

# Productivity Improvement

:

## Productivity is NOT ...

- Productivity is not equivalent to production .1
- Productivity is not a mere pursuit of efficiency .2
- Input factor  
Work Smarter Not Harder  
Productivity is not equivalent to productive capacity .3
- .Rejected by customers  
Productivity is not equivalent to profitability .4

## Productivity: A Measure of ... :

+ =

Productivity = Efficiency + Effectiveness

=

Efficiency = Doing things right

=

Effectiveness = Doing the right things

+

=

Productivity = Doing things right + Doing the right things

## Efficiency

The Ratio of Actual Output Attained to Standard Output Expected



## Effectiveness

The degree of accomplishment of objectives

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.1

.2

.3

.4

.5

.6

## PRODUCTIVITY MEASUREMENT

**If You Cannot Measure Productivity, You Cannot Manage It.**

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:

**Partial Productivity** (

:

Total Output/ (1) Input ÷ = PP

:

**Labour Productivity** .1

**Material Productivity** .2

**Machine Productivity** .3



**:Capital Productivity** .4

**:Multi-factor Productivity** (

—  
Total Output/ 1 Input + 2 Input ÷ =MFP  
(Benchmarking)

**Total Factor Productivity (TFP)** (

( )

÷ =TFP  
Total Output/ (1 Input + 2 Input + 3 Input ....)

**: Productivity Analysis**

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**:Productivity Evaluation**

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**:Productivity Planning**

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## :Productivity Improvement

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### :Ways of Improving Productivity

:

Achieving the same output from less input

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Achieving more output for the same input

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Achieving much more output for slightly more input

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Getting slightly less output for much less input

•

Achieving more output from less input

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: .9

: .10



	:	<b>.11</b>
	:	<b>.12</b>
	:	<b>.13</b>
	:	<b>.14</b>
	:	<b>.15</b>
	:	<b>.16</b>
( )	:	<b>.17</b>
	:	<b>.18</b>
	:	<b>.19</b>
	:	<b>.20</b>
	:	<b>.21</b>
	:	<b>.22</b>
	:	<b>.23</b>
		<b>Breakdown</b>
Capacity Utilization Rate		<b>.24</b>
Labor Utilization Rate		<b>.25</b>
	:	<b>.26</b>



	:	.27
	:	.28
	:	.29
( )		.30
		.31
	:	.32
		.33
		.34
" "	:	.35
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	:	
Bottlenecks & Backlogs		
	Queue Time	





"First- in, first- out"

Just-in-time Inventory System –

Idle Time

Economic Order

Quantity

## Plant Layout Design



:

.1  
.2  
.3  
.4  
.5  
.6  
  
.7  
.8  
.9  
.10  
.11  
.12  
.13  
.14

Types of Layout

:

**Fixed Position Layout** .1

...

**Product Layout** .2



**:Process Layout .2**

**:Hybrid Layout .3**

(Product-Process Layout Design

**:Modular Layout Design .4**  
Modules

**:Cellular Layout .5**

**Group Technology**

Efficiency

Flexibility

**Material Handling**



:	-
	-
	-
	-
	-
"Space is money"	-
	-
	-
	-
stow	-
	-
Work in process	-
Higher inventory turnover	-
	-
:	
	.1
	.2
	.3
	.4

## Line Balancing

(Work Station)



.Slack Time ( )

Bottleneck

(Cycle Time)

.(Bottleneck)

:

Backlog

.1  
Bottleneck

.2

.3

.4

.5

.6

.7

.8

.9

## Work Study

:

.1

( )

.2



Unproductive Time

Idle Time

( )

**Method Study .1**

Work Element

- (a)
- (b)
- (c)
- (d)
- (e)

**Method Study Steps**

: **Select the work to be studied :**

: **Record**

**Critical Examination :**

**:Develop**

.1

.2



.3

.4

**Define :**

:

**Install :**

:

-

Standard Practice

**Maintain :**

:

### TIME AND MOTION STUDY

#### MOTION STUDY

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:

.1

.2

Foreman

.3

#### TIME STUDY

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(Work Measurement

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Elements  
 ) Analysis Phase -  
 Measurement Phase -  
 .Work Element ( Synthesis -

( ) -  
 Standard Time -

Methods Alternative •  
 Planning •  
 Manning •  
 Scheduling and balancing •

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 •  
 •  
 •  
 •  
 •

**Time Study Steps** :





.( ... )  
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 :  
 : -  
 : -  
 :

**:Standard Time**

:  
 × =  
 ÷ =  
 Allowances

:  
 .( -1) × =

## Ergonomics

Interacts

( ) :  
 -  
 -  
 -



**Common Risk Factors**

- Awkward Position -
- Repetitiveness -
- Sustained Exertions -
- Extreme temperatures and hand-arm vibration -
- Poorly fitted gloves -

