

Form Page

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Rules for interpreting Control Chart

Process considered out of control or likely to go out of control if

- ① one point outside UCL or LCL
- ② Seven (or nine) points in the same side of center line
- ③ Six (or eight) points all increasing or decreasing

(These are indications for assignable causes)

Control chart acts as ICD

Shift the Mean. (of UCL-LCL)

This can happen due to assignable causes.

CPK is used to indicate this (long term capability index)

CP (Short Term Capability Index) (non shifted process)

$$CPK = \min \left\{ \frac{USL - \text{Mean}}{3\sigma} \text{ or } \frac{\text{Mean} - LSL}{3\sigma} \right\}$$

$CPK > 1$ process is capable after shift of mean. (For shifted process)

Motorola Targeted much higher level of process capability

- They reduced PW to $\frac{1}{2} SW$
- So $CP = \frac{SW}{\frac{1}{2} SW} = 2$
- $UCL = \text{Mean} + 6\sigma$
- $LCL = \text{Mean} - 6\sigma$

They called Six Sigma Process.

- in case of $CP = 1 \rightarrow \text{sigma level} = 3 \times 1 = 3 \Rightarrow \text{defect} = 2700$
- in case of $CP = 2 \rightarrow \text{sigma level} = 3 \times 2 = 6 \Rightarrow \text{defect} = 0.002$
- if process shift 1.5 - $CPK = 1.5$ - $CP = 3$ - sigma level = 6 $\rightarrow \text{defect} = 3.4$

Notes

- if no shift in the means $CPK \geq CP$
- in all other cases $CPK < CP$
- CPK cannot be greater than CP

Continual improvement

- Process out of control
- Point out of UCL/LCL
- Process likely to go out of control
- mean has shifted

