

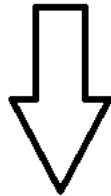
Toyota

## Lean

Reduce waste  
Efficient  
Speed/Simple  
Flexible

120 pounds vs 95 pounds  
Detox plan

Eliminate/Reduce:-  
Toxins  
Fats  
Fluids  
water retention  
Impurities



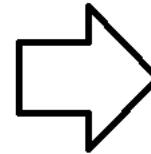
Motorola

## Six Sigma

Reduce Variation  
Effective  
Quality/Accuracy  
DMAIC

Good things

High fibrous  
HP  
HIIT  
Supplements  
PS  
Multivitamins



## Lean Six Sigma

D - Define  
M-Measure  
6 meals, 10 glasses, 9 hours  
sleep, move,  
A-Analyse  
4.5 hours, 1.5 hours  
**Sleeping, water, movement**

I - SP, Water, movement  
95 pounds

C- Maintain,

High fibrous  
HP  
HIIT  
Supplements  
PS  
Multivitamins

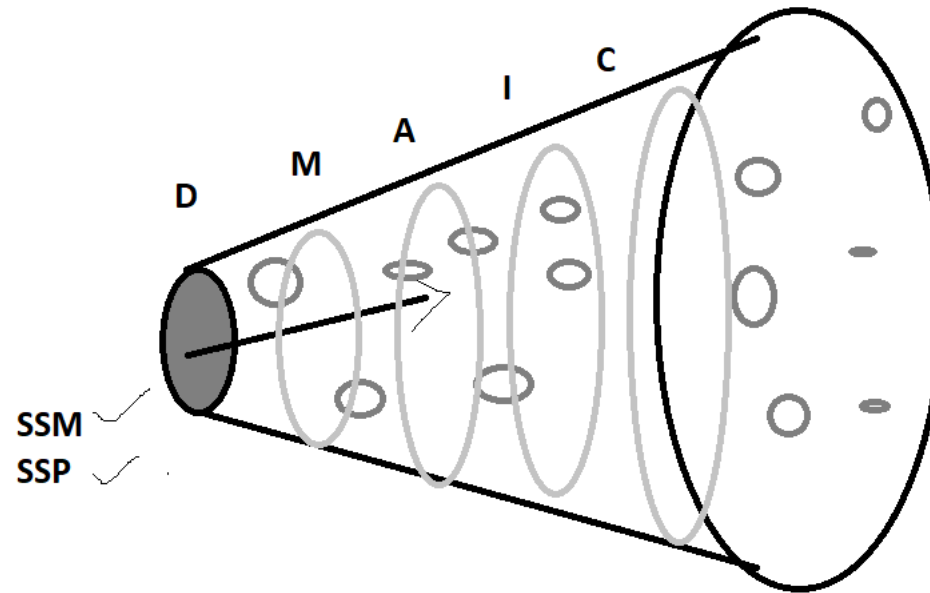
## Lean

No Cost  
Low Cost  
Less Resources  
Less Time  
Low Risk

## Six Sigma

More Budget  
More Time  
More Resources  
High Risk

disruptive innovation



## Six Sigma

6 sigma equates - 3.4 DPMO

Defects Per Million Opportunities

3.4 defects in 1 million Opportunities = 6 sigma



Opportunities Means Chances

2000 units \* 5 parameters

100000 opportunities, (chances) to make a good product or to make a mistake ( defects/errors/rejection/rework)

PROCESS SIGMA TABLE

| SIGMA LEVEL | DEFECT RATE  | YIELD     |
|-------------|--------------|-----------|
| 2σ          | 308,770 dpmo | 69.10000% |
| 3σ          | 66,811 dpmo  | 93.33000% |
| 4σ          | 6,210 dpmo   | 99.38000% |
| 5σ          | 233 dpmo     | 99.97700% |
| 6σ          | 3.44 dpmo    | 99.99966% |

3.8

70

0.019

0-1

99%

Kelly - QD  
1 million opportunities

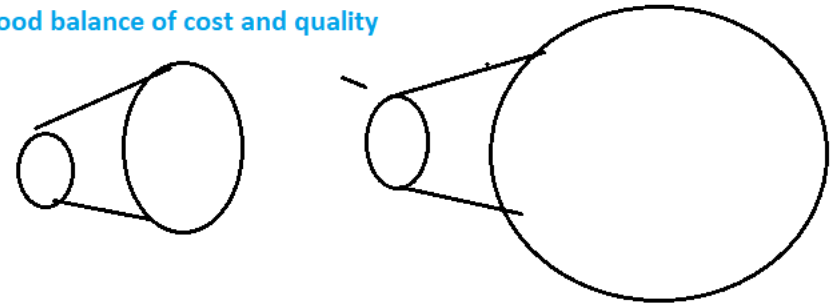
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| 6σ          | 3.44 dpmo    | 99.99966% |

counted

measured

Good balance of cost and quality

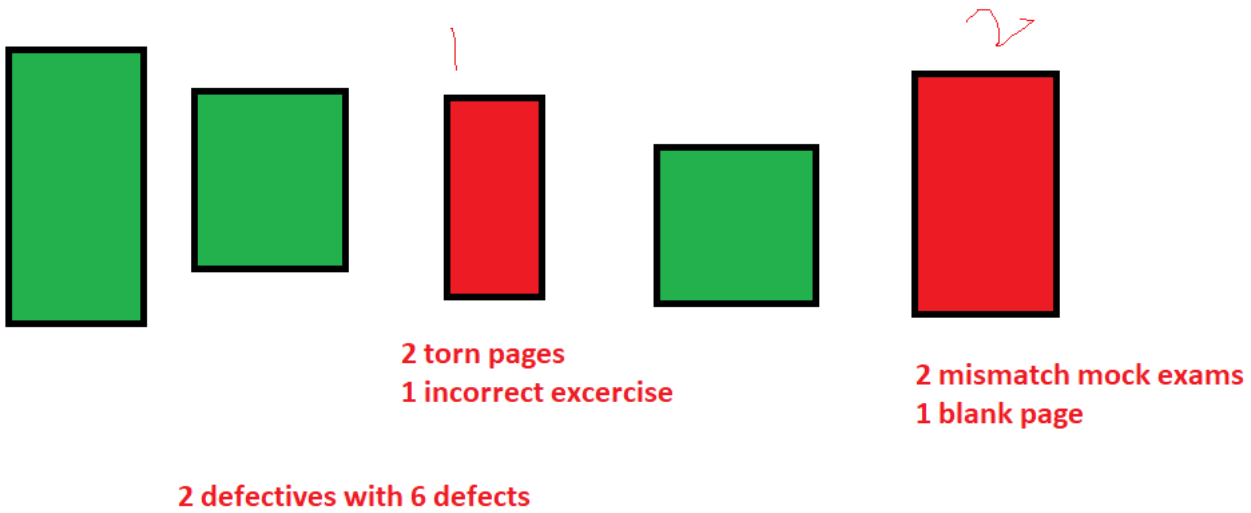
Time  
Resources  
Budget



60 / 100 = 60%

# What's good enough?

| 99% Good (3.8 Sigma)                                              | 99.99966% Good (6 Sigma)                  |
|-------------------------------------------------------------------|-------------------------------------------|
| 20,000 lost articles of mail per hour<br>(based on 2,000,000/hr)  | 7 articles lost per hour                  |
| Unsafe drinking water for almost 15 minutes each day              | 1 unsafe minute every 7 months            |
| 5,000 incorrect surgical operations per week                      | 1.7 incorrect operations per week         |
| 2 short or long landings daily at an airport with 200 flights/day | 1 short or long landing every 5 years     |
| 2,000,000 wrong drug prescriptions each year                      | 680 wrong prescriptions per year          |
| No electricity for almost 7 hours each month                      | 1 hour without electricity every 34 years |



## Six Sigma

6 sigma equates - 3.4 DPMO

Defects Per Million Opportunities

3.4 defects in 1 million Opportunities = 6 sigma



Opportunities Means Chances

2000 units \* 5 parameters

100000 opportunities, (chances) to make a good product or to make a mistake ( defects/errors/rejection/rework)

**Total production = 1200**

**Total defects = 650**

**Total defectives = 400**

**Opportunities = 5 parameters**

**DPU = 0.54**

**DPO = 0.108**

**DPMO = 108,333**

**Yield = 67%**

**DPU, Defects Per Unit = Total defects / Total units**

**DPO, Defects Per Opportunity = Total defects / (Total units \* number of opportunities)**

**DPMO, Defects Per Million Opportunities = [Total defects / (Total units \* number of opportunities)] \* 1000000**

**Yeild = (Good units / Total units ) \* 100**

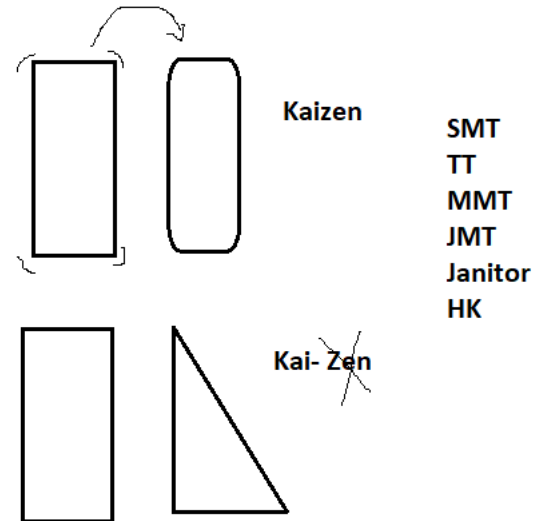
✓ TPS- Toyota Production System.

✓ TPS- Thinking People's System

**Kaizen**  
**Kai- change/modify**  
**Zen - Good/Better**

No cost  
Low Cost  
Less Time  
Less Resources

Engagement  
Team work  
Partnership



Kaizen - [https://www.youtube.com/watch?v=wot9DFzFRLU&t=92s&ab\\_channel=ExpertivityTechnologies](https://www.youtube.com/watch?v=wot9DFzFRLU&t=92s&ab_channel=ExpertivityTechnologies)

Waste / Muda

- Mura
- Muri

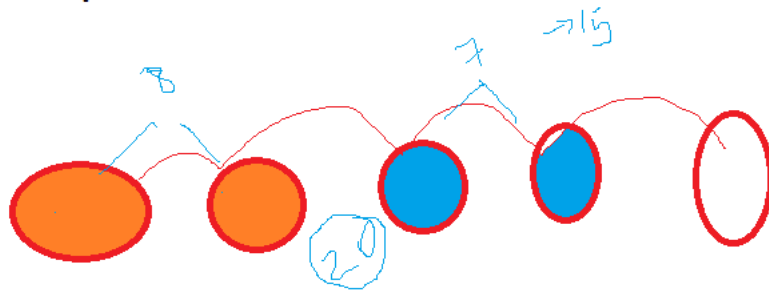
Defects  
Overproduction  
Waiting  
Non-utilised talents  
Excess inventory  
Motion  
Transportation

DOWNTIME  
TIMWOODS  
WORMPIIT

Waste  
but not defects

T  
I  
M  
W

Overproduction ( more units)  
Overprocessing ( NVA)  
D- Defects (Waste) →  
S- SKILLS →



150k - SPM  
2-4 months  
TL - 10 (50k)

5 S

Sort

Set in order

Standardize

Shine

Sustain

Safety

Cost

Medical

Claim

Loss

| 5S | Japanese | English      |
|----|----------|--------------|
|    | Seiri    | Sort         |
|    | Seiton   | Set in Order |
|    | Seiso    | Shine        |
|    | Seiketsu | Standardize  |
|    | Shitsuke | Sustain      |

Need:

1) Daily

2) Weekly

3) Monthly

4) once /twice year

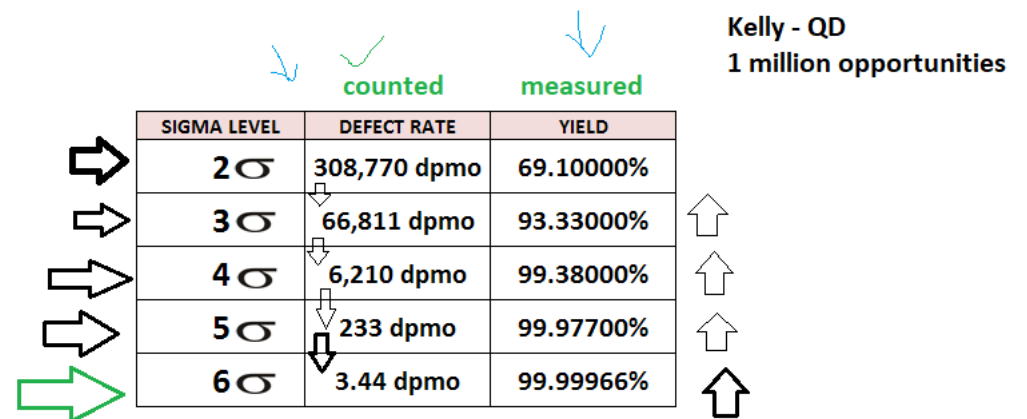
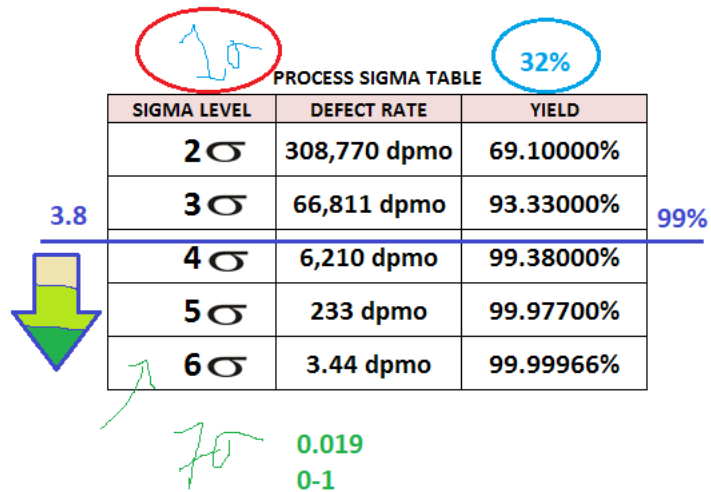
Don't Need:-

