
"Everything has a place and everything is in it's place"





SHINE
Perform a thorough cleaning & inspection

SIMPLIFY & STANDARDISE
Make it easy & incorporate cleaning procedures into the daily work

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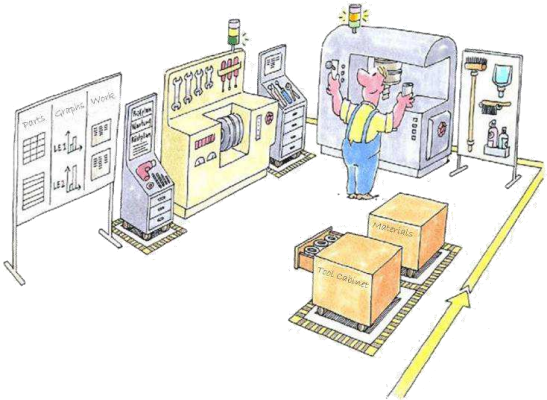
SORT – TYPICAL RED TAG FORMAT

TAG DATE:	**RED TAG**	TAG NO.:
TAGGED BY:		
REASON TAGGED		
1. Raw material ☐	5. Tools ☐	9. Books/mags. ☐
2. WIP ☐	6. Equipment ☐	10. Other ☐
3. Finished mat'ls ☐	7. Furniture ☐	☐
4. Storage equip. ☐	8. Office materials ☐	☐
ITEM NAME/DESCRIPTION:		QUANTITY:
WHERE FOUND:		
ADDITIONAL COMMENTS:		
SUGGESTED ACTION		
1. Sell ☐	4. Discard ☐	7. Other ☐
2. Repair ☐	5. Long term storage ☐	☐
3. Recycle ☐	6. Relocate to:	
ACTION TAKEN	DATE:	

Use Red TAG system is items may be needed by others

VISUAL MANAGEMENT



- **Standards** - methods, quality, maintenance, material location & quantities
- **Targets** - attendance, quality, productivity, cost, uptime, delivery time…
- **Monitoring** - progress towards targets
- **Problems** - visual & audible - live or recurring
- **Defects** - visual & audible e.g. quality care points

Information must be highly visible and used to take action when necessary by everybody

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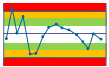
ELEMENTS OF VISUAL MANAGEMENT

	**Visual Assurance**	Enables you to know that hidden things are performing as required
	**Visual Controls**	Prompts you to take an action
	**Visual Metrics**	Enables you to know how you're performing as you're performing
	**Visual Standards**	Enables you to know and maintain the standard of a product/service
	**Visual Order**	Enables you to know and maintain the standard of the workplace
	**Visual Information**	Provides key information about the process

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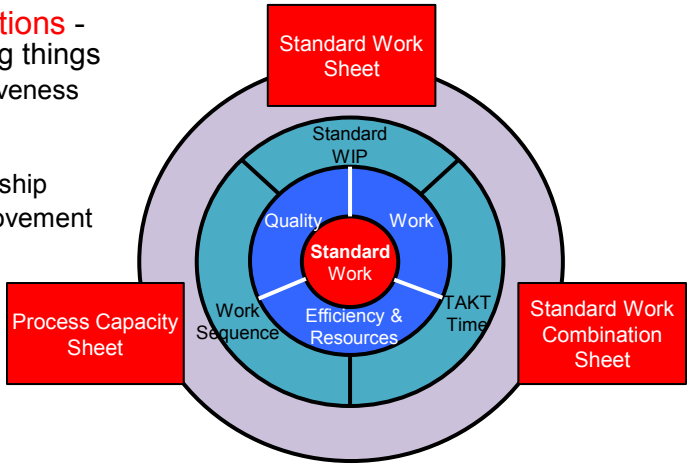
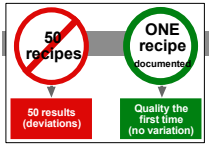
CONTENT OF STANDARD WORK

Standard operations -
a set way of doing things

- improves effectiveness and efficiency
- reduces errors
- promotes ownership
- a basis for improvement





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STANDARD WORK SHEET

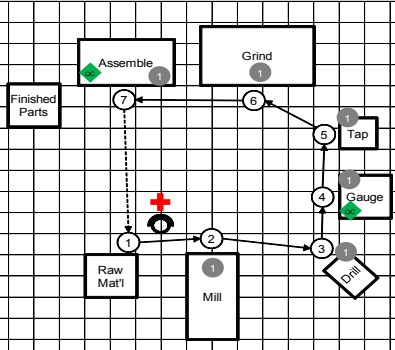
Plant	Acme		
Area	Machine shop		
By	Bill Johnson	Date	08/07/XX
Approved by	Mary Smith	Date	08/07/XX

STANDARD WORK SHEET

Op	1 of 1
Pg	1 of 1

Vol/shift	350
Shifts	2

Part No.	123-A		
Part Name:	Bracket		
Operation	From:	Raw Material	
Sequence	To:	Assembly	



No.	Major Steps	Manu	Auto	Walk	Walt
1	Pick up Raw Material	2			
2	Unload, Load, Start Mill	4	65	3	
3	Unload, Load, Start Drill	3	35	3	
4	Gauge Part	10		3	
5	Unload, Load, Start Tap	4	25	3	
6	Unload, Load, Start Grind	4	50	3	
7	Assemble Bracket, Inspect	25		3	7

Care Points

Set torque on Tap to specified value. Do not over torque! Remove flash on assembly.

See Job Breakdown sheet for detailed steps.

Quality Check	Safety Precaution	Standard WIP	# Pieces WIP	TAKT Time	Cycle Time
QC	Safety Glasses		6	77	70

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SHEWHART/DEMING WHEEL – PDCA

The Scientific Method

Adjust

Analyse the differences to determine their cause. Determine where to apply changes.

When there is no improvement, refine the scope and apply PDCA again.

Hypothesis

Describe in detail the objectives and processes necessary to deliver results in accordance with the expected output.

Reflect

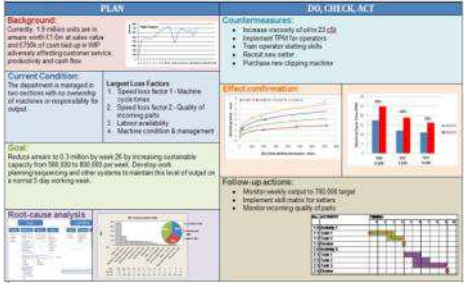
Measure the new processes and compare the results against the expected results to ascertain any differences.

Try

Implement the new processes. Often on a small scale or experiment first if possible.

A3 THINKING

- An A3 can cover any subject
- On one piece of A3/A4 (11″x17″/8.5″x11″) paper
- It is a process of thinking not an output
- Discipline required helps to sharpen thinking
- Use of graphics to make comprehension visual
- Standard format allows fast absorption of information
- Highly portable



An A3 is only as strong as the dialog behind it!

VALUE ADDED & WASTE

Value Added Work → Maximise

The part of the job the customer wants, changes the form or function and is done right the first time.

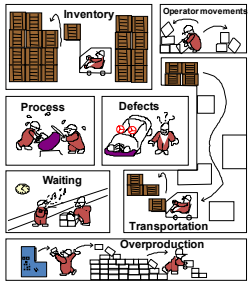
Enabling Waste → Minimise

Work that does not add value but is necessary due to technical, legislative or safety requirements

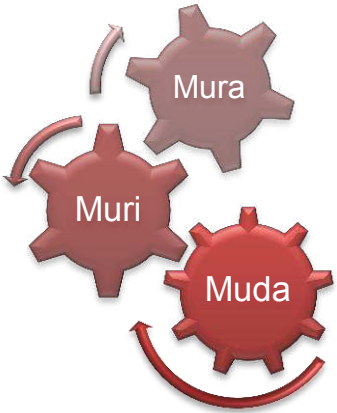
Obvious Waste → Eliminate

Work that does not add value and is unnecessary

1. **T**ransportation – further than is absolutely necessary
2. **I**nventory – too much raw material, WIP & stock
3. **M**ovements – double handling, un-ergonomic
4. **W**aiting – for prior process, materials, maintenance etc
5. **O**verproduction – producing more or before required
6. **O**ver processing – slow, unbalanced, poor equipment
7. **D**efects – scrap, rework, rejects, recalls plus related work



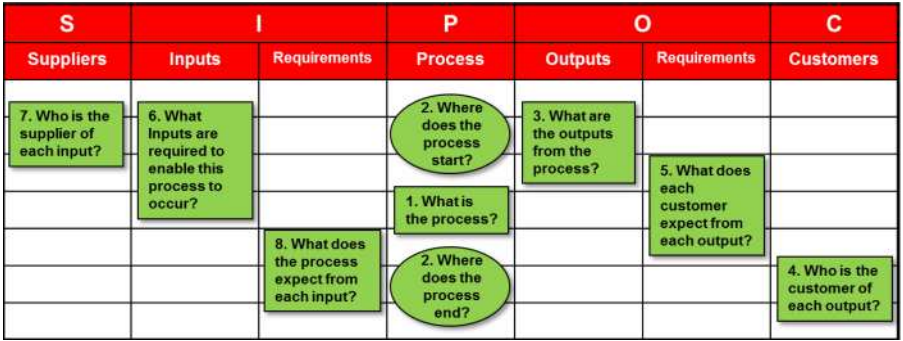
TYPES OF WASTE



- Unevenness (Mura) in a process; for example an uneven work pace causing people to hurry or wait
- Overburdening (Muri), overloading, or stressing of resources (such as people or equipment)
- Waste (Muda) any activity that consumes resources without creating value for the customer