$CPK \neq CP$

action:-

- Remove assignable causes using
- Corrective and preventive action

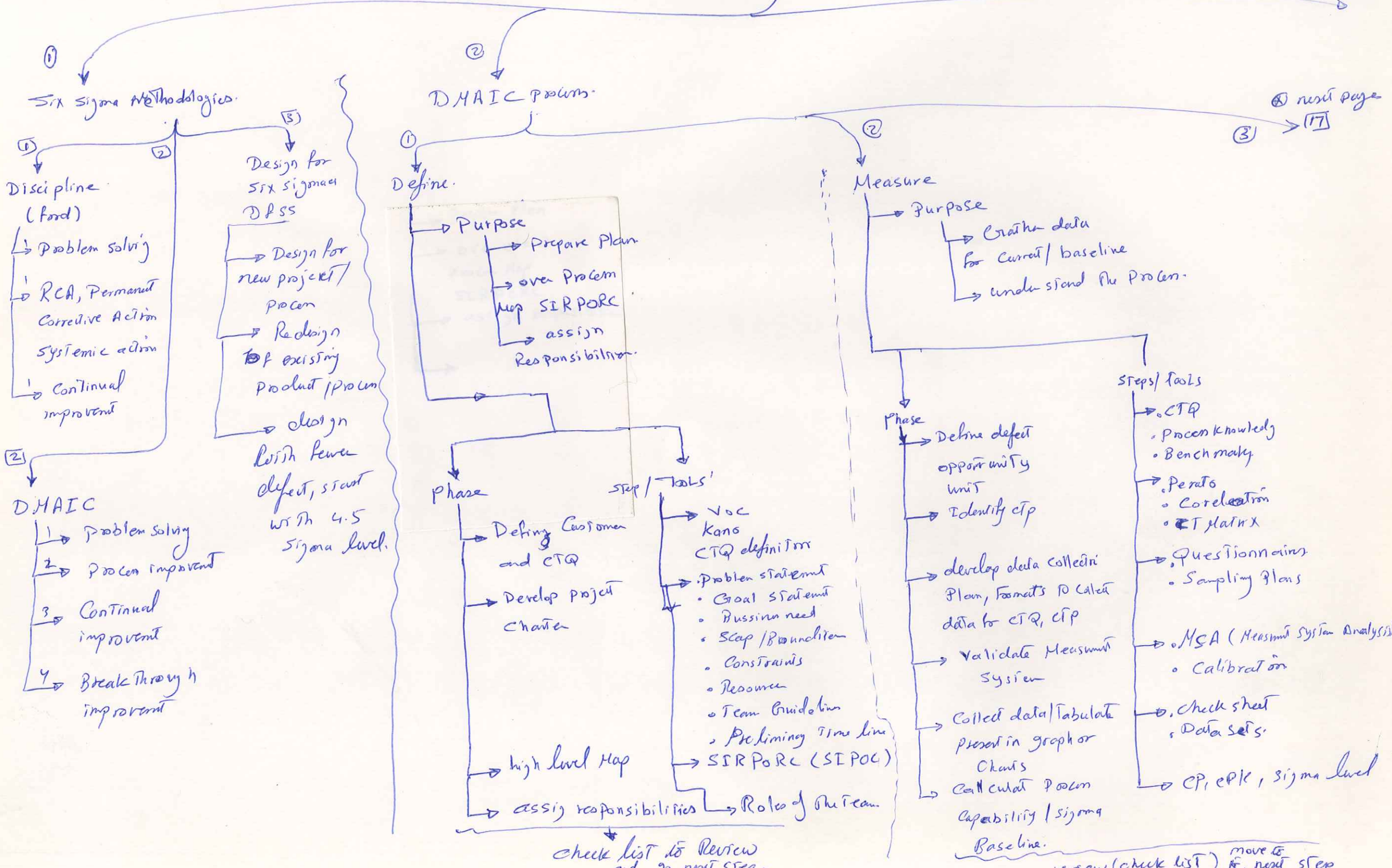
Breakthrough improvement

- $CP < 1$
- Process is not capable to meet requirement
- Variation due to inherent causes is high

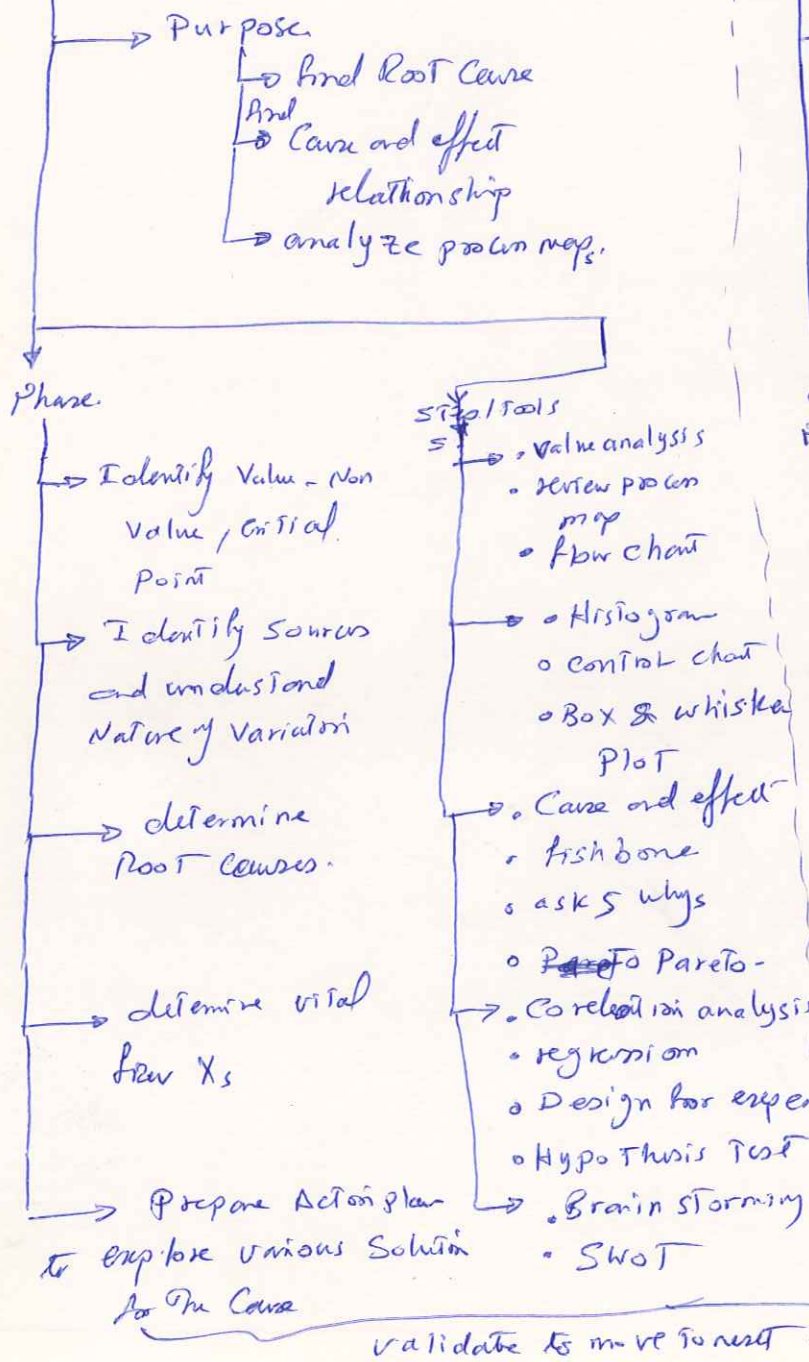
action:-

- Reduce SD which directly depends on non assignable causes

DMAIC Methodology

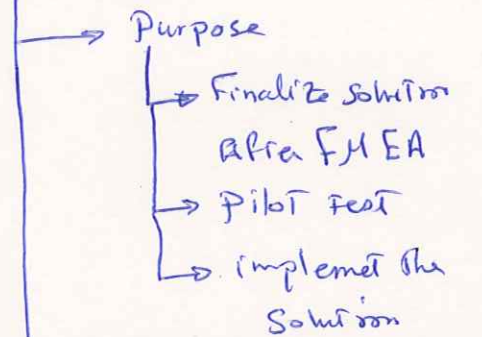


Analysis.