Sell it

Give it to team/dept

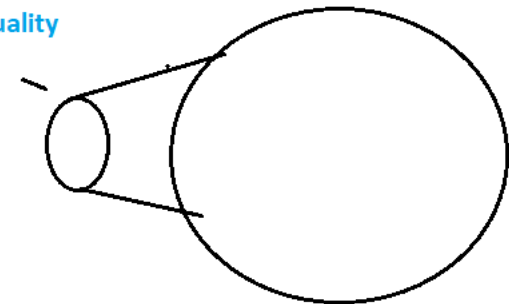
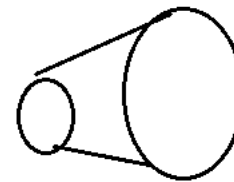
Donate

Trash



Good balance of cost and quality

Time  
Resources  
Budget



$$60 / 100 = 60\%$$

## Define:

VOC- Voice customer (collect VOC)

KPIV and KVOP

Scope the project - SIPOC

Business Case

Project Charter - Problem statement and Goal statement

Pain areas

How much

since when

Financial impact

C-sat /D-sat

Percentage

NOT include RC and solution

SMART Goals

### Sources of VOC:-

Scorecard

Surveys

Star rating/reviews

Customer Service Representatives

Claims>Returns/Replacement

Complaint trackers

VOC- internal customer (sales Rep)

Secondary data (SS, Crawler)

### Collection of VOC:

Proactive

Reactive

CTQ drill down

Makes the VOC measurable

### Types of VOC:-

Unclear and Vague - I didn't like your coffee, Bike, Training

Clear and Complex: Taste, temp, performance, Trainers knowledge,

Clear and Crisp : Bitter, sweet, Less than 70 DC, Poor Mileage, Unsmooth gear shifting, More vibration Engine noise, More examples, communications skills, does not answer our queries /doubts

$$y=f(x)$$

Sales of Coffee = F( taste)

$$y=f(x_1,x_2,x_3....)$$

Sales of Coffee = F( taste, color, aroma, price, quantity, hygiene)

It's not about measuring it right  
But  
To measure the right things

Weight= f( diet, workout, sleep, stress level, disease etc....)

Stomach - Collect data

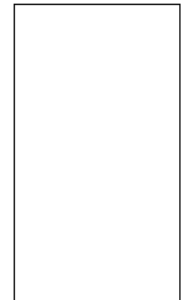
Blood test

Sonography

CT scan

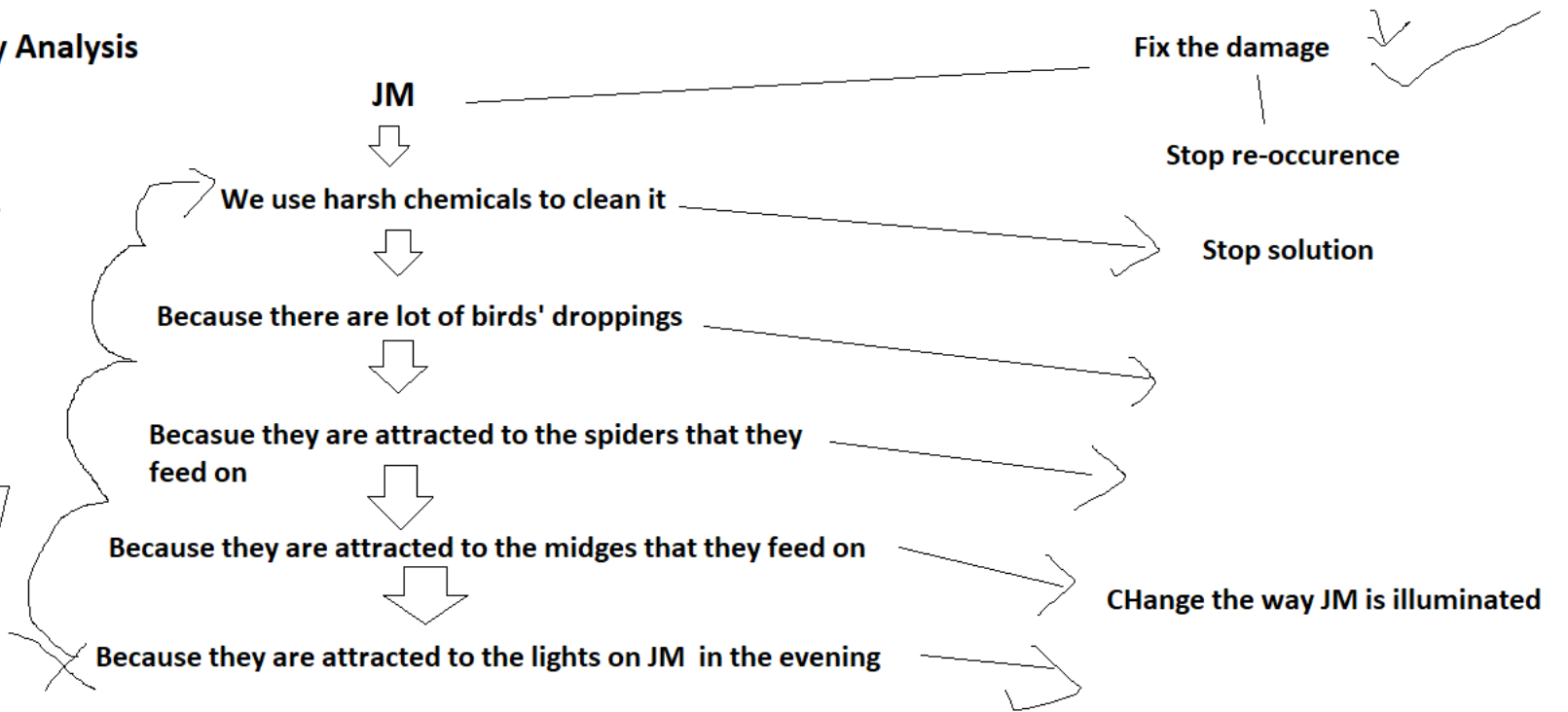
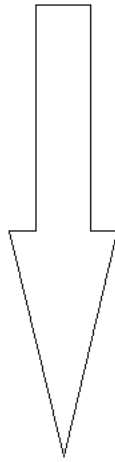
X-ray

Urine test



**5 Why Analysis**  
**3-4-7**

**Why-Why Analysis**



Vilfredo Preto - Italian economist



Pareto rule/graph  
Vital Few and Trivial many

Peas pods  
Pods Plants  
Plants garden  
Sales Produce  
Sales Customers  
Revenue Sales  
Issues Cause

80:20

70:30

60:40

Time  
Resource  
Budget

✓ TPS- Toyota Prodcution System.

✓ TPS- Thinking People's System

**Kaizen**

**Kai- change/modify**

**Zen - Good/Better**

No cost

Low Cost

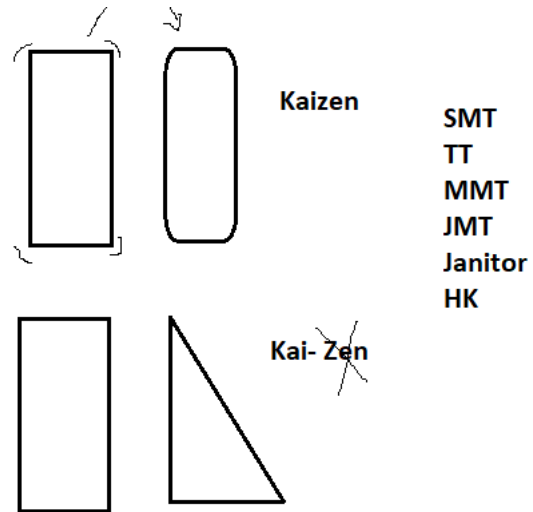
Less Time

Less Resources

Engagement

Team work

Partnership



Measure:-

How much

Since When

What you can't measure, you can't improve and  
you can't manage

Types of Data:

Data Collection:

Normal/ non-normal distribution

Base line

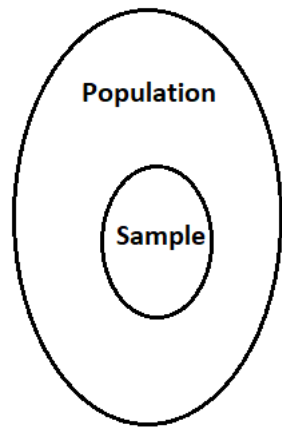
As- is VSM ( process map)

Process capabilities ( cp/cpk)

DPMO - Sigma level ( current)

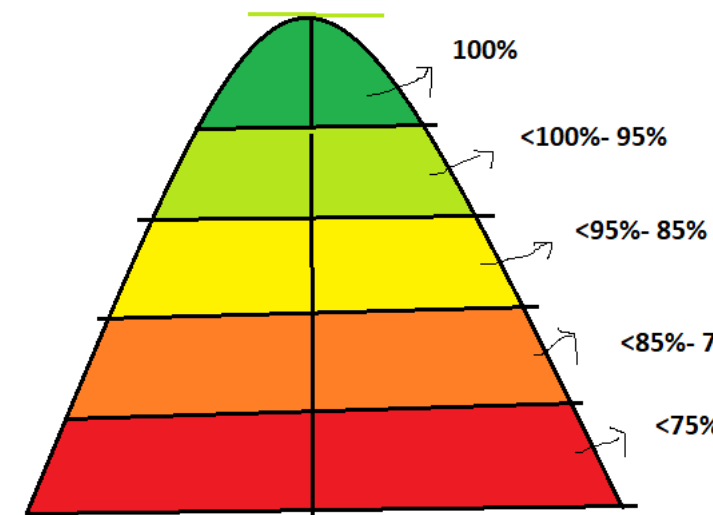
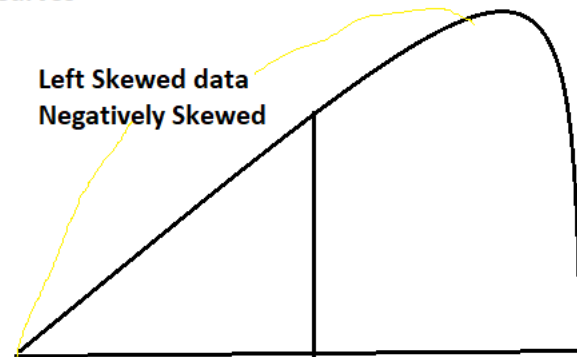
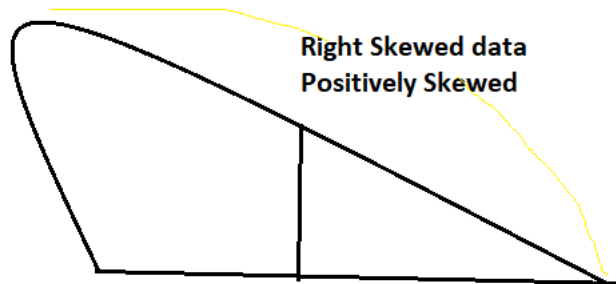
Measure of Central Tendency & Dispersion