SIPOC DIAGRAM

- Provides and process overview and aligns to customer requirements

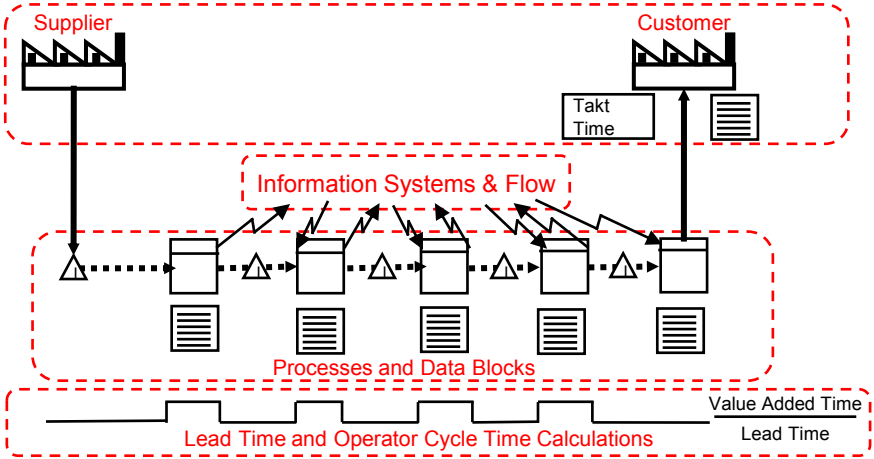


PROCESS MEASURES

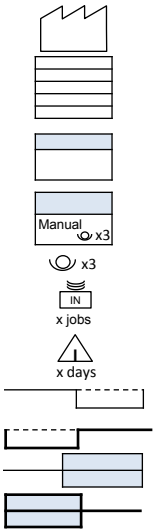
Measure	Sym	Description
Takt time	Takt	Customer demand rate (available time/quantity required)
Lead time	L/T	Time to complete a batch (= inventory / process rate (Little's Law))
Production to delivery ratio	P:D	Lead time/Delivery time
Process time	P/T	Time to complete one item (=L/T-waiting time)
Operator cycle time	OCT	Labour time
Machine cycle time	MCT	Machine time
Value added time	V/A	Time to change fit, form or function
Ontime delivery	OTD	Ontime deliveries/Total deliveries %
Inventory	I	Equivalent number of days good product in stock
Stock turns	ST	Number of times/year stock is turned (Inventory days/365)
Batch size	Batch	Number of pieces per run

Measure	Sym	Description
Total Process Effectiveness	TPE	Availability rate x production rate x quality rate %
Reliability	Rel.	Uptime of process %
Change over time	C/O	Time to change over process (Last good part to first good part)
First pass yield	FPY	100%-%scrap-%rework
Rolled throughput yld	RTY	Product of all FPY yields in a process
Scrap rate	Scrap	Defective parts/Total parts produced %
Parts per million quality	PPM	Defective parts/Good parts x 1,000,000
Rework rate	Rew-ork	Parts reworked/Total parts produced %
Area	Area	Area/space used for operation
Handling freq.	HF	Number of times a part or item is handled
Operator Dist	OD	Distance operator travels
Material Dist	MD	Distance material travels

TYPICAL LAYOUT OF A VSM



VALUE STREAM MAPPING SYMBOLS



External Entity

Data box

Process boxes

Operator (multiples)

In-box (Information queues)

Inventory & WIP

Time line segments

Time line ends

Electronic flow arrow

Manual flow arrow

Push arrow

FIFO

First In First Out stock system

Information box

Shipment arrow

daily

Shipment truck

K

Kanban signal

Supermarket store

OXOX

Load levelling system

Sequenced pull ball system

Kaizen

Improvement activity

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PROCESS MAPPING SYMBOLS

Operation
A Step in the process that adds value

Transportation
To move from one place to another. (Not part of an operation or inspection)

Measurement
To inspect, verify, count, examine, gage for quality or quantity

Storage
To hold for later use
(i.e. in a queue)

Decision
A step in the process where a change in the flow may occur

Delay
To wait for the next operation
(i.e. in a queue)
No value added

PROCESS MAPPING DATA COLLECTION

No	Activity	Time	Dist	●	➡	◆	D	■	▼	VA
1	Pick-up material A	2	2	✓					✓	
2	Get nut and place on mat'l	3		✓						
3	Press together	5		✓						5
4	Place In machine	5	1	✓						
5	Wait for machine cycle	20		✓			✓			5
6	Pick up material B	2		✓					✓	
7	Assemble parts A and B	30	2	✓						10
8	Inspect	10						✓		
9	Place in finished mat'l bin	3	4	✓					✓	
	TOTALS	80	9							20
									% Value Added	25

HOW TO MAP A PROCESS?

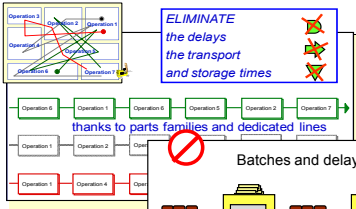
1. Decide which process you are going to map and it's boundaries
2. Form a multi-disciplinary team with experience of the process steps (and some that haven't)
3. Find a room with a large wall space (close to the process if possible)
4. Hang up a roll of paper about 1 metre depth along the wall (maps can get very long!)
5. Start at the end of the process and work backwards (this way you always consider the customer's view)
6. Divide the work amongst the team – no gaps, no duplication – work in pairs

Continued...

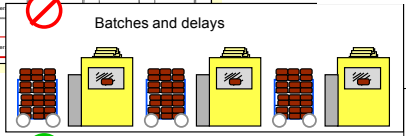
HOW TO MAP A PROCESS CONTINUED...

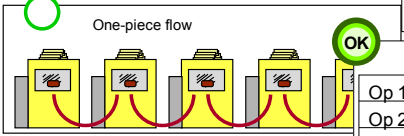
7. Walk the process with the process owner
8. Collect the information and metrics on the process
9. Use different coloured post-it notes to record i) each step and its metrics, ii) problem areas, iii) improvement activities
10. Identify the problem areas and areas for improvement
11. Use lean tools to design an improved future state
12. Plan the activities to make the improvements
13. Improve the process, verify it works and redraw the map
14. Communicate to relevant people
15. Repeat again – continuous improvement!

FLOW

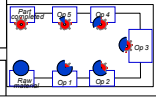


1. Set-up dedicated lines
2. Implement 1 piece flow
3. Balance line to the Takt time

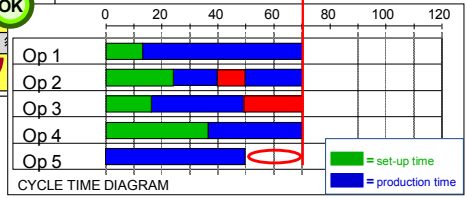




OK



TAKT: 70 SECONDS
= 1 part every 70 seconds



Takt Time = Time per day / Parts per day

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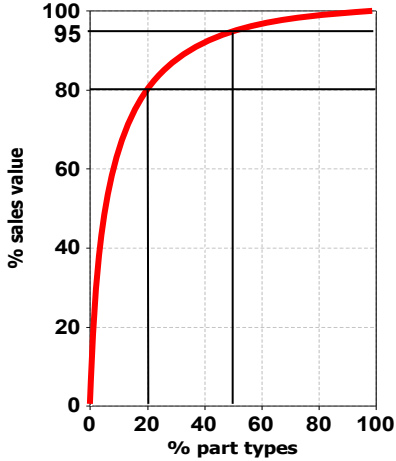
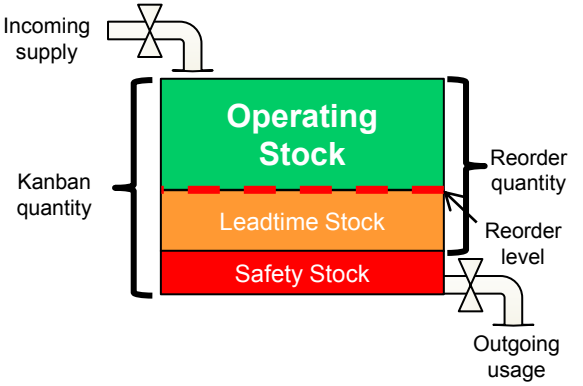
ABC ANALYSIS

- Pareto: the 80/20 rule
- 80% of sales (or profits) is given by 20% of the part types
- Classify parts as A, B or C (usually A = 80%, B = 15%, C = 5%)
- Make A's more frequently than B's & C's, thus hold less stock
- Control 95% of inventory by controlling 50% of part types (A & B)



KANBAN CALCULATION PRINCIPLE



Kanban = Operating Stock
Qty + Leadtime Stock
+ Safety Stock

- The average supply rate must equal the average usage rate
- Fluctuations in usage and supply are taken up by the Kanban stock
- Goods are reordered when the operating stock runs out
- The reorder quantity includes sufficient to cover the average supply leadtime

CALCULATING KANBAN SIZE

$K = (O + L + S)$

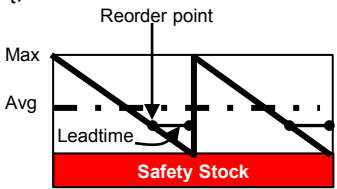
$K = D(O_t + L_t + S_t)$

$K_{avg} = D\left(\frac{O_t + L_t}{2} + S_t\right)$

$R_L = D(L_t + S_t)$

$R = D(O_t + L_t)$

$N = \frac{R}{C}$

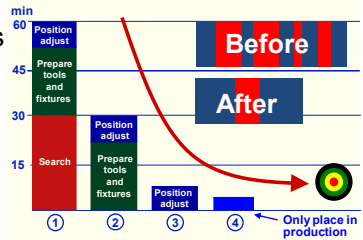


K = Kanban qty
O = Operating stock
L = Leadtime stock
S = Safety stock
D = Demand qty per period
O_t = Operating time
L_t = Leadtime
S_t = Safety time
R_L = Reorder level
R = Reorder qty
C = Container capacity
N = No. Kanban cards or containers required