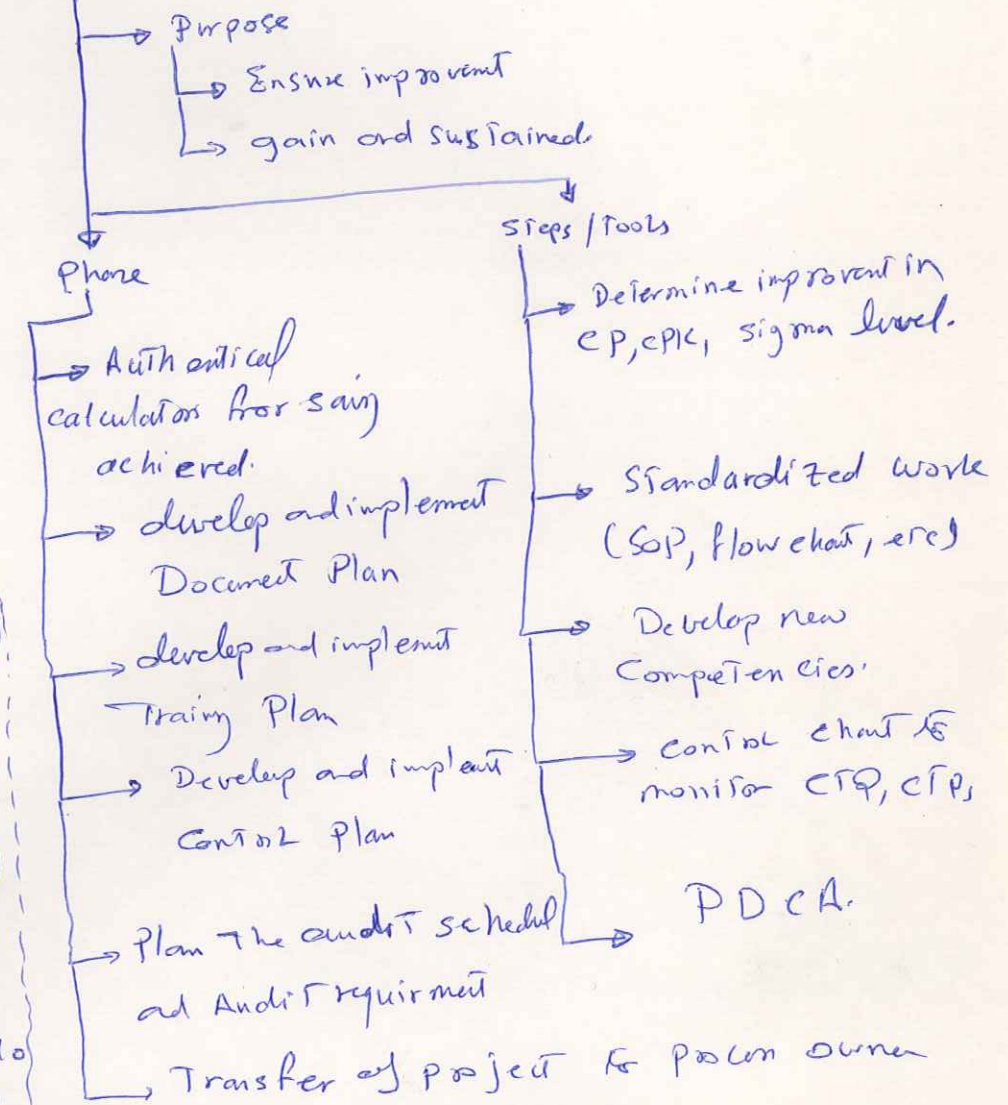
④

IMPROVE



⑤

Control



Validate.

④ from Page 17

③

Project charter

a) problem statement:-

→ quantified description
which we faced in process
→ include Base line data

example 40% of our delivery
is not meeting the Customer requirement
23% reject, 17% late delivery.

b) Goal statement:-

to be ~~smart~~ SMART

Smart Specific	Measurable	Achievable	Realistic	Time Bound.
Reduce error cut rework	by 60% by 50%		with 5 months	

c) Business need.

affecting our Business and costing
us SAR XXXX per month
and will effect our position as
leader in market

d) Scope Boundary

→ in scope
delivered to
Corporate
client
→ out scope
delivered to
clients other
than Corporate
client

e) Constraint
our Team
only available
3 days per week

f) Team guideline
= meet at least
once per week
= decisions will be
Taken by consensus
if not reach, Team leader
will make final call.

g) Team Member
→ Mr. --- Champion
→ Mr. --- BB
→ Mr. --- CIB

④

Samples for
check list to
validate each
phase (check
Book Page 90)

h) Preliminary Plan

→ Defm 3 weeks
→ Measure 4 weeks
→ Control 3 weeks