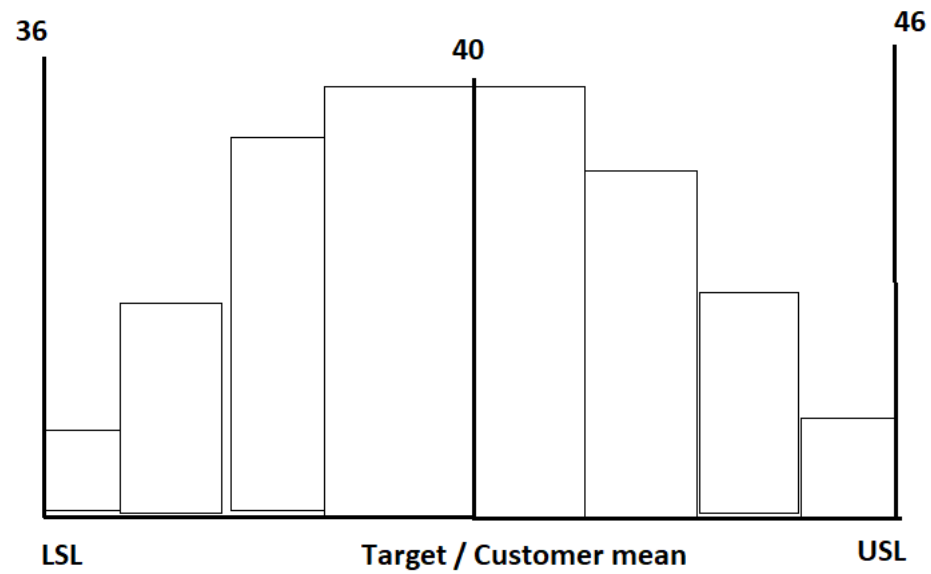
(mean, median, mode & range, StDev, Variance)



Normal  
Normal Curve  
Bell Curve

Non-Normal Curves



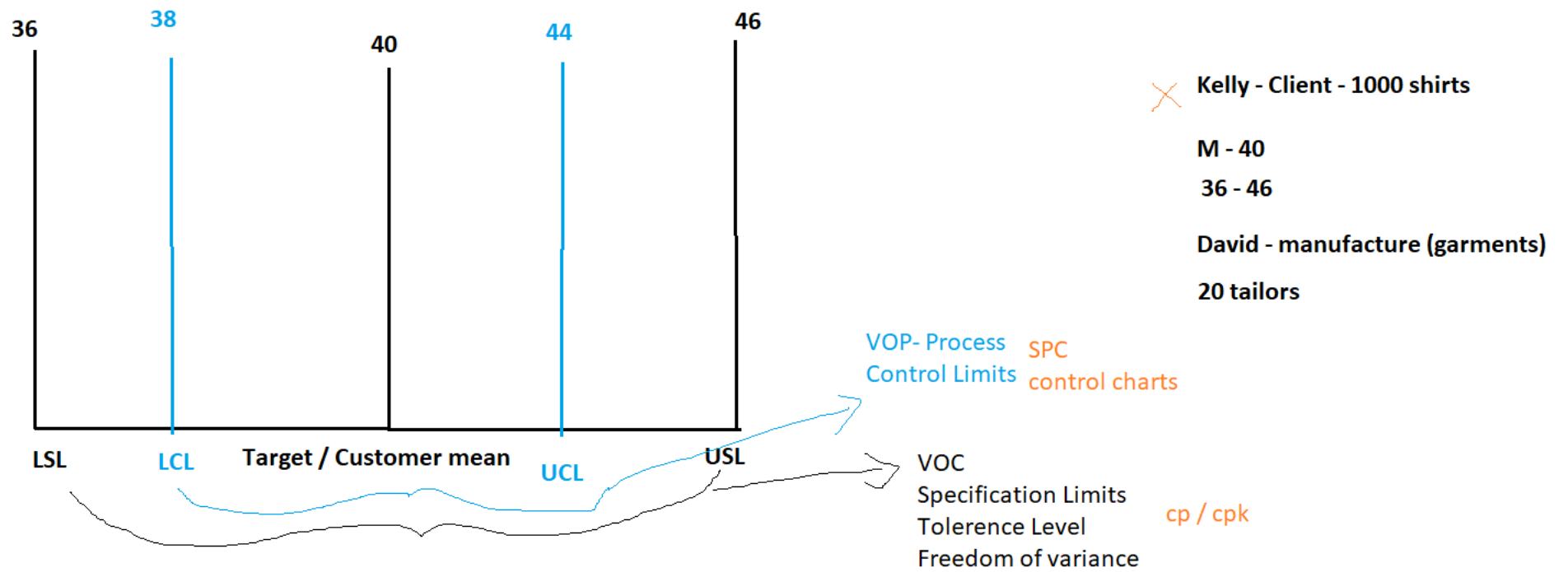


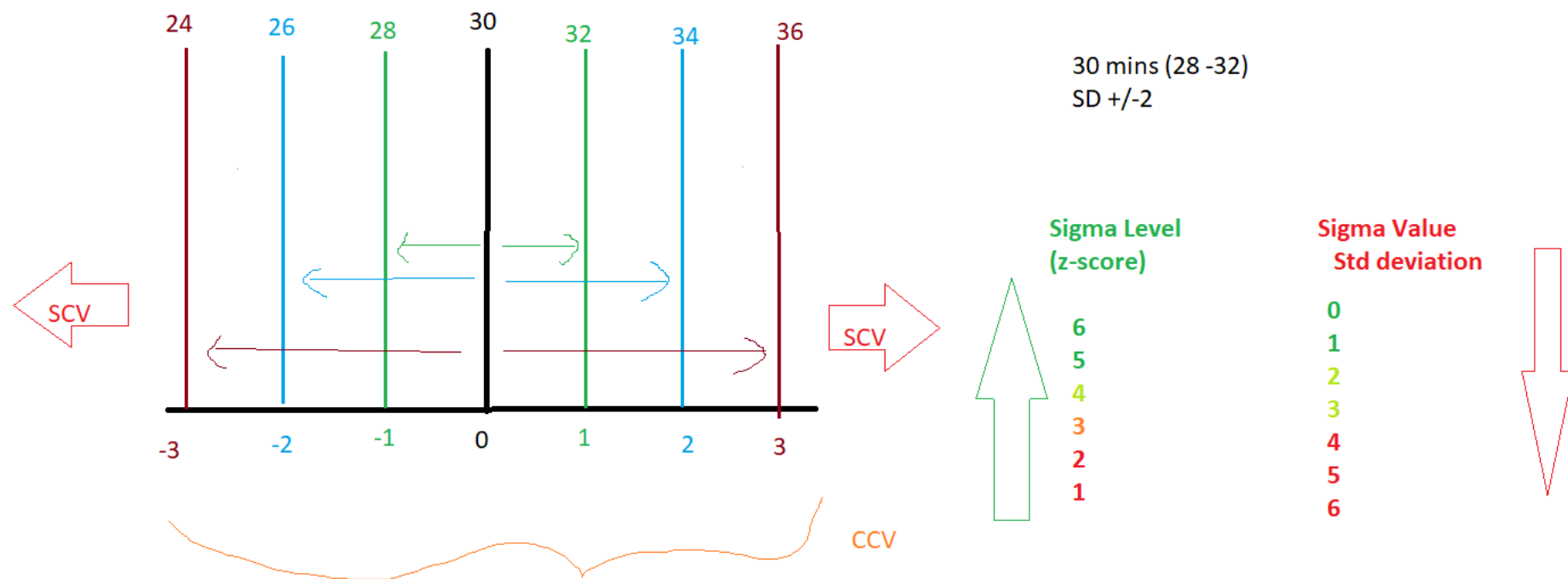
Kelly - Client - 1000 shirts

M - 40

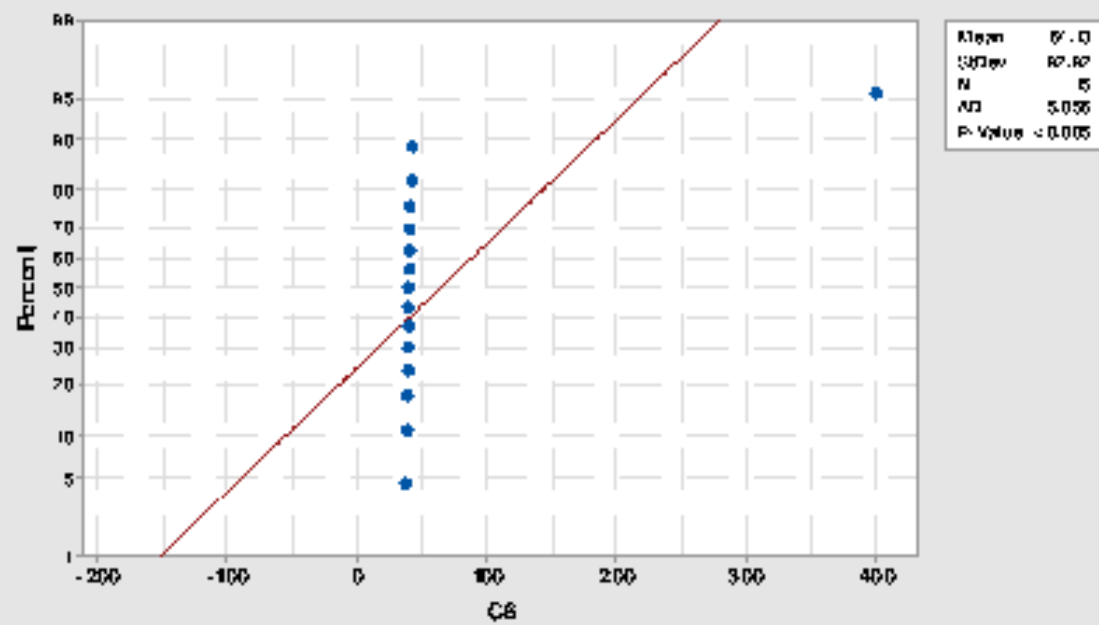
36 - 46

David - manufacture (garments)



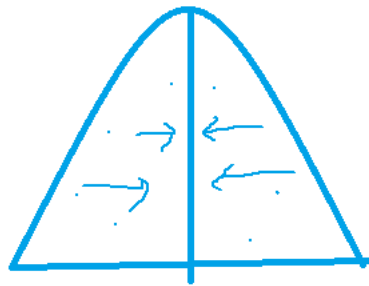
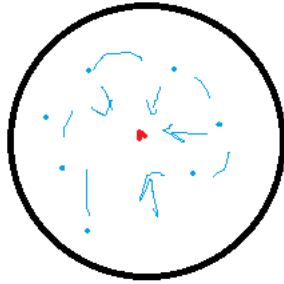


Probability Plot of C6  
Normal



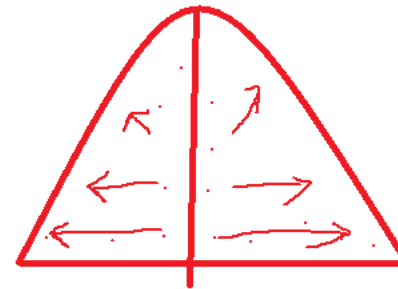
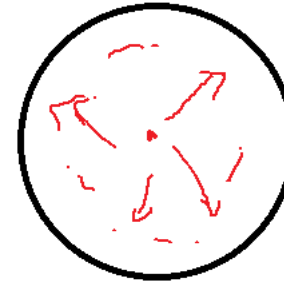
### Measure of Central Tendency