SMED: PROCESS/TOOL CHANGEOVERS

Single Minute Exchange of Dies – changing processes over in under 10 minutes

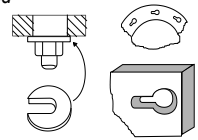
1. Analyse the process
2. Separate internal from external work
3. Convert internal to external work
4. Reduce/eliminate internal work times
5. Reduce/eliminate external work times
6. Standardise the method



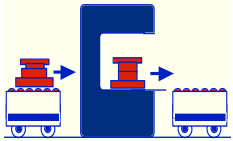
External time = time when process is running
Internal time = time when process is stopped

Select only the tools you need

Use checklist or standard operating procedure



Use quick release fasteners & techniques

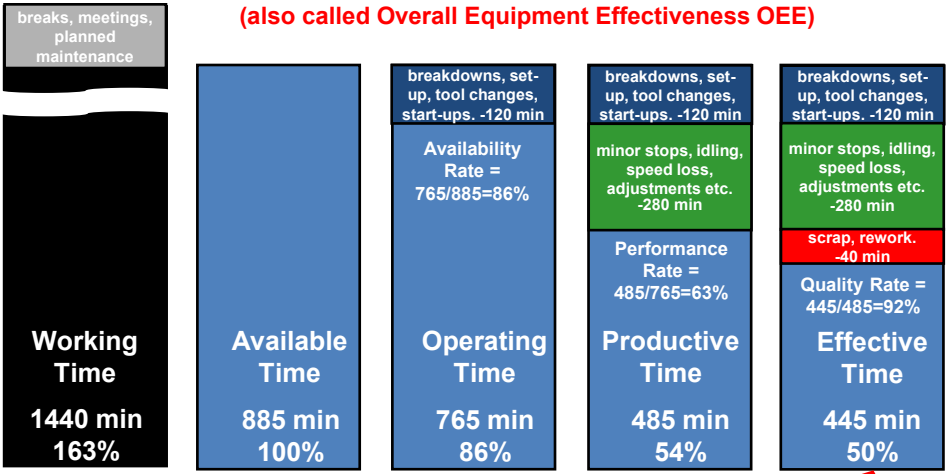


Pre-prepare tools and kitting – old out new in

AIM FOR ONE TOUCH CHANGEOVERS

TOTAL PROCESS EFFECTIVENESS

(also called Overall Equipment Effectiveness OEE)



TPE is 50%

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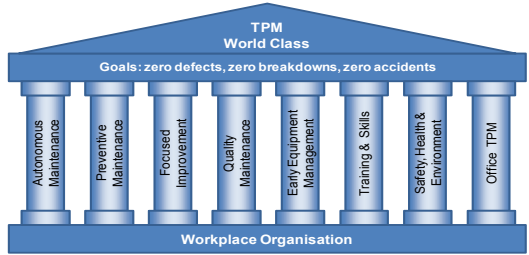
TOTAL PRODUCTIVE MAINTENANCE

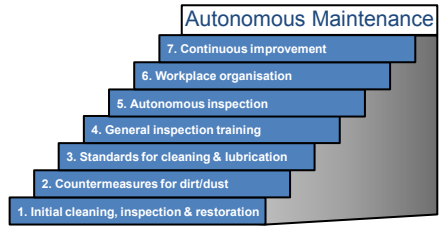
8 pillars of TPM

- Interconnected process of maintenance
- Involving operators, specialists, management and administration
- Implemented in a progressive manner



7 steps to Autonomous maint.

- Determine abnormalities
- Understand equipment
- Understand relationship between equipment conditions and product quality



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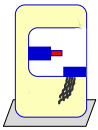
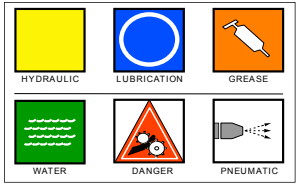
AUTONOMOUS MAINTENANCE

- Improve Overall Equipment Effectiveness to >85%
- Improve capability as a % of tolerance <25%
- Clean the machine to make problems visible
- Operators use their senses to detect problems
- Clear and make accesses easy
- Design custom cleaning tools
- Use visual labels for standards
- Identify normal operating conditions
- Use a standard operating procedure for maintenance

$$\%\ \text{Tol} = \frac{6 \times \text{St. Dev.}}{\text{Tolerance}}$$

St. Dev. of repeated m/c positions per axis





LOOKING AFTER MACHINES AND EQUIPMENT PROACTIVELY

JIDOKA STEPS TO AUTOMATION

M = Manual, A = Automate

Steps		0	1	2	3	4	5	6	7	8	9	10
1	Process	M	A	A	A	A	A	A	A	A	A	A
2	Hold	M	M	A	A	A	A	A	A	A	A	A
3	Feed	M	M	M	A	A	A	A	A	A	A	A
4	Stop feed	M	M	M	M	A	A	A	A	A	A	A
5	Return	M	M	M	M	M	A	A	A	A	A	A
6	Unload	M	M	M	M	M	M	A	A	A	A	A
7	Poka Yoke	M	M	M	M	M	M	M	A	A	A	A
8	Load	M	M	M	M	M	M	M	M	A	A	A
9	Start	M	M	M	M	M	M	M	M	M	A	A
10	Transport	M	M	M	M	M	M	M	M	M	M	A

Jidoka level 7 is ideal where operator is just loading
Known as Load-Load or Chaku-Chaku

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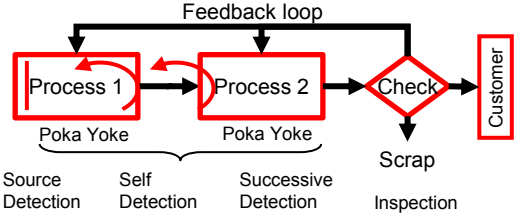
AUTOMATE A STEP AT A TIME, DO NOT JUMP STEPS

MISTAKE PROOFING

Basic Mistake Proofing (Poka Yoke) concept…



Source Detection

- The process makes it impossible to do it wrong

Self Detection

- The process finds the error during the operation to facilitate immediate remedy

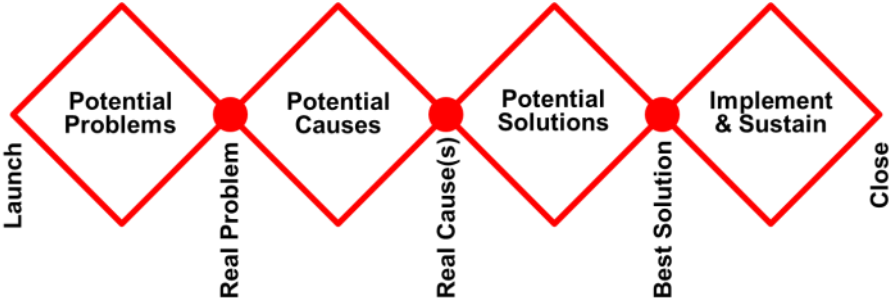
Successive Detection

- The process finds the error after the operation to prevent it being passed onto the next operation

Types of Mistake Proofing device

• Guides	• Symmetry	• Colour coding	• Bar Coding
• References	• Asymmetry	• Floor markings	• Cameras
• Templates	• Warning lights	• Posters	• Emergency stops
• Counters	• Buzzers	• Sign posts	• Duel palm buttons
• Sequence Restrictions	• Cut outs	• Fuses	• Proximity detectors

THE BRIDGE PROBLEM SOLVING™ METHOD



- Consistent with other problem solving methods such as PDCA, 8D and DMAIC
- Holistic structured approach to problem solving
- Provides a standardised method to ensure consistency across the organisation

PROJECT CHARTER

Project No:		**Title:**			
Organisation:			**Business unit:**		
Problem/Opportunity statement:					
Goals & targets:					
Project scope & boundaries:					
Project deliverables?					
Business need addressed by this project:					
Estimate of project benefits:			**Estimate of project costs:**		
Sponsor/Champion:	**Stakeholders:**				
Team leader:	**Team members:**				
Measures:	**Current performance:**		**Target performance:**		
Project start date:		**Project finish date:**			
Sponsor signature:	**Date:**	**Team leader signature:**		**Date:**	

- Project launch information
- Communication and negotiation tool
- Useful reminder of objectives and check on achievements against goals & targets

SMART checklist for goals

- **S**pecific?
- **M**easurable?
- **A**chievable?
- **R**elevant?
- **T**ime bound?