Continuous repetition of the same motions

" Carpal tunnel syndrome

.Eyestrain

Keyboard

**Total Quality Management**

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) ( )  
(  
( )

.Total Quality Control  
"Total Quality Management (TQM)  
1985



People Focus

)

(

:

- .1
- .2
- .3
- .4
- .5
- .6
- .7
- .8
- .9
- .10
- .11
- .12
- .13
- .14
- .15
- .16
- .17
- .18
- .19





		.11
		.12
		.13
.Employee	Evolve	.14
	participation activities	
	<b>Brainstorming</b>	

Generating a long  
in a relative short period

Collective thinking

list of ideas

of time

Potential root causes

12-6

:

:

:

:

.1

"No idea is a bad idea"

.2

"The best way to have a good idea is to

.3

have a lot of ideas"

## The Seven Tools of Quality Control



:Check Sheets

①

Product Number: XXXXXX		Line Name: ABC				
Product Name: XYZ		Process Name: XYZ				
Defective Item	2/5 (M)	2/6 (T)	2/7 (W)	2/8 (T)	2/9 (F)	TOTAL
Mold cracked	///	///	/// I	///	///	21
Fibers	///		///	I		8
Grit	///	///	///	///		14
Pinholes	I	///		///	I	9
Cracks		I	I			2
Other	I	///			///	7
<b>Total</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>11</b>	<b>8</b>	<b>61</b>

(Distinguishing between fact and opinion)

.1

.2

.3

in a systematic format

.4

.5

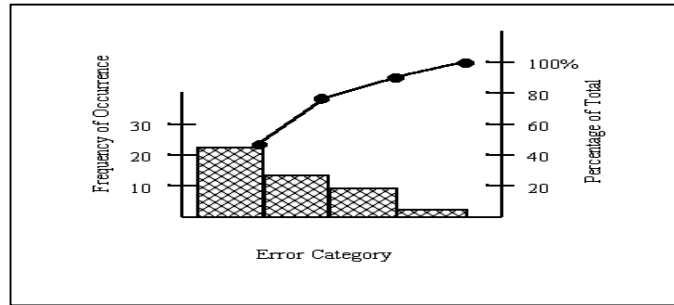
**Pareto Chart (Pareto Diagram)**

②

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**(20/80) Pareto Principle**

.20/80 . %20 %80

%20 %80 %20 %80 -

. 20/80 .

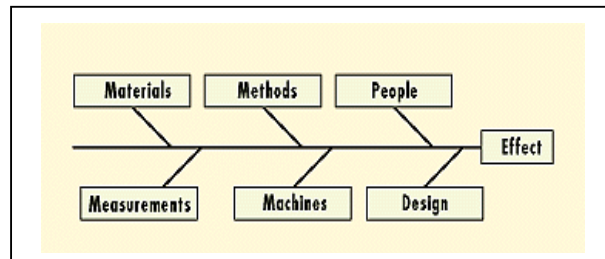
%20 %80 %80 %20

. %80 %20 .

. %80 ( )

. %20

**Cause & Effect Diagram or Ishikawa Diagram ( ) ③**  
**(Fishbone Diagram)**



Visual tool  
 Graphically

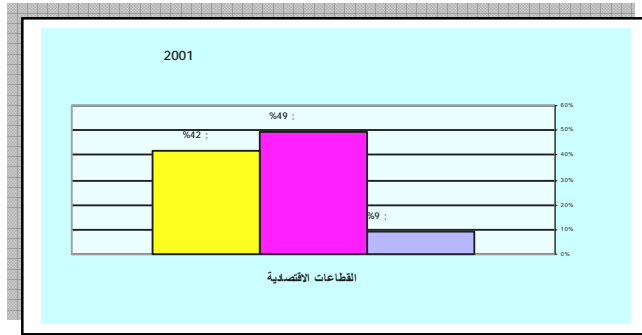
Explore  
 Identifying root causes

( )

.Fish Skeleton

**GRAPHS ④**





( ) Scatter Diagram

5

(x, y)

-

:

(x)

-

Cause

.Result

(y)

-

:

-

The strength

Predict

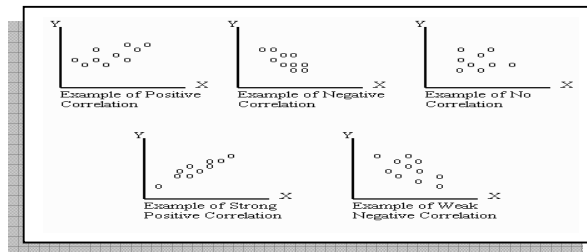
-

of relationship

:Correlation

( )