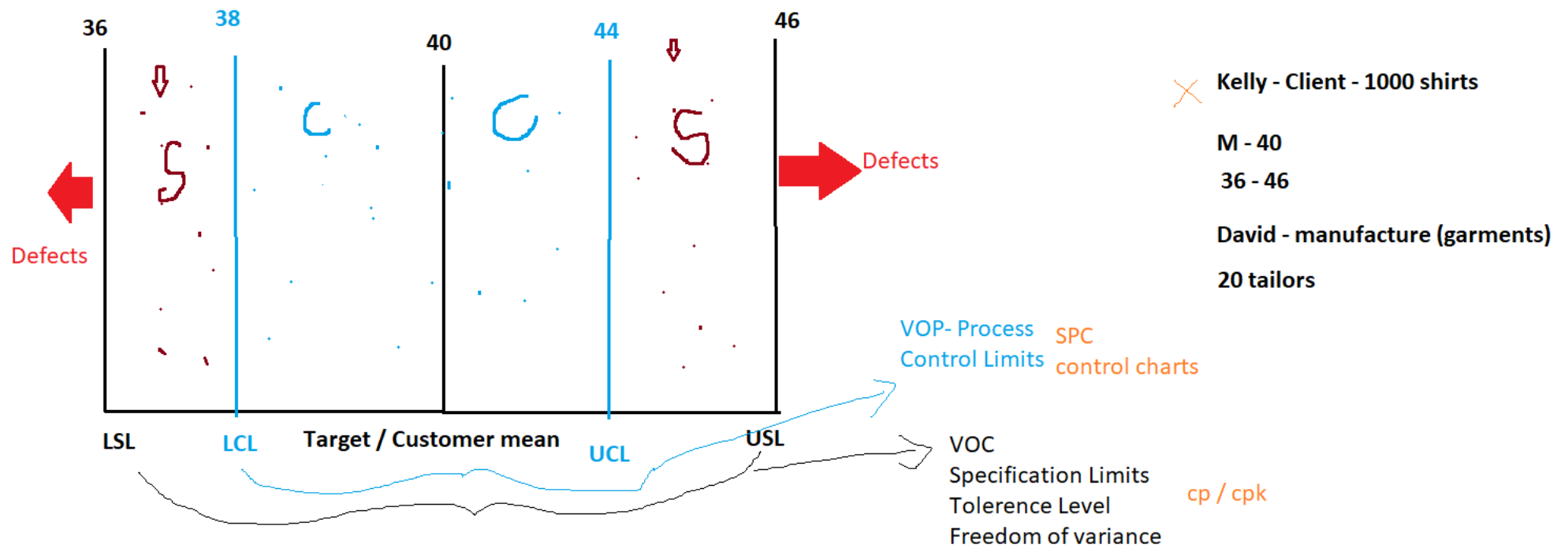
Mean, Median, Mode

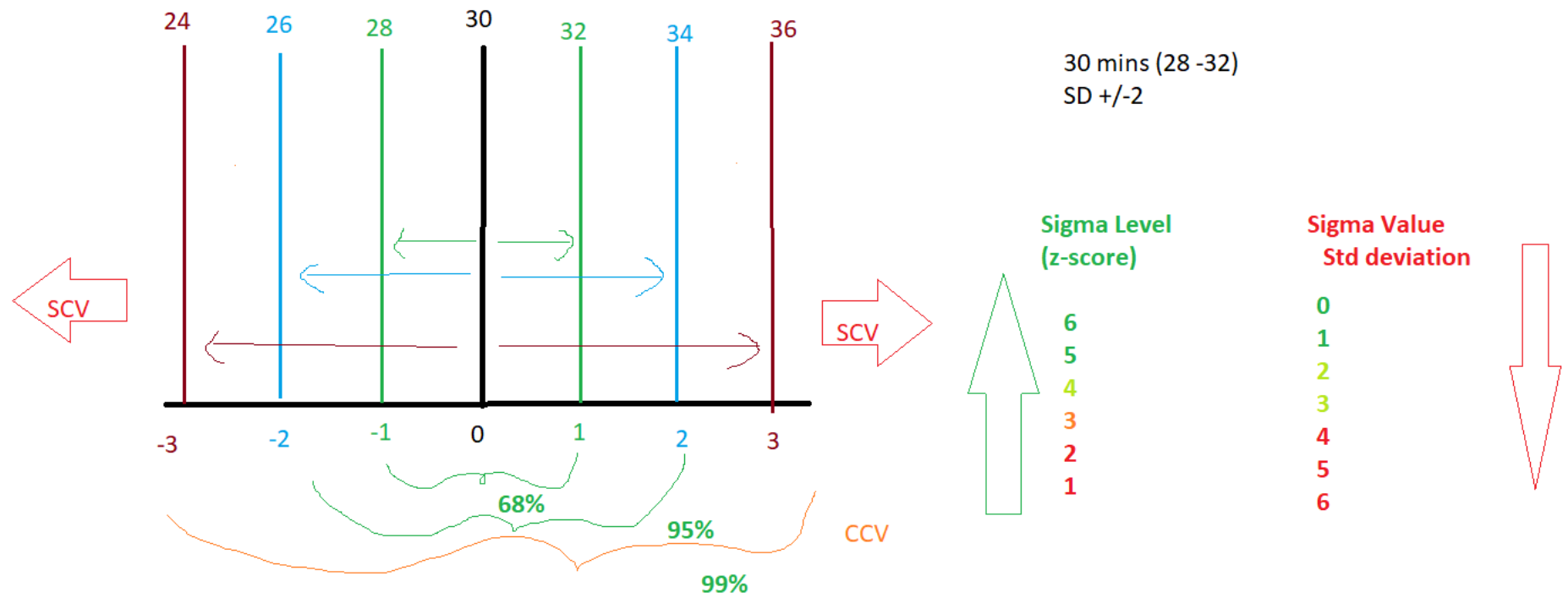


### Measure of Dispersion

Range, Variance, Standard Deviation







## Data Normality

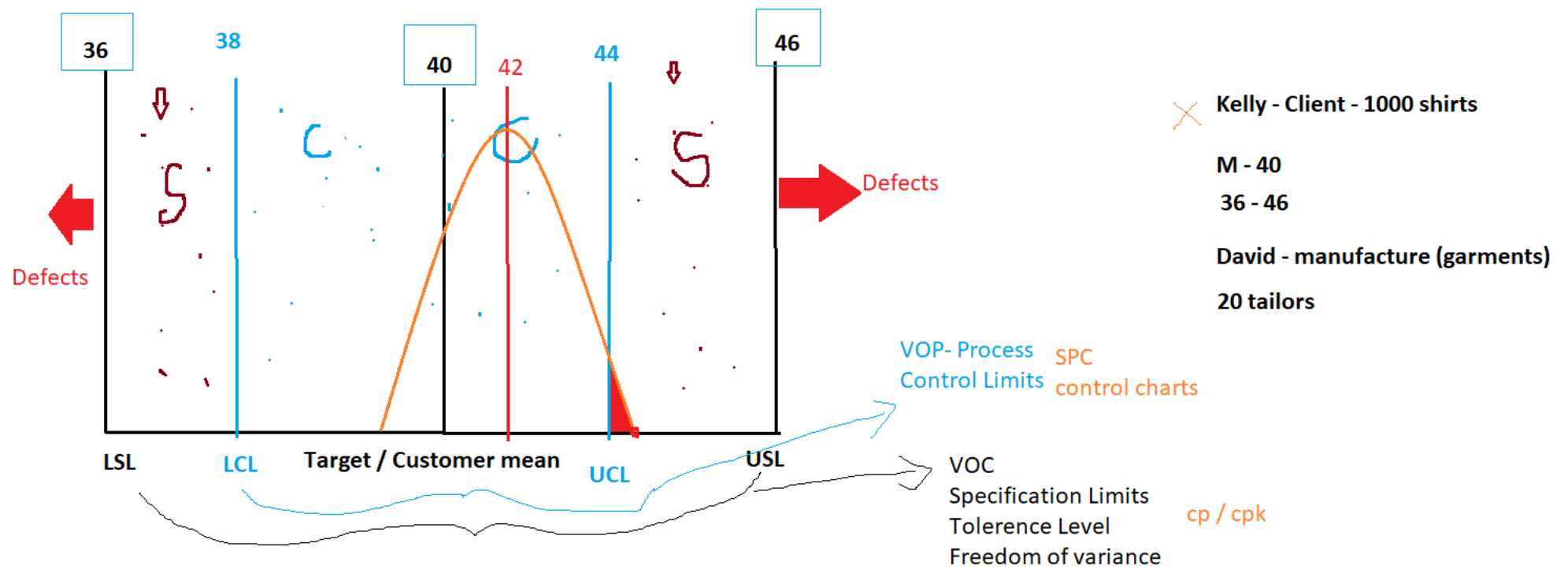
- 1) Histogram (bell curve)
- 2) Mean=Median=Mode
- 3) A\_D test

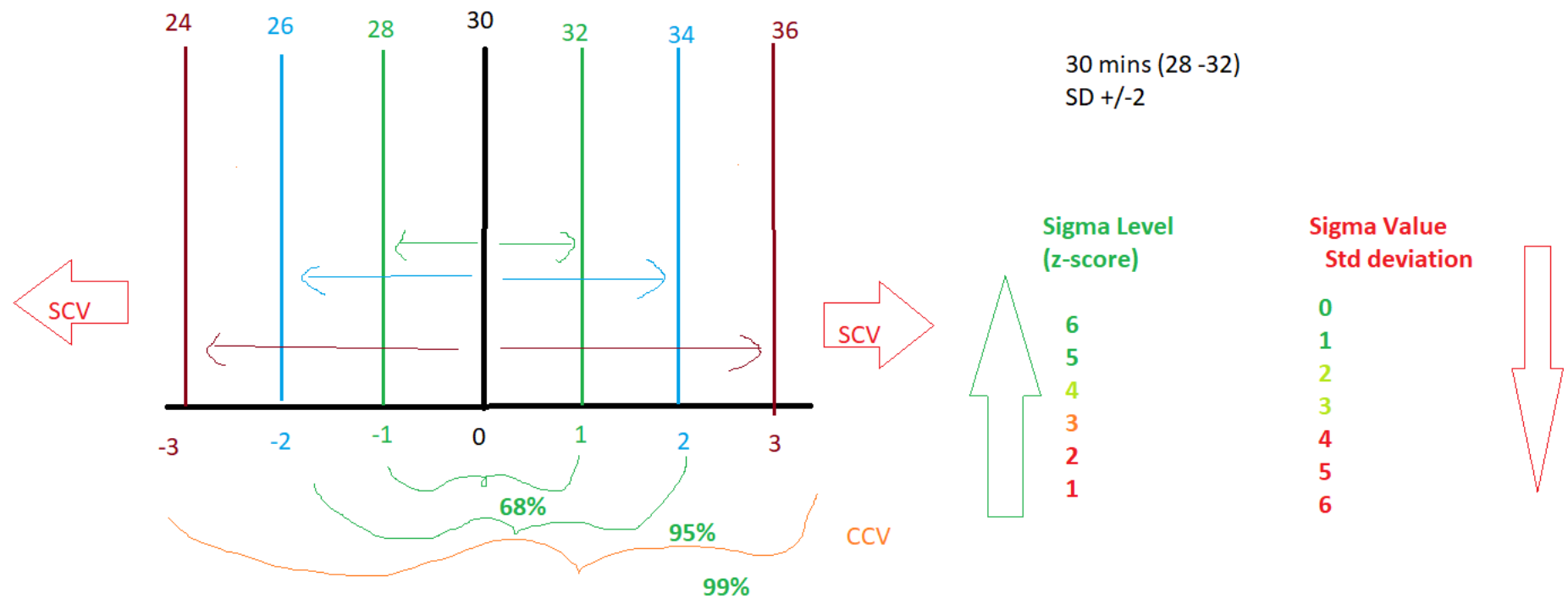
3) A\_D test  
Anderson Darling Normality Test  
Wilbur **Anderson** and Donald **Darling**

### **p-value, 0.05**

More than 0.05, normal

Lesser than 0.05, non-normal





MSA :-

MSA- <https://www.youtube.com/watch?v=k8NLd5linfw>

Gage RnR - [https://www.youtube.com/watch?v=6sRN1ICTqSM&ab\\_channel=LEARN%26APPLY%3ALeanandSixSigma](https://www.youtube.com/watch?v=6sRN1ICTqSM&ab_channel=LEARN%26APPLY%3ALeanandSixSigma)

Before data collection, data collection plan, check Measuring system is good (MSA)

### Measuring System Analysis

Home - 77  
Clinic - 76  
Gym - 75

} Equipment Variance

Gym:-  
A - 75  
B - 76  
C - 75.5

} Apraiser Variance

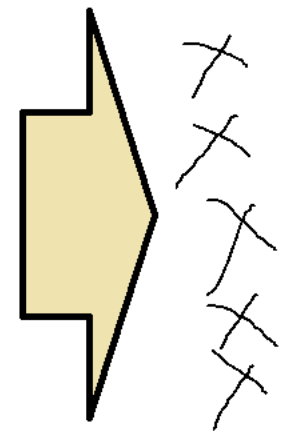
PT:-  
1 - 74  
2 - 75  
3 - 75.5

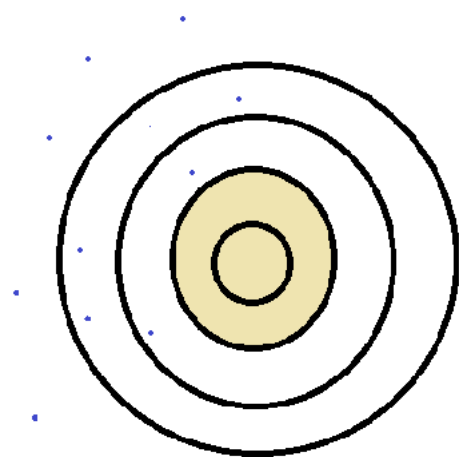
} part-to-part  
variance

Operator variance

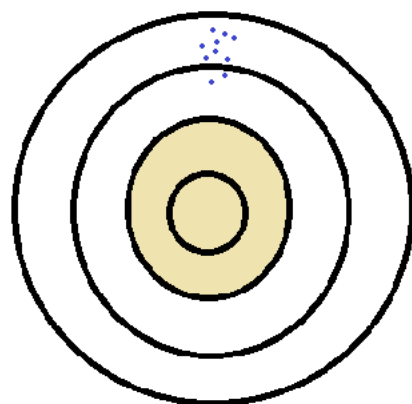
| Nurse | Equipment | Settings | Training | Method |
|-------|-----------|----------|----------|--------|
| ✓     | ✗         |          |          |        |
| ✗     | ✓         |          |          |        |
| ✓     | ✓         | ✗        |          |        |
| ✓     | ✓         | ✓        | ✗        |        |
| ✓     | ✓         | ✓        | ✓        | ✗      |

Result (data)