THE BRIDGE PROBLEM SOLVING™ METHOD

	1 Launch Initiative	2 Understand Situation & Define Problem	3 Implement Interim Solution	4 Determine Potential Causes	5 Identify & Verify Root Cause(s)
ACTIVITIES	Form the Team	Understand Customer Concerns	Need for Interim Solution	Understand Potential Causes & Effects	Identify Root Cause(s)
	Manage Stakeholders	Describe & Quantify Problem	Select Interim Solution		Verify Root Cause(s)
	Implement Communication Plan	Understand Process & Performance	Verify Interim Solution		
		Develop Project Plan understand risks			
TOOLS	Skills/Responsibility Matrix	VOC/CTS, Journey, Kano	Interim Solution Need	Affinity Process	5 Why
	Belbin Team Types	Charter: Problem, Objective, Scope	Interim Solution Approaches	Fishbone Diagram	Graphical Analysis
	Team Development	Is-Is Not - 5W2H			With/Without Studies
	Leading Projects	SIPOC, VSMi, Process Mapping			
	Stakeholder Management	Measuring Performance			
	Communication Plans	Gantt Chart, Risk Analysis			

THE BRIDGE PROBLEM SOLVING™ METHOD

	6 Determine Potential Solutions	7 Choose Optimum Solution	8 Implement & Validate Solution	9 Sustain Improvement	10 Close Initiative
ACTIVITIES	Generate Potential Solutions	Select Solution	Implement Solution	Standardise Procedures	Present Project Report
	Remove Waste		Validate Solution	Train in New Procedures	Recognise the Team
			Implement Control Systems	Extend to Other Areas	Share Knowledge & Learning
			Monitor Performance		Archive Results
TOOLS	Brainstorming	Pen Dot Voting	Implementation Plans	Standard Work	Project Reports
	Pattern Breaking	Ease/Impact Matrix	CEDAC	Review Systems	Recognition Methods
	Ideas Generator	Selection Matrix	Quantify Improvement	Training Matrix	Closing Projects
	VA/NVA		FMEA / Control Plans	Visual Management & Control Charts	
	Flow		Error Proofing	Share Best Practice	

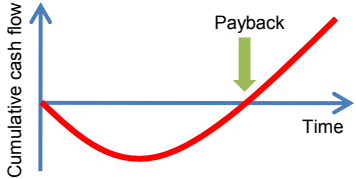
PROJECT CHECKLIST

No.	Description	Quick Ref.	Done
1.	Is the problem/opportunity clearly defined with relevant metrics?	DEFINITION	
2.	Have SMART* goals and objectives been defined?	GOALS	
3.	What are the project deliverables?	DELIVERABLES	
4.	Project boundaries clearly defined? What is in and what is out?	BOUNDARIES	
5.	Project costs and benefits been calculated?	COSTS vs BENEFITS	
6.	What business need does this project address?	BUSINESS NEED	
7.	Has the business case been made?	BUSINESS CASE	
8.	Are the Suppliers-Inputs-Process-Outputs-Customers understood?	SIPOC	
9.	Are the customer's needs understood and supported by data?	CUSTOMER NEEDS	
10.	Have the key project measures been chosen and the current and target values stated? (How will you measure your performance?)	CURRENT/TARGET MEASURES	
11.	Project risk assessment with plans to address high risk areas?	RISK ASSESSMENT	
12.	Key stakeholders identified and a communication plan in place?	STAKEHOLDERS	
13.	Correct team with time and resources to complete the project?	TEAM	
14.	Level of authority to make the necessary changes?	AUTHORITY	
15.	Is there a structure in place to manage the team and its progress?	TEAM MANAGEMENT	
16.	Is there a clear project plan with timing and responsibilities?	ACTION PLAN	
17.	Has the project been signed off to start?	SIGN OFF	

** SMART = Specific Measurable Agreed Relevant Timely*

CALCULATING PROJECT BENEFITS

- Hard benefits flow to the bottom line, soft benefits are delayed benefits and intangible are more difficult to calculate
- Typical Criteria
  - Return on Investment (ROI)
  - Payback
  - Return on Sales (ROS)
  - Return On Net Assets (RONA)
  - Impact on Gross Margin
  - Cash flow



$$\text{ROI} = \frac{\text{Benefit - Cost}}{\text{Cost}}$$

$$\text{Payback} = \frac{\text{Cost}}{\text{Benefit/mth}}$$

$$\text{ROS} = \frac{\text{Profit}}{\text{Sales}}$$

$$\text{RONA} = \frac{\text{Profit}}{\text{Net Assets}}$$

$$\text{Gross Margin} = \text{Sales - Materials \& other direct costs}$$

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PROJECT RISK ASSESSMENT

Area assessed:

Assessor(s):

Comments:

RISK ASSESSMENT FORM

PRA001

Likelihood	x	Severity
Very unlikely	1	Very low
Unlikely	2	Low
Likely	3	Moderate
Very likely	4	High
Certain	5	Very high

Date:

Copies:

Risk Rating: Adequately controlled 1-4, Low risk 5-9, Medium risk 10-16, High risk 17-25

Project Risk	Existing Controls	Likelihood	Severity	Risk Rating	Additional Actions Recommended	Target Date	By Whom	Completion Date	Likelihood	Severity	Risk Rating
Funding unavailable	None	3	5	15	Agree budget with FD				1	5	5
Timing slippage	Management meeting	4	2	8	Create timing plan & manage critical path				2	2	4
Poor communication	None	2	4	8	Develop RACI comms plan				1	4	4
Measured issues	Calibrated gauges	1	3	3					1	3	3
Team not available	Allocated to team	5	4	20	Agree with department heads and appoint stand ins				3	2	6

RACI COMMUNICATION CHART

RACI CHART	Project Objectives	Establish team	Define problem	Results of analysis	Improvement actions	Improvement results	Controls
Champion	A	C	I	I	I	I	I
Process owner	C	C	C	C	C	I	R
Finance	I	I	I	I	C	I	I
Project leader	C	R	A	C	R	R	A
Team members	I	C	A	C	C	A	C
Operators	I	I	C	I	I	I	C
Others	I	I	I	I	I	I	I

RACI (R Responsible, A Accountable, C Consult, I Inform)

CAPTURING CUSTOMER REQUIREMENTS

Customer Journey

- take the journey of a customer through your process(es)
- rate each step 1-5
- note:

– attraction points

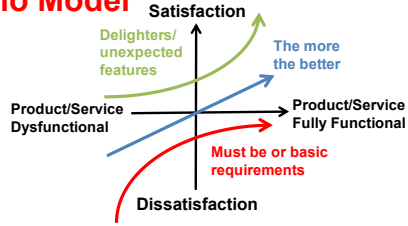
– decision points – leave or stay

– delighter points

Voice of Customer

- Specifications
- Customer feedback
  - surveys
  - feedback forms
  - focus groups

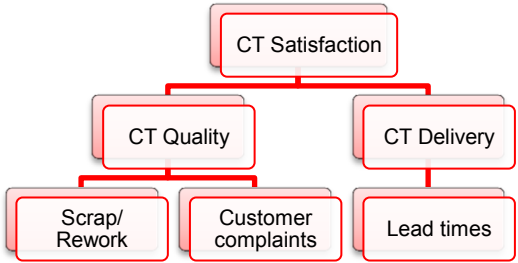
Kano Model



CT'S: CRITICAL TO'S

Turning 'fuzzy' voice of customer statements in to clear measurable goals.

- CT Satisfaction
  - CT Cost
  - CT Quality
  - CT Delivery
  - CT Safety
  - CT ...
- CT KPI's



Item	Target	Current	Gap
Scrap/Rework	8%	3%	5%
Complaints	200	50	150
Lead times	15	10	5

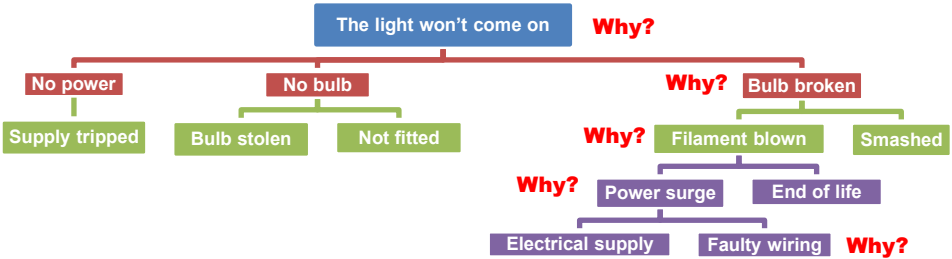
THE 5 WHYS

The 3 steps to Root Causes:

1. Develop a thorough definition of the problem
2. Define the system in which the problem occurs
3. Ask why? five times and develop an event tree

Event trees:

A structured way of identifying all the possible causes of a problem e.g.:



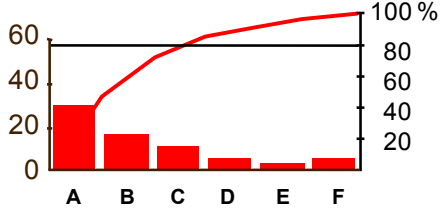
ASKING WHY 5 TIMES IS USUALLY SUFFICIENT TO FIND THE ROOT CAUSES

PARETO DIAGRAMS - 'THE 80/20 RULE'

- Decide which items to study - causes or effects
- Collect data - check sheets, SPC, other
- Arrange in descending order - biggest first
- Calculate cumulative total and percentage
- Draw a bar chart & cumulative percentage

PARETO ANALYSIS CALCULATIONS

DEFECT	NUMBER OF DEFECTS	CUMULATIVE NUMBER	% CUMULATIVE = Cumulative Number / Total Number x 100%
1. Cold Lap	30	30	43%
2. Burn	17	30+17=47	67%
3. Porosity	10	47+10=57	81%
4. Overlap	5	57+ 5=62	89%
5. Undercut	2	62+2=64	91%
6. Other (10)	6	64+6=70	100%
TOTAL	70		



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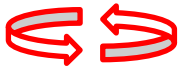
RULES FOR BRAINSTORMING

- Choose a facilitator - to scribe, involve and operate 'rules'
- Define the problem/concern - write it down
- Generate as many ideas as possible - quantity not quality
- Encourage freewheeling - don't reject "silly" ideas
- No criticism - evaluate later
- Everyone to participate - take turns if necessary
- Write everything down - don't edit, keep record
- Let ideas incubate - allow them to 'hatch'
- Use pattern breaking methods to un-jam

THINK WHAT? WHERE? WHEN? HOW MUCH/MANY?