"Correlation Analysis



Process Control Charts

6





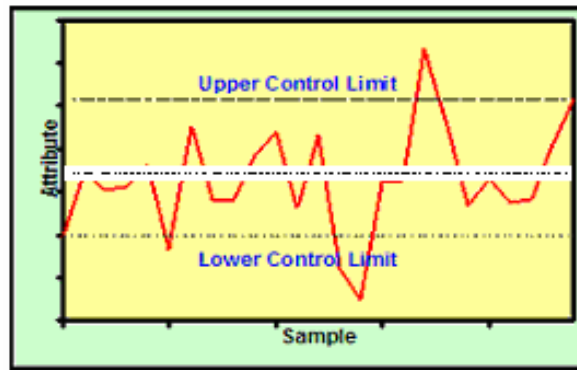
## :Control Chart Concepts

Dispersions due to *Accidental, Common, Normal* Causes .1  
 Chance,

- %100

Dispersions due to *Abnormal, Special,* .2  
 Assignable, Causes

.Inadequate standards



Center Line

Upper Control Limit (UCL)

.Lower Control Limit (LCL)

Process Average

Center Line

Controlled Condition

Uncontrolled

.Condition



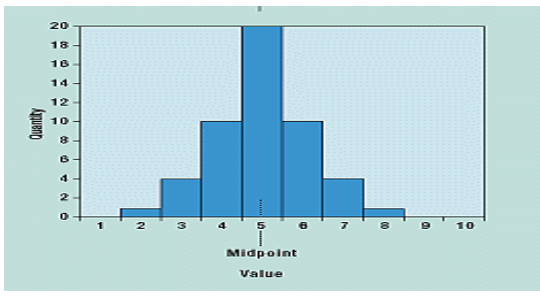
# Histogram

7

Variations

Operating Standards

( )



## FIVE "S" PRACTICES

Seiton

Seiri

Seitketsu

Seiso

.Shitsuke

(Making workplace more user friendly, cleaner and better organized)

:The Origin of the Term 5S

: (S)

(5S)



Seiri, Seiton, Seiso, Seiketsu, and Shitsuke

- Put things in order (Seiri) .1  
out .

- Proper Arrangement, Simplifying (Seiton) .2

- Systematic Cleaning (Seiso) .3

- Standardize (Seiketsu) .4

.( Seiri-Seiton-Seiso.) 3 2 1

-Sustain (Shitsuke) .5

Self-disciplined

(Seiri, Seiton, Seiso, Seiketsu)

:(5S)

.1

.2

.3

(5S Cycle)

.4

:

Improve on-time delivery

.1

Improve quality/ reduced defects

.2

)

.3

Reduce lead times (

Reduce waste in materials, space

( )

.4

and time

Reduce inventory and storage costs

.5

Reduce of a specific machine

.6

changeover time

-

.7

Reduce Equipment Downtime, caused by malfunction

Improve Safety

.8

) Waste

.9

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# KAIZEN

"Zen" Change

"Kai" –

" For the better

(Taiichi Ohno & Shigeo Shingo)

"Kaizen"

.Use your knowledge not your money –

Eliminate Waste

:Large-Scale Improvements

:Small-Scale Improvements

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Kaizen

Kaizen

Kaizen

Processes Creates results -

Materials Methods Machine Man - Environment

Total System Focus Vs. -

Departmental Focus

Non-blaming and Non-judgmental -

	: Waste		
Waste of ( )		-	.1
			Overproduction
Waste in Inventory ( )			.2
	- Waste of Defects		.3
	Waste of Movement		.4
		Waste of Motion	
Waste of ( )			.5
	(Excess processing) Processing (Inappropriate Processing)		
	Waste of Waiting or Delay		.6
	Waste of Transportation		.7

### POKA-YOKE



"Poke-Yoke"

1961 Shigeo Shingo

TMC

Defect

Error

( ) -

"Yoke"

( )

"Poka"

Poka-yoke

" ... Shingo

" Shingo

**"Poka-Yoke"**

Prevention device

.1

Detection device

.2

### Just-In-Time

(TMC)

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( )



JIT

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## Total Productive Maintenance

TPM

TPM

Improve Productivity

.Asset availability

TPM

Rework

Breakdown

Defects

Rejected

TPM

TPM



			<b>TPM</b>
			.1
		"	.2
			.3
			.4
			.5
Zero downtime of			.6
zero accidents	zero defects	machinery/equipment	
			.7

## SIX SIGMA

6

6

Defect 3.4

(Defects Per Million Opportunities – DPMO)

1983

3.4 Centerline

6

6

Mistakes

Rework

Eliminate Wastes

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- 
- 
- 
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Six Sigma





Service -related

Exceed Customer Expectations

Processes

Six Sigma -

Six Sigma -

Six Sigma

1983

6

-

Six Sigma

Six Sigma

3.4

Six Sigma

Six Sigma

: Six Sigma

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-  
-  
-  
-

.Six Sigma

## BENCHMARKING

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Best-in-class



The Search for those best practice that will lead to the superior performance of a company.

Xerox

Benchmarking Partner

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.2  
.3  
.4  
.5  
.6  
.7



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-  
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World class status

.1

.2

.3

.4

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