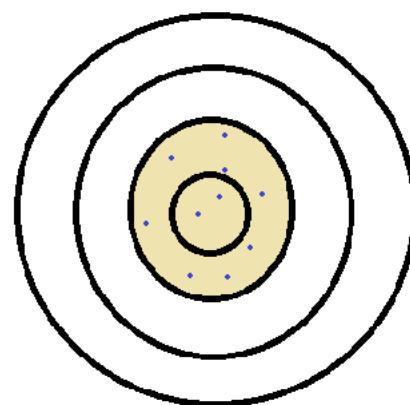




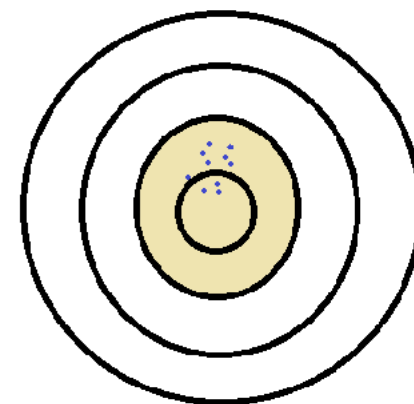
A = ✗  
P = ✗



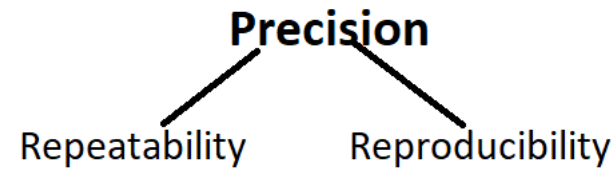
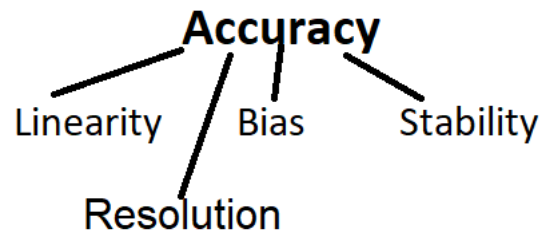
A = ✗  
P = ✓



A = ✓  
P = ✗



A = ✓  
P = ✓



$$cp = (USL - LSL) / (6 * SD)$$

$$cpk = (\text{Nearest specification limit} - \text{Mean}) / (3 * SD)$$

$$cp * 3 = zst \text{ (short term sigma)}$$

$$cpk * 3 = zlt \text{ (long term sigma)}$$

### Sigma Level

1) DPMO + calc

2)  $cp/cpk * 3$

|         | A     | B    |
|---------|-------|------|
| USL     | 44    | 9.2  |
| LSL     | 35    | 8    |
| Mean    | 40    | 8.5  |
| Std dev | 2.6   | 0.09 |
| cp      | 0.577 |      |
| cpk     | 0.513 |      |
| zst     | 1.73  |      |
| zlt     | 1.54  |      |

$$\Rightarrow C_{pu} = (\text{Process mean} - \text{LSL}) / (3 * \text{Standard deviation})$$

$$cpk = \min (cpu, cpl) \quad \Rightarrow C_{pl} = (\text{USL} - \text{Process Mean}) / (3 * \text{Standard deviation})$$

$$\min (0.64, 0.512)$$

$$cpu = (40 - 35) / (3 * 2.6) = 0.641$$

$$cpl = (44 - 40) / (3 * 2.6) = 0.5128$$

**SCV**   Long Term

Annual Revenue

Quarterly Quality score

Monthly Quality score

Weekly sale (50)

Daily sales (24)

Short Term   **CCV**

Monthly , Quarterly

Monthly Quality score , Fortnightly

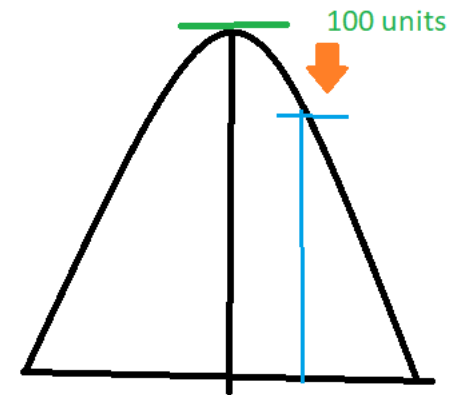
Weekly QC, Daily QCd

Daily - 12

Hourly sales (3) \* 8 =24 sales

100 units  
85 units

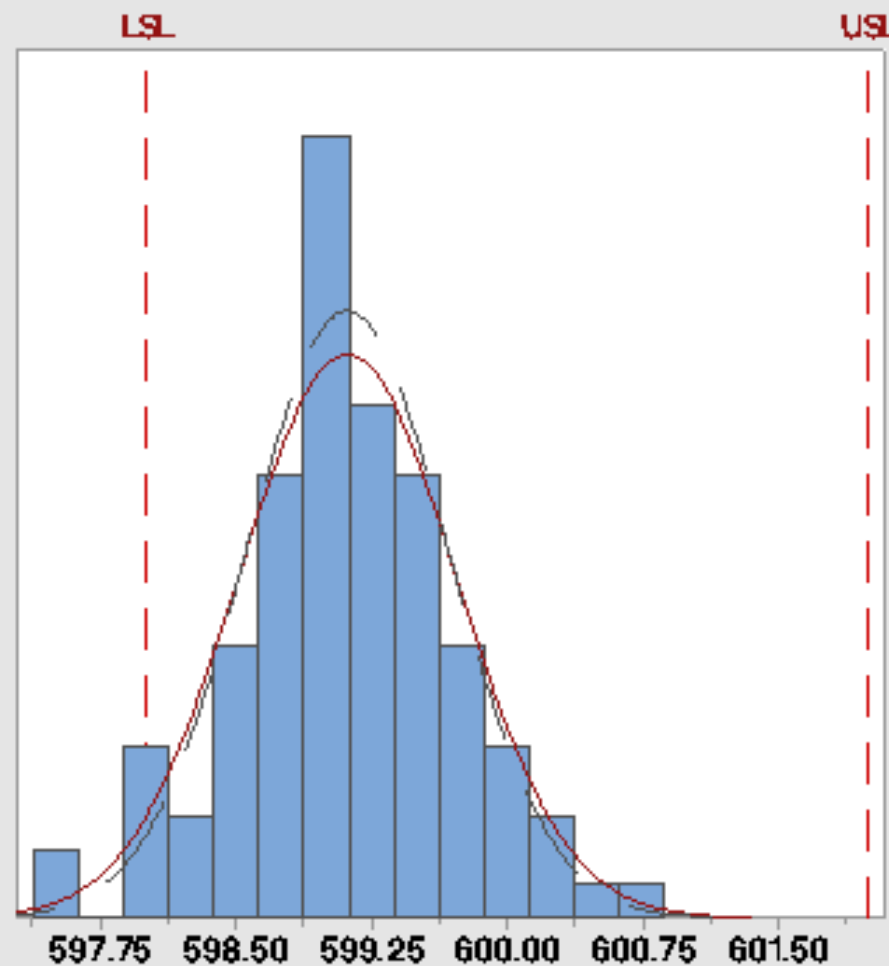
$z\text{-shift} = zst - zlt = 1.5$   
ranges from 1.4 to 1.6  $\sim 1.5$



|                         | A | B | C   | D   | D | F   |
|-------------------------|---|---|-----|-----|---|-----|
| $zst = 4 \text{ sigma}$ | 4 | 5 | 3   | 3.5 | 4 | 6   |
| $zlt = 1 \text{ sigma}$ | 3 | 3 | 2.5 | 3   | 2 | 3.5 |
| $z\text{-shift}$        | 1 | 2 | 0.5 | 0.5 | 2 | 2.5 |

# Process Capability Report for Supplier 1

| Process Data   |          |
|----------------|----------|
| LSL            | 598      |
| Target         | ^        |
| USL            | 602      |
| Sample Mean    | 599.115  |
| Sample N       | 100      |
| StDev(Overall) | 0.602583 |
| StDev(Within)  | 0.559239 |



|           |
|-----------|
| — Overall |
| — Within  |

| Overall Capability            |      |
|-------------------------------|------|
| Pp                            | 1.11 |
| PPL                           | 0.62 |
| PPU                           | 1.60 |
| Ppk                           | 0.62 |
| Cpm                           | ^    |
| Potential (Within) Capability |      |
| Cp                            | 1.19 |
| CPL                           | 0.66 |
| CPU                           | 1.72 |
| Cpk                           | 0.66 |

| Performance |          |                  |                 |  |
|-------------|----------|------------------|-----------------|--|
|             | Observed | Expected Overall | Expected Within |  |
| PPM < LSL   | 30000.00 | 32130.26         | 23088.05        |  |
| PPM > USL   | 0.00     | 0.84             | 0.12            |  |
| PPM Total   | 30000.00 | 32131.10         | 23088.18        |  |



## Process Capability Indices - Continuous Data

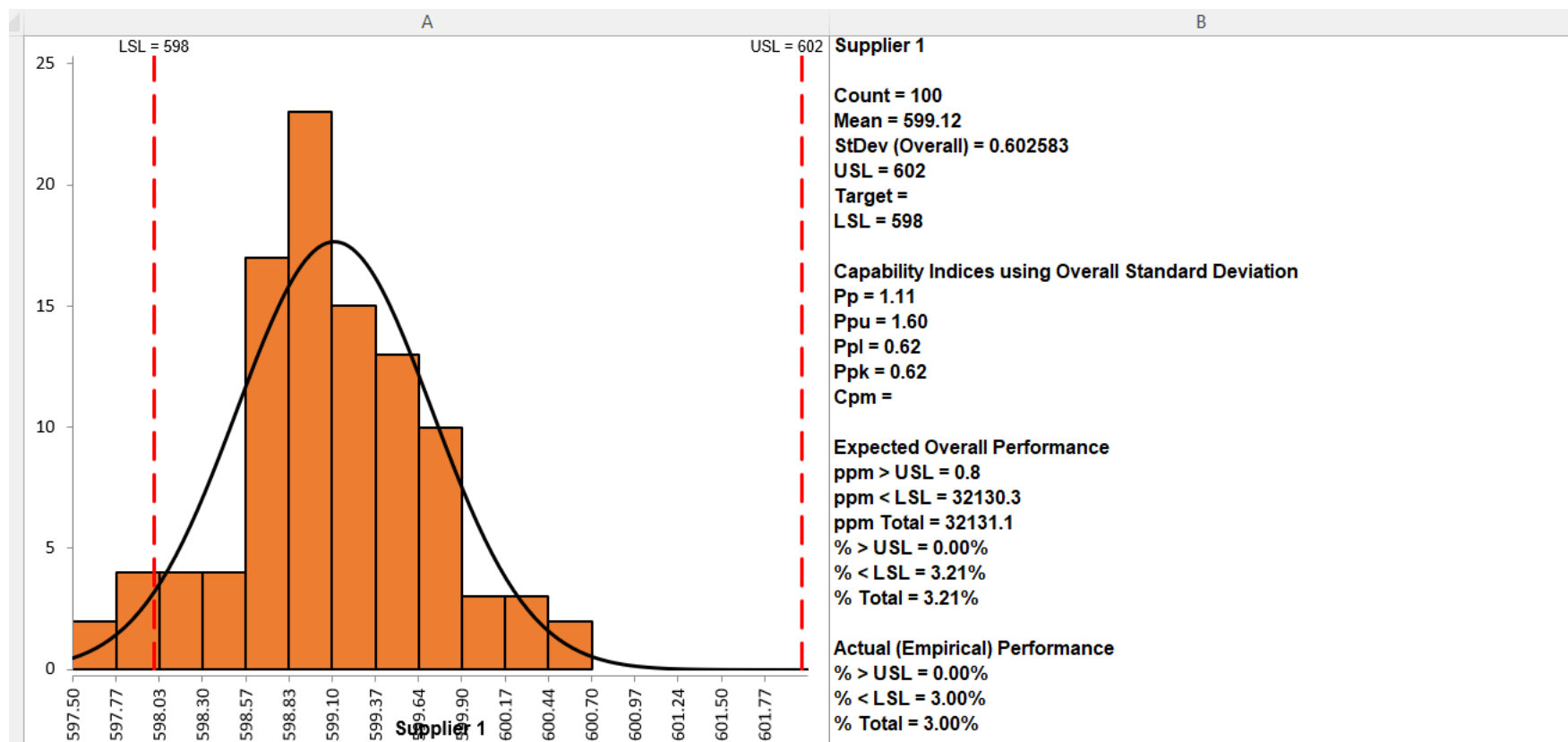
(Assumes that data are normally distributed)

### Sample Data (user inputs):

|                           |       |     |
|---------------------------|-------|-----|
| Mean                      | x-bar | 40  |
| Standard Deviation        | s     | 2.6 |
| Upper specification limit | USL   | 44  |
| Lower specification limit | LSL   | 35  |

### Results:

|          |      |
|----------|------|
| Cp, Pp   | 0.58 |
| Cpu, Ppu | 0.51 |
| Cpl, Ppl | 0.64 |
| Cpk, Ppk | 0.51 |





## Process Sigma Level Calculator - Discrete Data

### Sample Data (user inputs):

|                                         |   |       |
|-----------------------------------------|---|-------|
| Number of units                         | n | 1,200 |
| Total number of defects observed        | d | 650   |
| Number of defect opportunities per unit | o | 5     |
| Sigma Shift (typically +1.5)            |   | 1.5   |