PATTERN BREAKING TOOLS

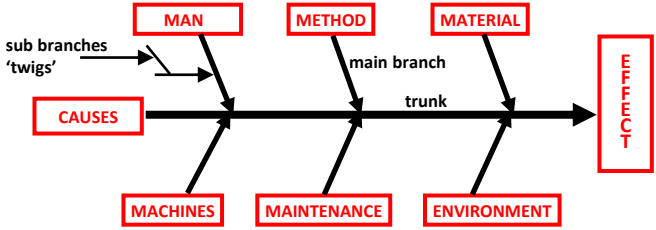
Use in Brainstorming to stimulate ideas

1	**REVERSING ASSUMPTIONS**		List provocative assumptions and reverse e.g. Working faster leads to more mistakes. This is a fallacy
2	**FORCING ASSOCIATIONS**		Look at how another technology or service has solved this problem e.g. engineering look at service and vice-versa
3	**MAKING COMPARISONS**		Ask how unrelated systems have dealt with the same basic problems e.g. nature or another industry
4	**OTHER POINTS OF VIEW**		Look at situation from another stakeholder's perspective – useful for areas of conflict e.g. customer or bosses perspective
5	**OUTRAGEOUS IDEA**		List things that are absurd and would never do. Look for concepts behind these ideas e.g. 'sailing' in space = world-wide web

CAUSE & EFFECT DIAGRAMS

(Fishbone or Ishikawa Diagram)

- Define the problem/concern - i.e. the 'effect'
- Subdivide big problems - tackle each part
- Identify main causes - use '6M's' or other headings
- Identify sub-causes - attach 'twigs'
- Circle biggest causes - rank them using Pareto



SCAMPER - IDEAS GENERATOR

Substitute - can you substitute people, components, materials or processes from elsewhere?

Combine - are there functions, elements, features or processes that you can combine to your advantage?

Adapt - can you alter or adapt ideas from different processes, products or industries to your advantage?

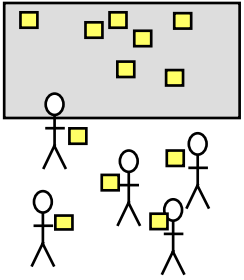
Modify - can you modify a feature or function, perhaps by increasing/decreasing it, or changing its shape or attributes?

Put to another use - can you put your product, service, solution or idea to a different use? Can you access a new market?

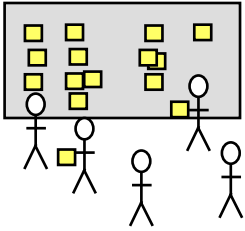
Eliminate - what would happen if you removed an element or process? How would you work round it? Would it simplify things?

Reverse - can you turn things inside out or upside down? What would happen if you did things back to front?

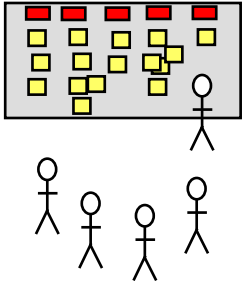
AFFINITY PROCESS TO ORGANISE IDEAS



- Step 1: As a group brainstorm the problem
- Each individual write their ideas on Post-it notes
- Then read each one out and stick the Post-it notes on a wall in no particular order. Add others as necessary

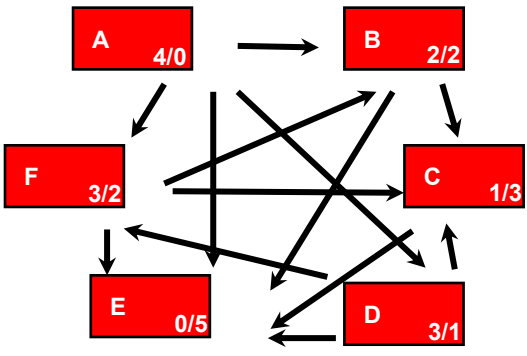


- Step 2: In silence each participant groups the ideas into categories /'affinities' aligned vertically
- No discussion or judgments are cast yet about what is posted

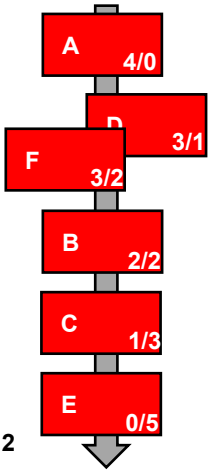


- Step 3: Discuss the categories chosen and make any amendments, additions or subtractions
- Give each grouping a title or category name and write it on a different color Post-it as a heading

THE INTERRELATIONSHIP DIAGRAM



Step 1

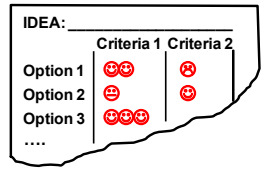


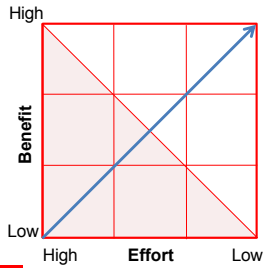
Step 2

Numbers represent arrows out over arrows in

SELECTING IDEAS

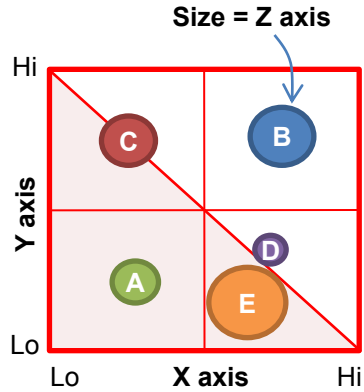
1. Voting
   - each person to choose best three ideas
   - record number of times each idea is chosen to identify most popular ideas
2. 'Pen dots'
   - each person to allocate 10 dots across all ideas (maximum 5 dots per idea)
   - count up the dots for each idea
3. Ranking - 'High, Medium or Low' or 1 to 10 or 'smilies' ☺ 😐 ☹
   - decide as a group the score for each idea
   - criteria – easiest, best payback, most interesting
4. Ease/Impact Matrix
   - assess each idea on a scale of low to high based on:
     - the effort required to implement the idea (Ease)
     - the potential benefit gained (Impact)
   - mark your assessment of each idea on the matrix
   - the better ideas are in the top right of the matrix





SELECTION SQUARE

Axis (X, Y, Z)	Lo/Bad	Hi/Good
Profit/Margin	Poor	Good
Competitive position	Disadvantaged	Advantaged
Customer satisfaction	Expected	Delighter
Timescale	Long	Short
Value potential	Lo value	Hi value
Cost of implementation	Low cost	High cost
Revenue stream	Poor	Good
Assets employed	Consumes assets	Little impact on AE
Payback	Long >3yrs	Short <1yr
Impact on quality	Low	High
Impact on safety	Low	High
Meets objectives	No	Yes
Difficulty	Low probability of success	High probability of success



PROJECTS A - E

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SELECTION MATRIX

SELECTION MATRIX		1	2	3	4	5	6			
Candidate / Selection Criteria		Speed	Amount	Ease	Risk			Total	Rank	%
	Rating of Importance of Selection	9	6	5	8					
1	Idea A	1	3	3	1			50	4	20%
2	Idea B	3	9	3	9			168	1	67%
3	Idea C	3	1	1	9			110	3	44%
4	Idea D	9	1	3	3			126	2	50%
5	Idea E	1	3	1	1			40	5	16%
6										
Total		153	102	55	184					

High	9
Med	3
Low	1

PUGH MATRIX - RANKING METHOD

- List projects to be evaluated across top
- List features down left hand side
- Rank each project against current OR datum OR against each other

Best idea

Concept/project/idea / Features	Idea 1	Idea 2	Idea 3	Idea 4	Idea 5	Idea 6
Customer Impact	DATUM	W	B	W	W	W
Savings potential		W	B	W	W	W
Low investment		W	B	B	W	W
Strategic alignment		S	S	W	B	W
Speed of delivery		W	S	S	W	S
Team availability		S	S	W	W	W
Probability of success		W	S	W	B	W
Sum of B's		0	3	1	2	0
Sum of W's		5	0	5	5	6
Sum of S's		2	4	1	0	1

B=Better, W=Worse, S=Same as Datum

FAILURE MODES AND EFFECTS ANALYSIS

- Assessing failure modes and their effects in processes and products

FAILURE MODES AND EFFECTS ANALYSIS

Description: _____ Responsibility: _____ FMEA Number/Rev: _____

Prepared by: _____ Date (Orig.) / (Rev.): _____

SEVERITY SCALE | OCCURENCE SCALE | DETECTION SCALE

Item	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Potential Cause(s)/ Mechanism(s) of Failure	Occur	Current Controls	Detec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
											Actions Taken	Sev	Occ	Det	R.P.N.
What is the item that could fail?	In what ways does the item fail?	What is the impact on the Customer or Business?	How Severe is the effect to the	What causes the Key Input to go wrong?	How often does cause or FM occur?	What are the existing controls to prevent and detect either the cause or the Failure Mode?	How well can you detect cause or FM?	Multiply Sev x Occure x Detec	What are the actions for reducing the occurrence of the Cause, or improving detection?	Who is Responsible for the recommended action and date when?	What are the completed actions taken? Include completion date.				

FMEA GENERAL RATING SCALES

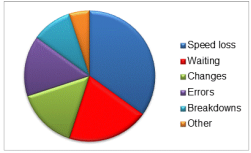
High

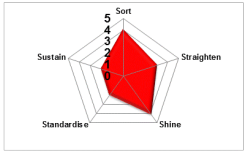
Low

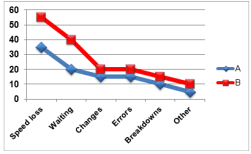
RATING	DEGREE OF SEVERITY	LIKELIHOOD OF OCCURRENCE	ABILITY TO DETECT
10	Customer endangered due to the adverse effect on safe system performance without warning before failure or violation of governmental regulations	Assured of failure based on warranty data or significant testing	Absolute certainty that the current controls will not detect the potential failure
9	Customer endangered due to the adverse effect on safe system performance with warning before failure or violation of governmental regulations	Failure is almost certain based on warranty data or significant testing	Current controls probably will not even detect the potential failure
8	Very high degree of dissatisfaction due to the loss of function without a negative impact on safety or governmental regulations	High failure rate without supporting documentation	Very poor likelihood that the potential failure will be detected or prevented before reaching the next customer
7	High degree of customer dissatisfaction due to failure without complete loss of function. Productivity impacted by high failure or reprocessing levels.	Relatively high failure rate with supporting documentation	Poor likelihood that the potential failure will be detected or prevented before reaching the next customer
6	Warranty or significant customer complaint	Moderate failure rate without supporting documentation	Controls are unlikely to detect or prevent the potential failure from reaching the next customer
5	Customer is made uncomfortable or their productivity is reduced by the continued degradation of the effect	Relatively moderate failure rate with supporting documentation	Moderate likelihood that the potential failure will reach the next customer undetected
4	Customer dissatisfaction due to reduced performance	Occasional failures	Controls may detect or prevent the potential failure from reaching the next customer
3	Customer will experience annoyance due to the slight degradation of performance	Low failure rate without supporting documentation	Low likelihood that the potential failure will reach the next customer undetected
2	Customer will probably experience slight annoyance	Low failure rate with supporting documentation	Almost certain that the potential failure will be found or prevented before reaching the next customer
1	Customer will not notice the adverse effect or it is insignificant	Likelihood of occurrence is remote	Sure that the potential failure will be found or prevented before reaching the next customer

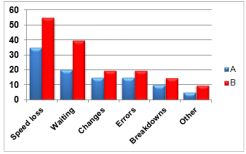
DISPLAYING DATA

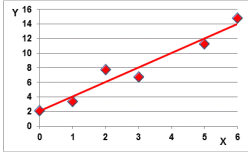
- Pie and radar charts
  - show relative proportions and help to identify priorities
  - quick and easy to see issues
- Line, column and bar charts
  - show scale of measurement
  - values can be identified
- X-Y scatter and box plots
  - X-Y charts (scatter charts) show relationships
  - box plots show relative spread of data

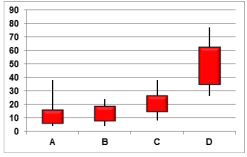












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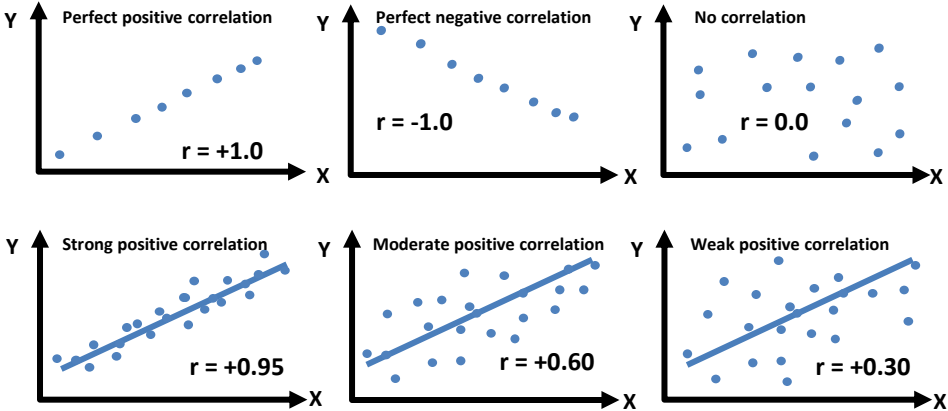
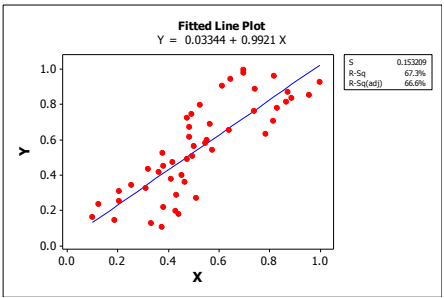
CORRELATION

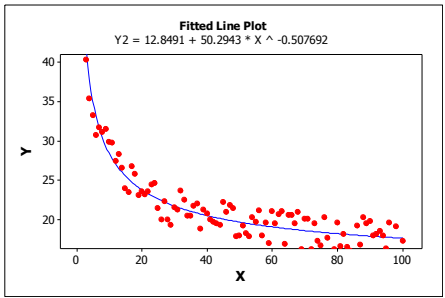
Correlation is a measure of the strength of relationship between two continuous variables. To be 95% confident that there is a significant relationship between X and Y $r_{min} = 2/\sqrt{n}$ (n= number of data points)



REGRESSION

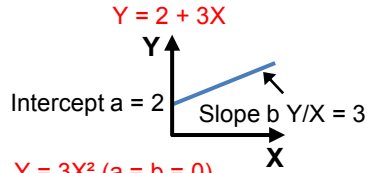
- Regression models relationships between two or more continuous variables by ‘fitting’ an equation to the data
- The method of least squares minimises the sum of the squares of the residuals (difference between actual and equation)



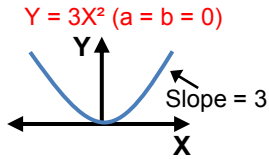


FITTING DATA

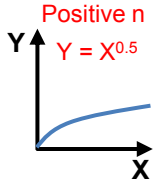
- **Linear** $Y = a + bX$

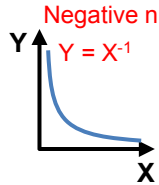


- **Quadratic** $Y = a + bX + cX^2$



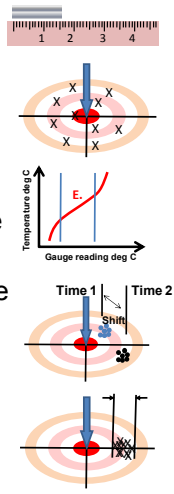
- **Power** $Y = aX^n$





COMPONENTS OF MEASUREMENT ERROR

1. Resolution/Discrimination
   - capability to detect the smallest acceptable change
   - "10 bucket" guideline resolution to be 1/10th
2. Accuracy (bias)
   - ability to hit a target or master value on average
3. Linearity
   - measurement is true or consistent across range of gauge
4. Stability (consistency)
   - measurements remain constant and predictable over time i.e. accuracy remains constant
5. Precision – Repeatability & Reproducibility
   - Repeatability – variation that occurs when repeated measurements are made under identical conditions
   - Reproducibility – variation that results when different conditions are used to make the same measurements



ATTRIBUTE GAGE R&R - OVERALL

C = correct rating
I = Incorrect rating

Parameter	Standard	Appraiser 1		Appraiser 2		Overall
		First Try	Second Try	First Try	Second Try	
1	C	C	C	C	C	C
2	I	C	C	C	C	I
3	C	C	C	C	C	C
4	C	C	I	C	C	I
5	C	C	I	I	I	I
6	C	C	C	C	C	C
7	C	C	C	C	C	C
8	I	I	I	I	I	C
9	I	I	I	I	I	C
10	C	C	C	C	C	C

Overall Measurement System error (Accuracy, Repeatability & Reproducibility)

Appraiser 1		Appraiser 2	
Accuracy vs Std*	70%	Accuracy vs Std*	80%
Repeatability vs Self	80%	Repeatability vs Self	100%
Overall Repeatability, Reproducibility & Accuracy			70%

SCALE – <80% needs improvement, >80% to 95% marginal, >95% acceptable, >99% for high risk

* Take worst case try

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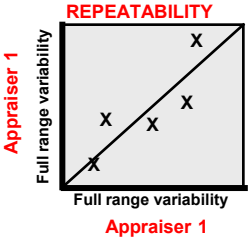
SIMPLE VARIABLE GAGE R&R



- Select 5 to 10 items representing full range of long term variability
- Have 2 to 3 appraisers measure items 2 to 3 times and plot pairs of results
- Assessments of Repeatability and Reproducibility can be obtained from Correlation Coefficients (Excel = CORREL(arr1,arr2)

Acceptability	Correlation Coefficient
Unacceptable	<0.90
Marginal	>0.90 to <0.99
Acceptable	>0.99

CALCULATING CONFIDENCE INTERVALS

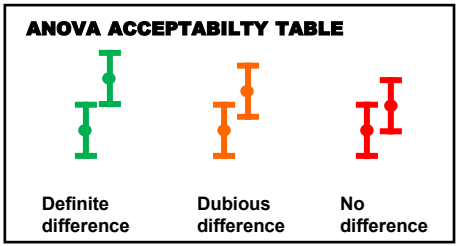
$$d = \frac{2s}{\sqrt{n}}$$

CI = $\pm d$ = Confidence Interval

s = Standard Deviation

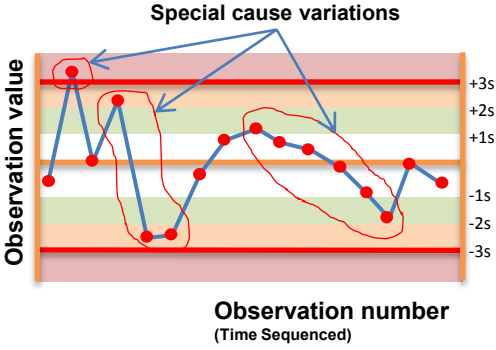
n = Number of data points

The 2 gives 95% confidence



- Calculate the 95% confidence interval for the data mean using the formula opposite
- This provides the limits within which you can be 95% confident that the data set mean sits
- Now plot the mean and the confidence limits for each set of data you want to compare
- Make your judgment from the ANOVA acceptability table opposite

STATISTICAL PROCESS CONTROL



s = standard deviation

TESTS FOR SPECIAL CAUSE VARIATIONS

1. Any point outside control limits
2. 9 consecutive points on same side of centre line
3. 6 consecutive points increasing or decreasing
4. 2 of 3 points outside ±2s zones
5. 4 of 5 points outside ±1s zones
6. 14 consecutive points alternating up and down
7. 15 consecutive points within ±1s
8. 8 points in a row greater than ±1s, same side of centre line

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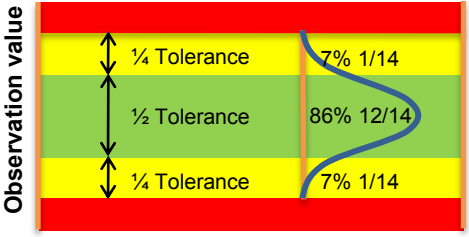
An unstable process has trends, patterns or unexpected large values

SPC PRE-CONTROL – A SIMPLE CONTROL METHOD



Average six sample pairs between consecutive adjustments

Key:

UTL	– Upper Tolerance Limit
LTL	– Lower Tolerance Limit
UPCL	– Upper Pre-Control Limit
LPCL	– Lower Pre-Control Limit

To qualify set-up:

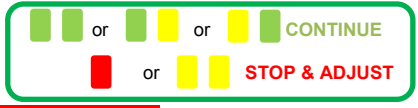
- If five consecutive pieces are in Green zone, set-up is ok to run
- If one yellow, restart counting
- If two consecutive yellows, adjust the process
- If one reading is red, adjust the process

Qualifying setting

Sample two consecutive pieces A and B

- If both are green or one is yellow and the other is green, continue
- If both A and B are yellow on the same side, adjust the process. If yellows are on the opposite sides, call for help as this may require review of the process
- If any of the pieces is red, adjust the process. Inspect the last sample.