### Results:

|                                   |        |             |
|-----------------------------------|--------|-------------|
| Defects per Unit                  | dpu    | 0.541666667 |
| Defects per Million Opportunities | dpmo   | 1,08,333.3  |
| Defects per Opportunity           | dpo%   | 10.83%      |
| Yield                             | yield% | 89.17%      |
| Process Sigma Level               | sigma  | 2.735       |



## Process Sigma Level Calculator - Continuous Data

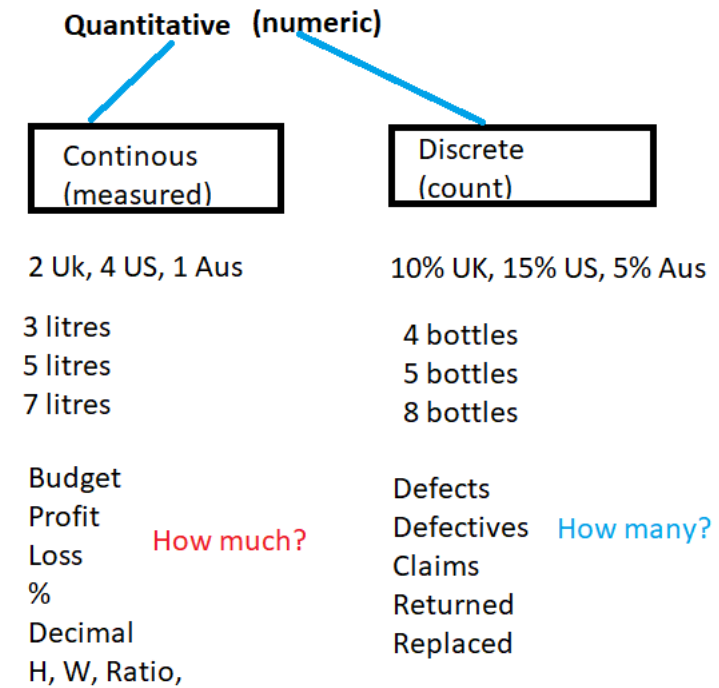
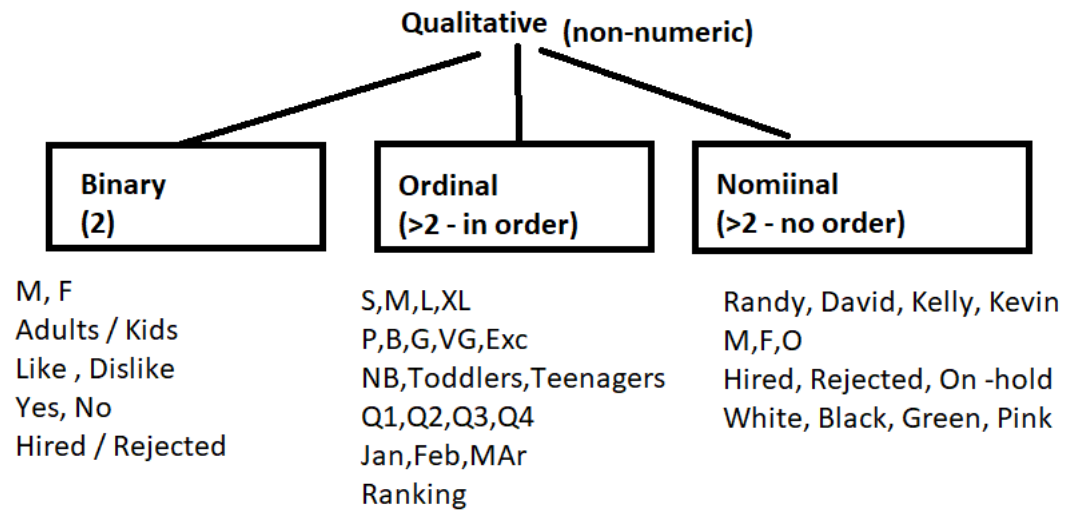
(Assumes that data are normally distributed)

### Sample Data (user inputs):

|                              |       |     |
|------------------------------|-------|-----|
| Mean                         | x-bar | 40  |
| Standard Deviation           | s     | 2.6 |
| Upper Specification Limit    | USL   | 44  |
| Lower Specification Limit    | LSL   | 35  |
| Sigma Shift (typically +1.5) |       | 1.5 |

### Results:

|                            |         |
|----------------------------|---------|
| Expected ppm > USL         | 61967.9 |
| Expected % > USL           | 6.20%   |
| Expected ppm < LSL         | 27235.2 |
| Expected % < LSL           | 2.72%   |
| Expected ppm (overall)     | 89203.1 |
| Expected yield (overall) % | 91.08%  |
| Process Sigma Level        | 2.846   |



Next week:-

## Analyze Phase

Please watch these videos for the next class:-

[https://www.youtube.com/watch?v=8JOJ\\_7R\\_OWY](https://www.youtube.com/watch?v=8JOJ_7R_OWY) - simple linear regression on excel

<https://www.youtube.com/watch?v=HgfhfwK7VQ> - multiple linear regression on excel

Scatter Diagram : - <https://www.youtube.com/watch?v=1D2gudv591M>

[https://www.youtube.com/watch?v=SG3\\_mWwReac](https://www.youtube.com/watch?v=SG3_mWwReac)

Gemba academy - DEO – <https://www.youtube.com/watch?v=tZWAYbKYVjM&t=53s>

What is Design of Experiments (DoE)? Example: <https://www.youtube.com/watch?v=Srq9Q-yd1Rk>

Design of Experiments DOE used in Service and Transactional Businesses as well as Manufacturing.

By John Dennis and Paul Allen

[https://www.youtube.com/watch?v=tmEe9GdKBNY&ab\\_channel=LeanSixSigmaTrainingLtd](https://www.youtube.com/watch?v=tmEe9GdKBNY&ab_channel=LeanSixSigmaTrainingLtd)

## Analyse:-

## Hypothesis Test

Null is a claim or a belief which does not need any proof

Alternate hypothesis

P-value is more than 0.05, accept the Null

P-value is less than 0.05, Reject the Null

He is innocent until proven guilty

He is innocent - Null Hypothesis

He is not innocent - Alternate Hypothesis

Judge = Proof, photo, witness, camera footage ( data)

There is a risk involved in trusting the data.

P-value is more than 0.05, CCV , not statistically significant ( no impact)

P-value is less than 0.05, SCV , statistically significant ( has impact)

Null Hypothesis  
Alternate Hypothesis

P-value (0.05)

Risk

Alpha

Beta

Type 1 and 2 error

Sky is blue

Schools have teachers

Teachers are strict

The sun rises in the east

Sun is hot

Temperature in California is 100DC

## Analyse:

Collected data in the measure phase. Toll gate Review  
RCA - Fishbone+ 5 Why analyse  
Hypothesis Test

| Risk | alpha | CI  |
|------|-------|-----|
| 5%   | 0.05  | 95% |
| 4%   | 0.04  | 96% |
| 10%  | 0.1   | 90% |
| 3%   | 0.03  | 97% |

## How much risk is OK?

New business = 80% profit - 20% loss (risk)  
Steel or iron industry = 10% is ok  
Pharma / medicines = 10% is not ok  
5% is still a risk ...  
>3%

Over the decades , statisticians or business leaders or experts have decided  
that 5-10% risk is ok.  
Minimum risk is better.  
5% risk is OK  
**This risk is alpha, which is the p-value**

P-value is more than 0.05, CCV , not statistically significant ( no impact)  
P-value is less than 0.05, SCV , statistically significant ( has impact)

P-value is more than 0.05, accept the Null  
P-value is less than 0.05, Reject the Null

|

P-value is more than 0.05, accept the Null  
P-value is less than 0.05, Reject the Null

If you reject Null, **Type 1 error**, risk alpha, producer's risk  
If you accept Null, **Type 2 error**, risk beta, consumer's risk

Assumption = Good  
Reality = Good  
Assumption = Reality  
Null Hypothesis, Accept

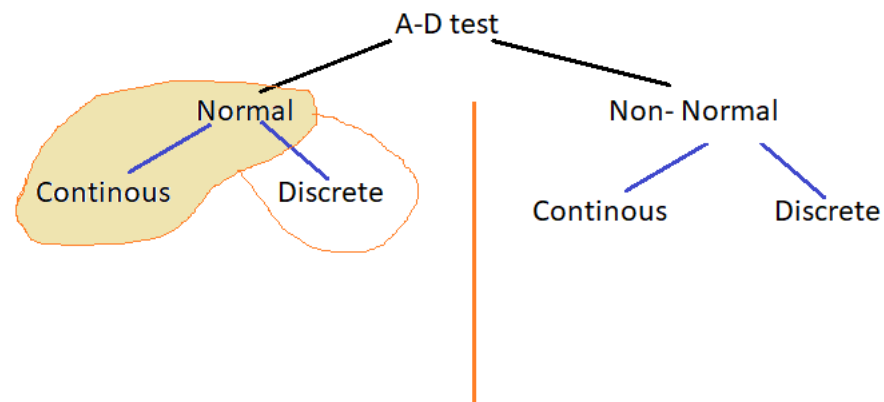
It wasn't good  
If you reject Null  
Type 1 error

**Titanic**  
**Assumption = Good**  
**Reality = Good**  
**Assumption = Reality**  
It was not good  
**Producer's risk**

Assumption = Good  
Reality = Not so good  
Assumption  $\neq$  Reality  
Alternate Hypothesis, Reject Null

It was good  
Failing to reject Null  
Type 2 error

**Me Time**  
**Assumption = Good**  
**Reality = Not so good**  
**Assumption  $\neq$  Reality**  
It was good.  
Type 2 error  
**Consumers will watch it**  
**Consumer's risk**



### Difference between t and z tests

t-test

Sample size (<30)

both the samples should be equal

12 - 12

08 - 08

21-21

29-29

z-test

Sample size (>30)

samples can be equal / unequal

32-32

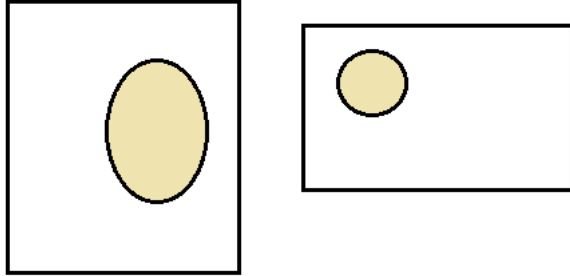
32-300

48-48

48-340

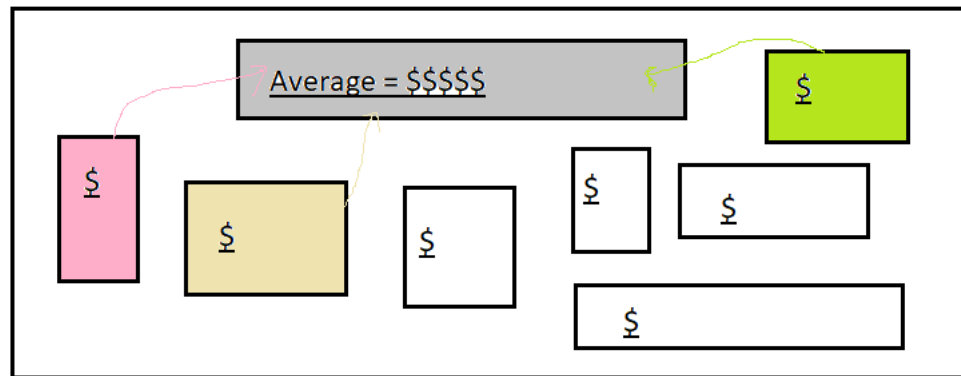
### Difference between 1-sample and 2-sample tests

2 sample tests are when the samples  
are compared from 2 different population



1-sample test

When the sample is compared with the **AVERAGE** of the **same** POPULATION



**Paired t -test:-**

## Paired t-test

## Before - After

Pharma - BP patients  
1 month course  
1tab+1cap+1inj

20 sales reps  
cost per head  
8 sales rep- training  
12 - BAU

| Before | After |
|--------|-------|
| 30     | 150   |
| 32     | 200   |
| 31     | 30    |
| 350    | 65    |
| 150    | 230   |
| 32     | 56    |
| 90     | 92    |
| 15     | 20    |

P-value is more than 0.05, CCV , not statistically significant ( no impact)

P-value is less than 0.05, SCV , statistically significant ( has impact)

P-value is more than 0.05, accept the Null

P-value is less than 0.05, Reject the Null

1 way Anova

|               |       |   | Kelly | David | Kevin |
|---------------|-------|---|-------|-------|-------|
| Voice         | CS    | { | 80%   | 52%   | 100%  |
|               |       |   | 75%   | 62%   | 100%  |
|               |       |   | 86%   | 89%   | 25%   |
| Chat<br>email | Sales | { | 96%   | 100%  | 25%   |
|               |       |   | 93%   | 63%   | 60%   |
|               |       |   | 95%   | 100%  | 98%   |