Running: measure 2 pieces in a row



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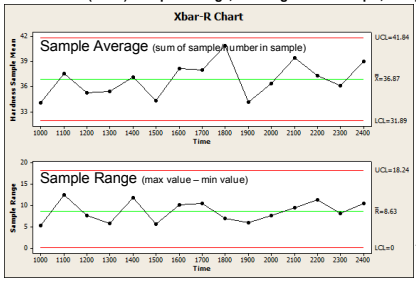
CHARTING CONTINUOUS DATA

Continuous data has no boundaries between adjoining values
e.g. time, temperature, weight, pressure

Chart Types

- I-MR Individual and Moving Range used when collecting more than 1 sample doesn't make sense e.g. destructive tests, low volume processes, batching
- Xbar-R Average and sample range for sample sizes less than 10
- Xbar-S Average and sample standard deviation for sample sizes10 or greater

Xbar-R → Xbar(mean)=sample average, R= Range within sample, Sample sizes less than 9.



Time	Hardness	R
1000	34.05	5.32
1100	37.55	12.48
1200	35.26	7.55
1300	35.41	5.71
1400	37.15	11.80
1500	34.31	5.62
1600	38.14	10.18
1700	37.96	10.42
1800	40.87	7.01
1900	34.08	6.02
2000	36.34	7.65
2100	39.45	9.53
2200	37.31	11.39
2300	36.09	8.19
2400	39.05	10.46
Average	**36.87**	**8.62**
StDev	**2.05**	**2.43**
UCL	**43.02**	**15.91**
LCL	**30.72**	**0.00**

Notes:
UCL ≈ Average + 3s, LCL ≈ Average -3s
LCL in moving range is set to zero if negative
Xbar-R can be used on non-Normal data (the distribution of samples tend towards normality)
Take a minimum of 25 samples before constructing UCL and LCL lines

CHARTING DISCRETE (ATTRIBUTE) DATA

Discrete data has clear boundaries between adjoining values includes names, categories, counts and rank orders e.g. dates, colours, defects, defectives.

Chart Types

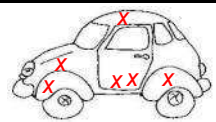
- NP Charts – plots the ***number*** of defectives per lot or subgroup size (constant lot sizes)
- P Charts – plots the ***proportion*** of defectives per lot or subgroup (variable lot sizes)

Defectives

- C Charts – plots the number of defects from a lot or subgroup (constant lot sizes)
- U Charts – plots the number of defects per unit sampled (variable lot sizes)

Defects

	Defectives	Defects
Variable Sample	P-Chart	U-Chart
Constant Sample	NP-Chart	C-Chart



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PROCESS CAPABILITY RATIOS (CP, PP, CPK, PPK)

A centred process

$$Cp = \frac{USL - LSL}{6s_{short\ term}}$$

$$Pp = \frac{USL - LSL}{6s_{long\ term}}$$

An off-centred process

$$Z_L = \frac{\bar{X} - LSL}{3s}; \quad Z_U = \frac{USL - \bar{X}}{3s}$$

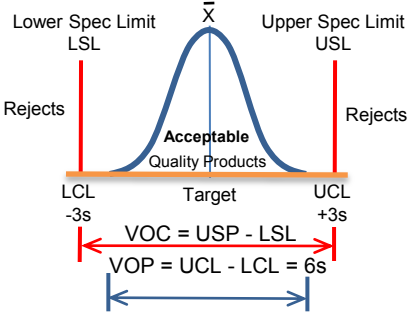
$$Cpk = \frac{Min\ (Z_L, Z_U)_{short\ term}}{3s_{short\ term}}$$

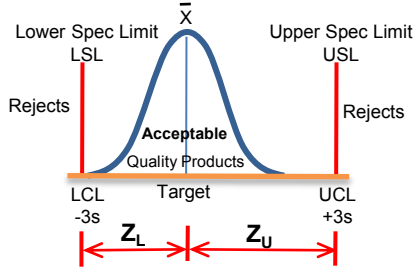
$$Ppk = \frac{Min\ (Z_L, Z_U)_{long\ term}}{3s_{long\ term}}$$

Sigma of a process

$$Z_{Score} = \frac{SL - \bar{X}}{s}$$

SL = nearest specification limit. A Z_{Score} of 6 is Six Sigma





CP/PP RELATIONSHIPS

Sigma	Cp/Pp	Yield (2 sided)*	PPM (2 sided)*
1	0.33	68.27%	317,310.5
1.5	0.50	86.64%	133,614.4
2	0.67	95.45%	45,500.3
2.5	0.83	98.7581%	12,419.3
3	1.0	99.7300%	2,699.8
3.5	1.17	99.9535%	465.3
4	1.33	99.9937%	63.3
4.5	1.5	99.99932%	6.8
5	1.67	99.999943%	0.57
5.5	1.83	99.999996%	0.038
6	2.0	99.9999998%	0.00197

N.B. Yields and PPM's are calculated using defects at both tails of the Distribution assuming a Centred Process

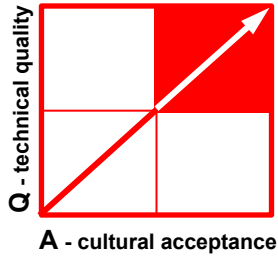
CHANGE EFFECTIVENESS FORMULA

E = Q x A

- **E** – Effectiveness of change
- **Q** – Quality of technical solution
- **A** – Cultural acceptance

Lessons Learnt

- ✓ Devote as much energy to the A as you do to the Q
- ✓ Get the Q right - It's tough to gain cultural acceptance for a poor technical solution



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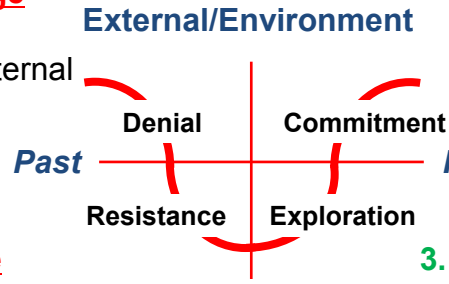
BELBIN TEAM TYPES

	Role Name	Role Tasks Preferred
	**Company Worker (CW)**	Converting concepts, strategy, and ideas into relevant plans for action
	**Chairperson (CH)**	Charismatic steering of teams towards an effective performance. The resolution of non-productive conflict and the focusing of resources
	**Shaper (SH)**	The forceful manager who has the task in mind and impresses those around to keep on course
	**Plant (PL)**	The ideas person who finds new angles and approaches to problems
	**Resource Investigator (RI)**	The Mr(s) Fix It who has contacts and runs the relevant or irrelevant network of connections
	**Monitor Evaluator (ME)**	The continuous standard setter who, by experience or background know how it "ought" to be done
	**Team Worker (TW)**	The "grafter" who wants to be allowed to get on with the job and is not really concerned with individual control issues
	**Completer Finisher (CF)**	The individual concerned with the actual delivery of the task

BOLMAN'S CHANGE MODEL

1. Denial Stage
- Numbness
- Reaction internal
- Disbelief



4. Commitment
- New objectives
- Action plans
- Team work

2. Resistance
- Anger
- Anxiety
- Fear
- Verbal reaction

3. Exploratory
- Begin to accept the inevitability
- Negotiation
- Looking for benefits

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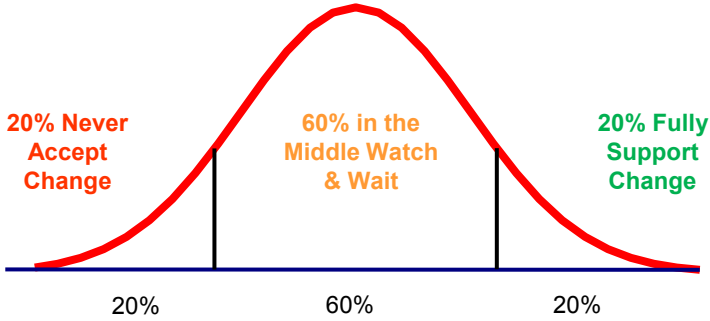
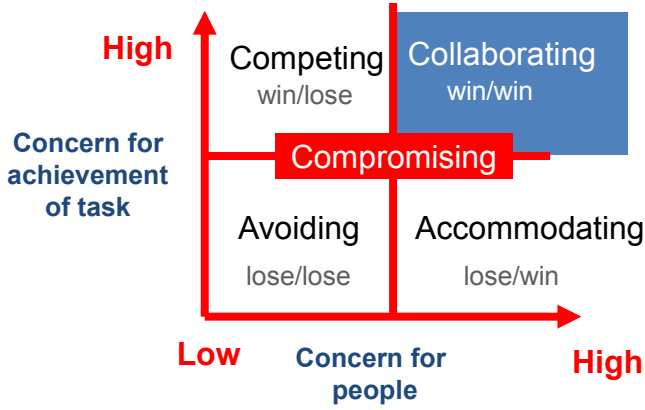
THE 20/60/20 RULE OF CHANGE

- Recruit the Supportive 20% but Manage the Unsupportive 20%
- The Silent Majority Watch & Wait



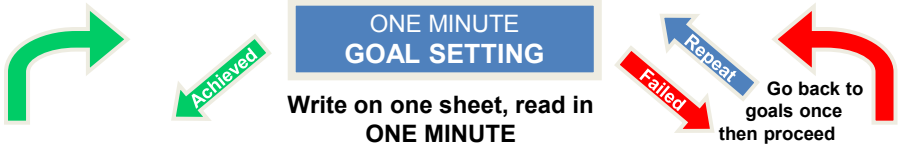
Capture the hearts and minds of the silent majority

MANAGING CONFLICT



Collaborate: to work together, especially in a joint intellectual effort

ONE MINUTE MANAGER



1. praise the behaviour
2. do it soon
3. be specific
4. tell the person what they did right and how you feel about it
5. encourage the person
6. shake hands.

You win !

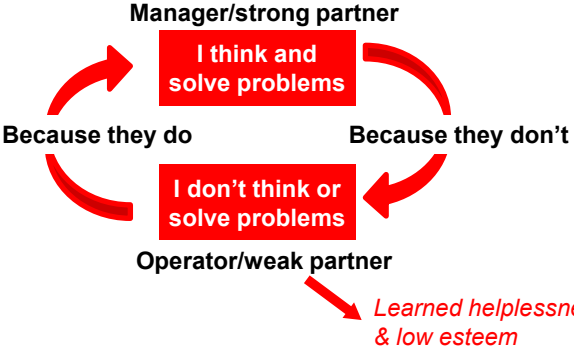
1. reprimand the behaviour
2. do it soon
3. be specific
4. tell the person what they did wrong and how you feel about it
5. encourage the person
6. shake hands.

You lose !

Lean Improvement Handbook

DEPENDENCY LOOP & COACHING

Don't solve other peoples problems
Coach them to solve their own



- Set SMART objectives
- Support & guide
- Coach using SOCS
  - Situation
  - Options
  - Consequence
  - Select

Both must change

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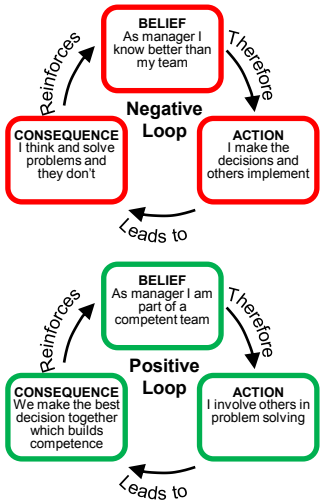
COACHING

- Socratic questioning used to develop critical thinking to:
  - explore complex ideas
  - get to the truth
  - open up issues and problems
  - uncover assumptions
  - analyse concepts
  - distinguish what we know from what we don't know
  - follow out logical implications of thought
- Use open questions: "What did you…", "How can you…", "Why do you think…"



MEETINGS TERMS OF REFERENCE

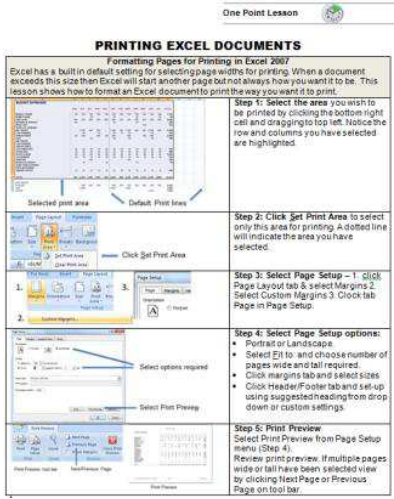
For a meeting to run smoothly and efficiently it needs to be 'designed' to fulfil it's purpose. A 'Terms of Reference' document can help you achieve this. Let people know why they are required and what you expect of them.

TEAM NAME	Continuous Improvement Team
MEETING PURPOSE	To ensure actions are completed and benefits gained
ATTENDEES	Line 1 team
FREQUENCY	Weekly
TIME & LOCATION	10:00 in meeting room 1
DURATION	1 hour
AGENDA	Review actions taken since last meeting Assess progress against target dates Agree any further actions Critique meeting

INPUTS	**OUTPUTS**	**RULES**
Action plan/timing plan Current measures	Update action plan Points to communicate	Start on time Come prepared Stick to the point

ONE POINT LESSONS

- Lesson on **one topic** taking less than 15 minutes
- On **one sheet** of paper
- Use as **many senses** as possible in the learning
- Written as **simple** as possible
- Topic can be **anything**
- Generally prepared by supervisors or group leaders and sometimes by operators.


One Point Lesson

PRINTING EXCEL DOCUMENTS

Formatting Pages for Printing in Excel 2007

Excel has a built in default setting for selecting page widths for printing. When a document exceeds this size then Excel will start another page but not always how you want it to be. This lesson shows how to format an Excel document to print the way you want it to print.

Selected print area

Default Print lines

Step 1: Select the area you wish to be printed by clicking the bottom right cell and dragging to top left. Notice the row and columns you have selected are highlighted.

Click Set Print Area

Step 2: Click Set Print Area to select only this area for printing. A dotted line will indicate the area you have selected.

Step 3: Select Page Setup – 1. Click Page Layout tab & select Margins 2. Select Custom Margins 3. Clock tab Page in Page Setup.

Select options required

Select Print Preview

Step 4: Select Page Setup options:

- Portrait or Landscape.
- Select Fit to and choose number of pages wide and tall required.
- Click margins tab and select sizes.
- Click Header/Footer tab and set-up using suggested heading from drop down or custom settings.

Step 5: Print Preview

Select Print Preview from Page Setup menu (Step 4).

Review print preview. If multiple pages wide or tall have been selected view by clicking Next Page or Previous Page on tool bar.

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A TYPICAL KAIZEN WORKSHOP AGENDA

1. Day 1
   - a.m. measure the current situation
   - p.m. ideas & plan for the new situation
2. Day 2
   - a.m. design new situation
   - p.m. make some changes
3. Day 3
   - a.m. make some changes
   - p.m. run the new process
4. Day 4
   - a.m. record the new situation
   - p.m. complete follow-up action plan
5. Day 5
   - a.m. practice presentation
   - a.m. presentation

20-35%
Depending on process and teaching required

40-60%
Depending on what the team can achieve

15-25%
Depending on process and what follow-up actions are required

DON'T FORGET TO 'TEACH AND DO' AND THEN REPEAT

KAIZEN BEHAVIOURS

1. Don‘t try to justify the past – challenge fixed ideas
2. Be positive – think how things CAN be done not why they CAN‘T
3. Use data, not pet theories or opinions
4. Use wisdom not money
5. Work smarter not harder
6. Set high standards but don’t let perfect get in the way of better
7. Correct failures immediately - 70% now is better than 100% never
8. Lead by example – do first and others will follow
9. A team is better than 1 expert – involve people
10. Identify the root cause

CAN DO, DO IT, DO IT NOW!

FINAL PRESENTATION FORMAT

Introduction

- team
- area/cell/process

Before | After

- photos
- metrics
- improvements

Conclusion

- improvement monitor
- follow-up action plan

Improvements		Event: Kaizen Location: Tarmac Lines S&S		Date: 19-21/08/08	
PARAMETERS	UNITS	BEFORE	AFTER	IMP'T	REMARKS
House Keeping Score	%	56	89	59%	
OEE	%	50.3	83.9	67%	After actions
Number of people (all shifts)		5	3	40%	
Productivity	U/day	280	483	67%	
Bottleneck Process Time		15.5	14	10%	
Improvements to do		23	14	39%	10 left to complete

ACTION CHART		Event: Kaizen Location: Tarmac Lines S&S	Date: 19-21/08/08	Page 1 of 2	
No.	Observation	Action	Who	When	Prog
1	No defined bds location	Organise and make permanent	AB/SG/ RC		
2	Overflow of product on both filling lines	Fit trays to both sides	CN		
3	Sack tip used for IRSB not yet working correctly	Now ready use on next run	Ops		
4	German order	Better forecast/scheduling of 3mm stone	AB	5/9/08	
5	Plan hopper to prod'n	Mark lines and communicate	CB,DS, MB		
6	Lidding m/c NOK	Investigate	A-Bar (PE)		
7	Bags not sealing correctly L6	Adjust track speeds & height of bag holding pins	CN		
8	Robot not correctly stacking	X&Y and crushing plastic	PE		

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PROJECT ACTION PLAN

No	Issue	Action	Who	When	Prog.
1	Issue 1	Action 1 (not yet started)			
2	Issue 2	Action 2 (planned or 25%)			
3	Issue 3	Action 3 (piloted or 50%)			
4	Issue 4	Action 4 (checked or 75%)			
5	Issue 5	Action 5 (completed or 100%)			

Progress wheel based on Deming's PLAN, DO, CHECK, ACT cycle

IMPROVEMENT WORKSHOP CHECKLIST

People

Get approval	☐
Best team available	☐
Inform:-	
Management	☐
The team	☐
Specialists	☐
Audience for presentation	☐
Operators & materials to run	☐
Others?	☐

Facilities / other

Base/Room available	☐
Computer & projector (?)	☐
Flipchart & pens	☐
Presentation board/stand	☐
Refreshments	☐

Equipment

Team name tags	☐
Relevant presentations	☐
Kaizen forms	☐
Paper & pens	☐
Post-It notes	☐
Stop watch(s)	☐
Tape measure	☐
Camera	☐
Floor tape	☐
Marker pens	☐
White tack	☐
Other	☐
	☐

NOTES

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