2 way Anova

Parametric tests - Normal

Non Parametric tests - Non-Normal

1 way Anova      Detergents

|      |   |  | Det 1 | Det 2 | Det 3 |
|------|---|--|-------|-------|-------|
| cold | { |  | 80%   | 52%   | 100%  |
|      |   |  | 75%   | 62%   | 100%  |
|      |   |  | 86%   | 89%   | 25%   |
| Hot  | { |  | 96%   | 100%  | 25%   |
|      |   |  | 93%   | 63%   | 60%   |
|      |   |  | 95%   | 100%  | 98%   |

2 way Anova

## Analyze Phase: Hypothesis Testing with Non-Normal Data

### *Non-Parametric*

1 Sample Sign  
1 Sample Wilcoxon  
Mann-Whitney  
Kruskal-Wallis  
Mood's Median  
Friedman

Will discuss  
more with  
examples

### *Parametric (normal data)*

One-sample t-test  
Paired t-test  
2 sample t-test  
One-way ANOVA  
One-Way ANOVA  
Balanced ANOVA

One- and Two-Sample Proportion: (for pass/fail data)  
Chi-Squared (Contingency Tables): (for association)

**Improve:-**

|          |                                                                                                                                                                                                  |                                                                                    |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| <b>S</b> | <b>SUBSTITUTE:</b><br>Replace a thing, or concept with something else.                                                                                                                           |  |
| <b>C</b> | <b>COMBINE:</b><br>Unite! What? Who? Ideas? Materials?                                                                                                                                           |  |
| <b>A</b> | <b>ADAPT:</b><br>Adjust to a new purpose. Re-shape? Tune-up?                                                                                                                                     |  |
| <b>M</b> | <b>MODIFY, MAGNIFY, MINIFY</b><br>Change the colour, sound, motion form, size.<br>Make it larger, stronger, thicker, higher, longer.<br>Make it smaller, lighter, slower, less frequent, reduce. |  |
| <b>P</b> | <b>PUT TO ANOTHER USE:</b><br>Change when, where, location, time, or how to use it.                                                                                                              |  |
| <b>E</b> | <b>ELIMINATE:</b><br>Omit, get rid of, cut out, simplify, weed out...                                                                                                                            |  |
| <b>R</b> | <b>REARRANGE, REVERSE</b><br>Change the order, sequence, pattern, layout, plan, scheme, regroup, redistribute...                                                                                 |  |

PICK chart – prioritize the solution.

**CBR = Cost Benefit Ratio**

**CBA = Cost Benefit Analysis**

Cost = 100

Benefit = 200

CBR : B/C

CBR > 1 , do it

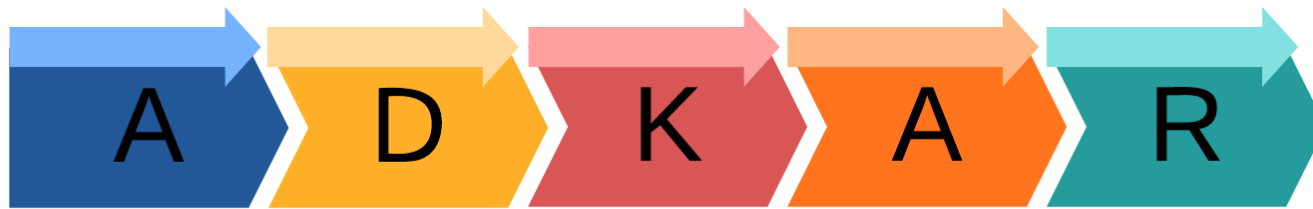
CBR < 1 , do it

CBR = 1 , getting approval is difficult.

Check for hidden benefits

Change Management

ADKAR



### Awareness

- Announce the change to employees well ahead of time.
- Explain your reasoning behind the change, including current pain points and potential ROI of the new solution.
- Give employees an opportunity to ask questions and make suggestions.

### Desire

- Gauge employees' reactions to the change.
- Identify champions.
- If employees are resistant or indifferent, address their concerns or show them how the change benefits them personally.

### Knowledge

- Provide training or coaching to show what employees need to do after the change takes place.
- Address any skill gaps.
- Offer resources, such as process flowcharts, that employees can reference later on.

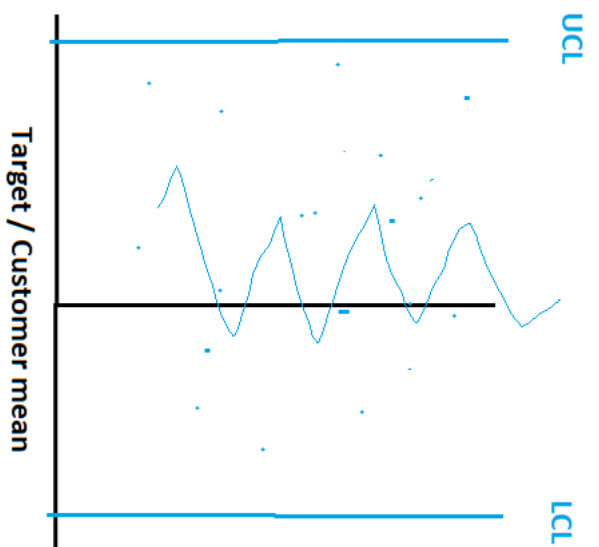
### Ability

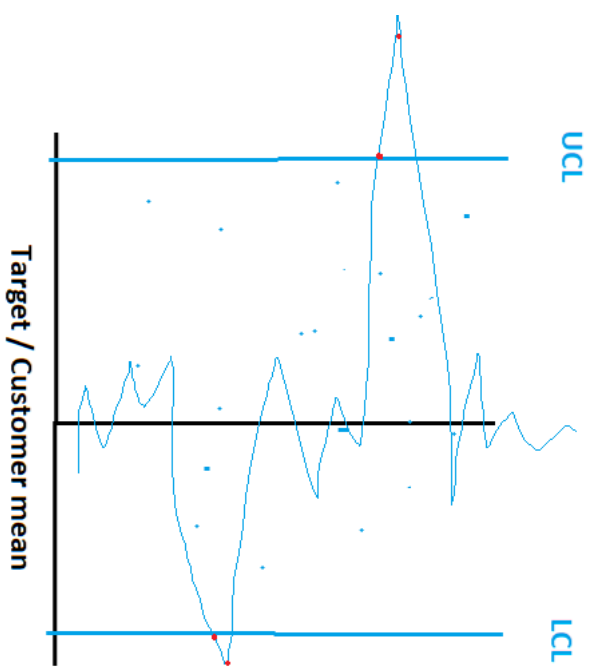
- Schedule practice runs before the change is fully implemented.
- Monitor performance immediately following the change and provide constructive feedback.
- Set reasonable goals and metrics at the start.
- Adjust processes as necessary.

### Reinforcement

- Monitor the change over time to ensure it fulfills your desired outcome.
- Use positive feedback, rewards, and recognition to encourage employees to keep following the new process.







## Continous

I-MR

Individual  
moving range

1

Normal

X-R

Mean Range

2-9

Normal/ Non-normal

X-S

six value/ std deviation

10 and above

Normal/ Non-normal

## Discrete

Defectives

np chart

equal

p chart

unequal

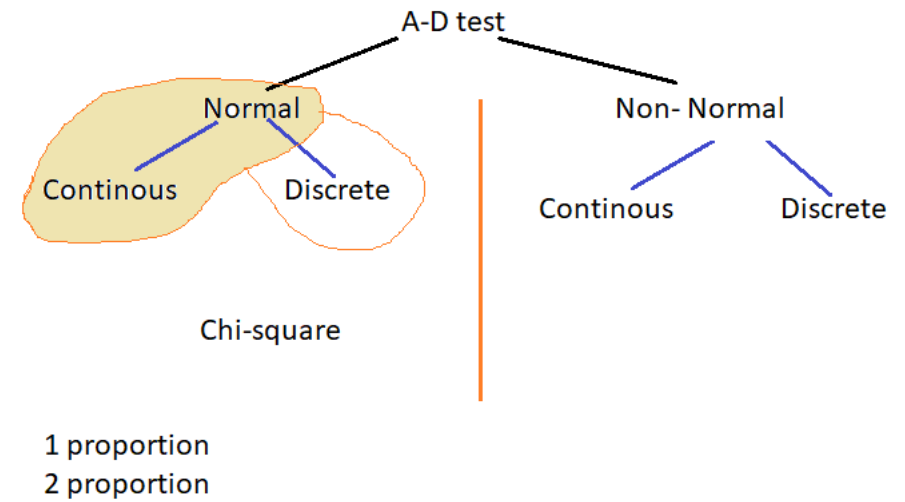
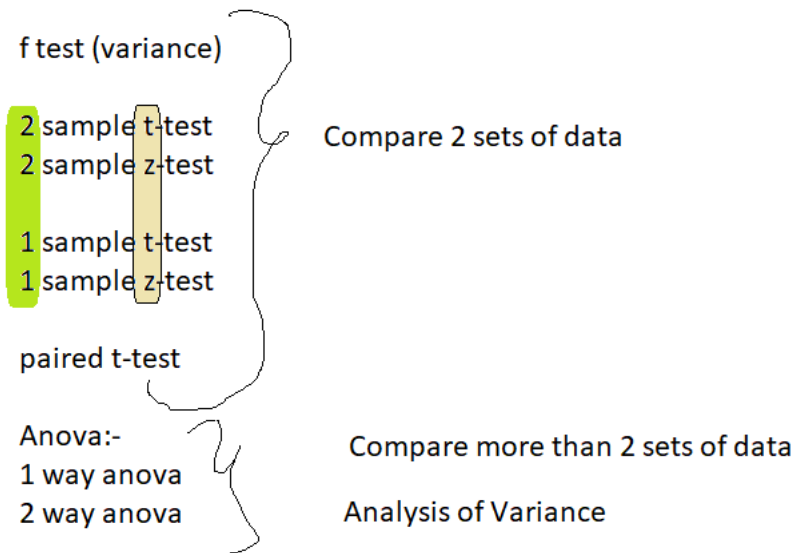
Defects

c chart

equal

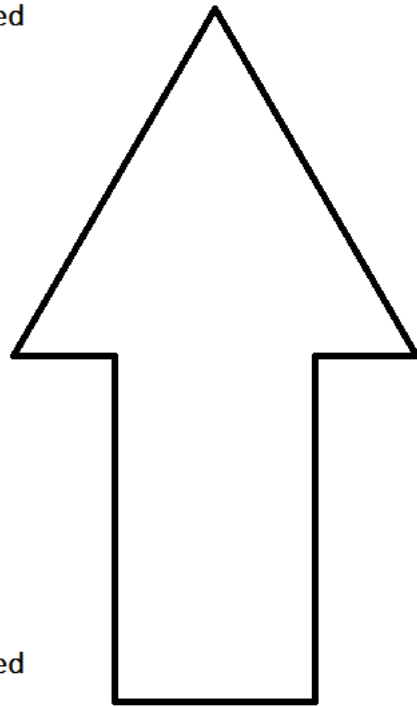
u chart

unequal



Day 1 – BB :-

Most Desired



Least Desired

Automate

Autonomation (Semi-Automation)

Eliminate Steps

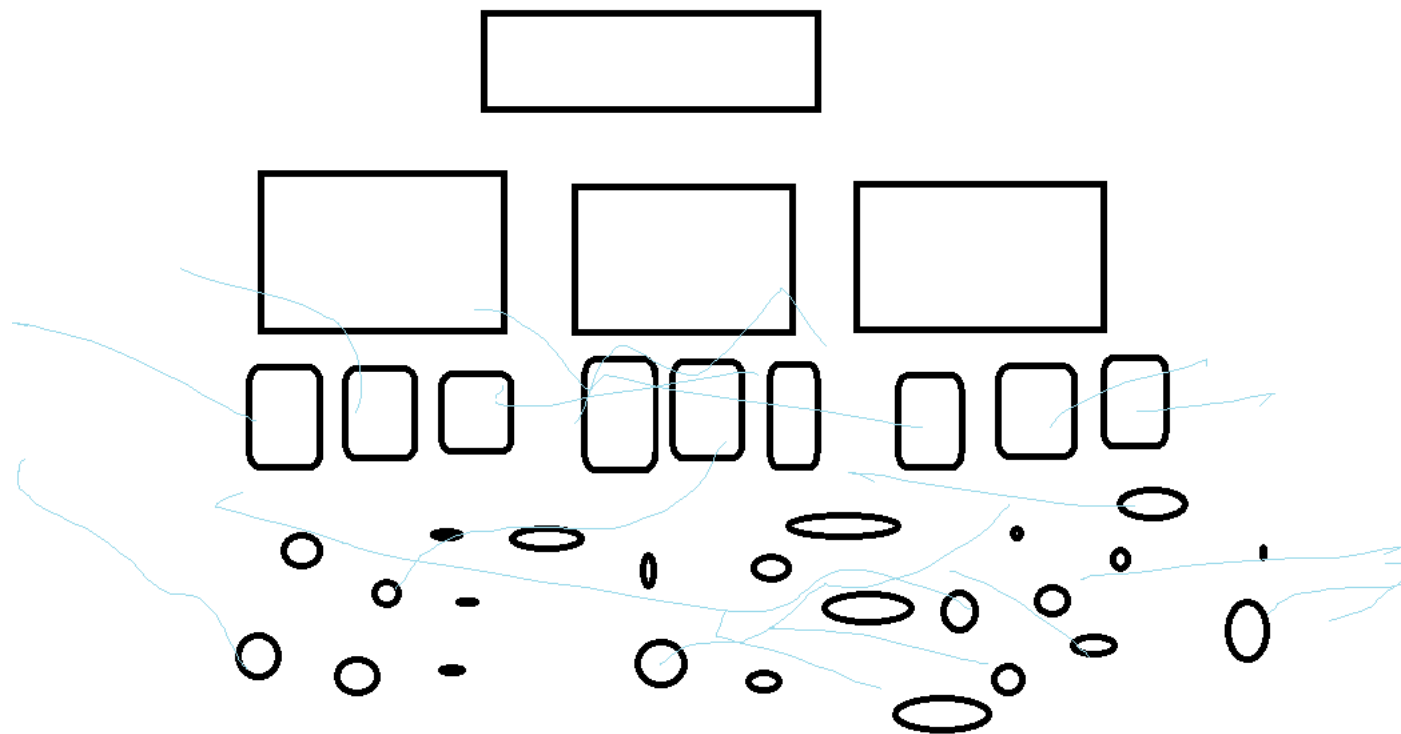
Simplify the process

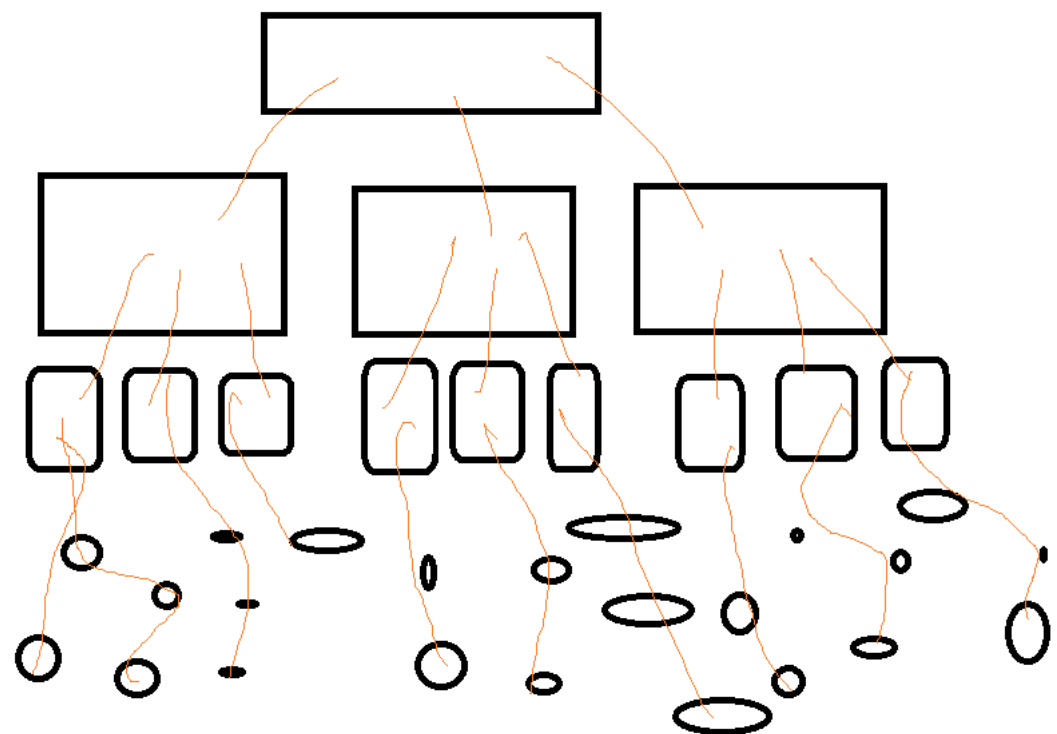
Training and certifying

Correction and Compensation

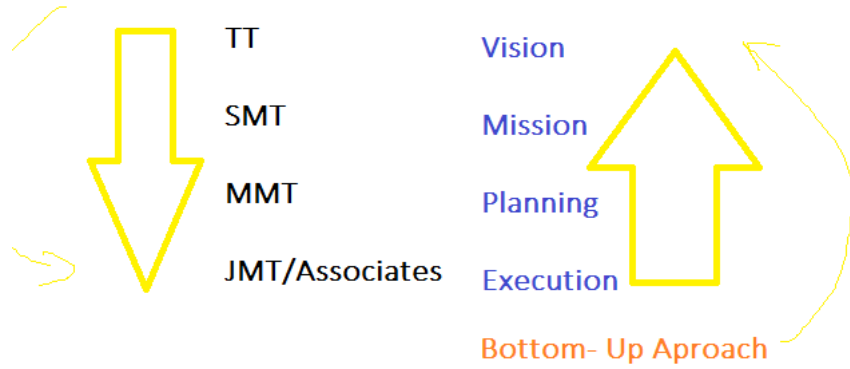
8 Dimensions of Problem Solving

8D problem solving approach <https://www.youtube.com/watch?v=-9MUBLT0DjI>





Top Down Aproach



TT

SMT

MMT

JMT/Associates

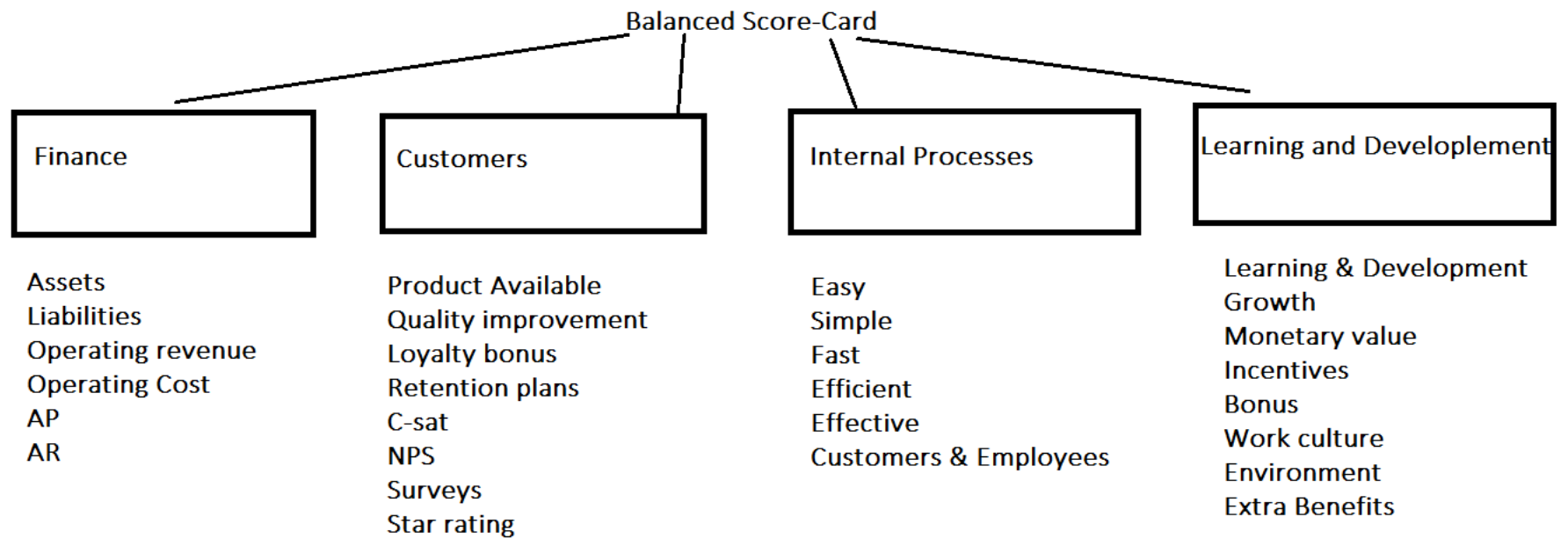
Vision

Mission

Planning

Execution

Bottom- Up Aproach



D Less taste, no salt, no veggies, look  
 M Less salt, less veggies, omlette is not enough for the bread  
 A 1 egg instead 1, less salt, no spices, no cheese, not grilled

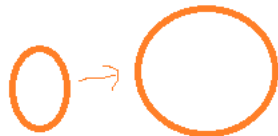
I Add salt, add spices, butter and grilled for 5 mins more, add one more omlette, Add fresh veggies  
 C Monitoring

D Look, smell, taste  
 M Spice fine, no taste, smells bad  
 A Eggs are rotten

D-redesign  
 Verify

~~I~~  
~~C~~

DMAIC



For existing process

DMADV



## DFSS

Omlette Pizza

D  
M  
A  
Design  
V

New Process

Identify

portable PC, independant equipment

Design

light weight, Charged and used, Slim, poratble to car

Optimise

More RAM, Better Processor, Features

Verify

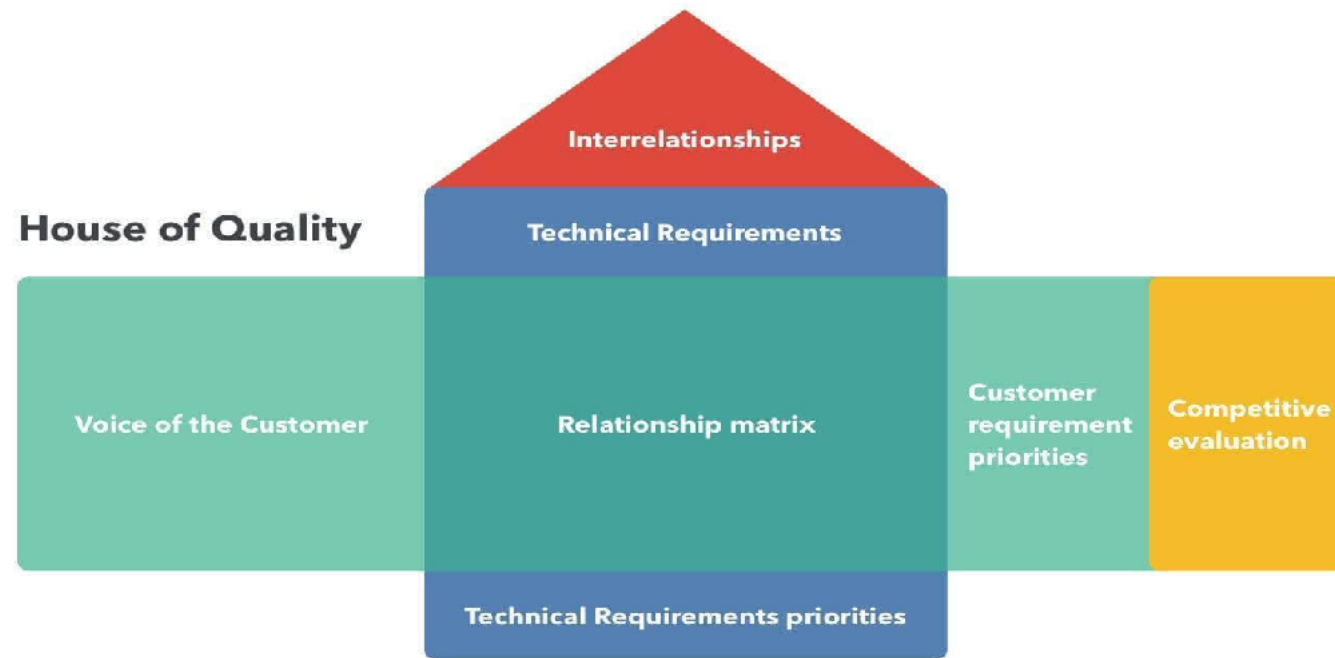
Sales and feedback

Kano:-

|      |  |                                                                                                          |            |                           |                     |  |
|------|--|----------------------------------------------------------------------------------------------------------|------------|---------------------------|---------------------|--|
| KANO |  |                                                                                                          |            |                           |                     |  |
|      |  |                                                                                                          |            | Met                       | Not Met             |  |
|      |  | Get what we ordererd, Hygienic, Clean,<br>Table and seats are avialble                                   | Basic      | Not necessarily satisfied | Highly dissatisfied |  |
|      |  | On time, Price, Good service, pleasant<br>waiter, Taste,                                                 | Expected   | Satisfied                 | Dissatisfied        |  |
|      |  | Complimentary cake, welcome drink,<br>Live music, Pets corner, Kids corner,<br>15% discount on the bill, | Exciting   | Highly satisfied          | Not dissatisfied    |  |
|      |  | Use artifical colors/flavours,                                                                           | Dissuaders |                           |                     |  |
|      |  |                                                                                                          |            |                           |                     |  |
|      |  |                                                                                                          |            |                           |                     |  |
|      |  | USP - completitor analysis                                                                               |            |                           |                     |  |
|      |  |                                                                                                          |            |                           |                     |  |

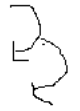
QFD:-

Send the template with this notes file.



Things we need to be ready with for QFD:-

VOC  
CTQ  
Kano  
Competitor Analysis



Technical Requirements

**Figure 1** — House of quality template and benefits

