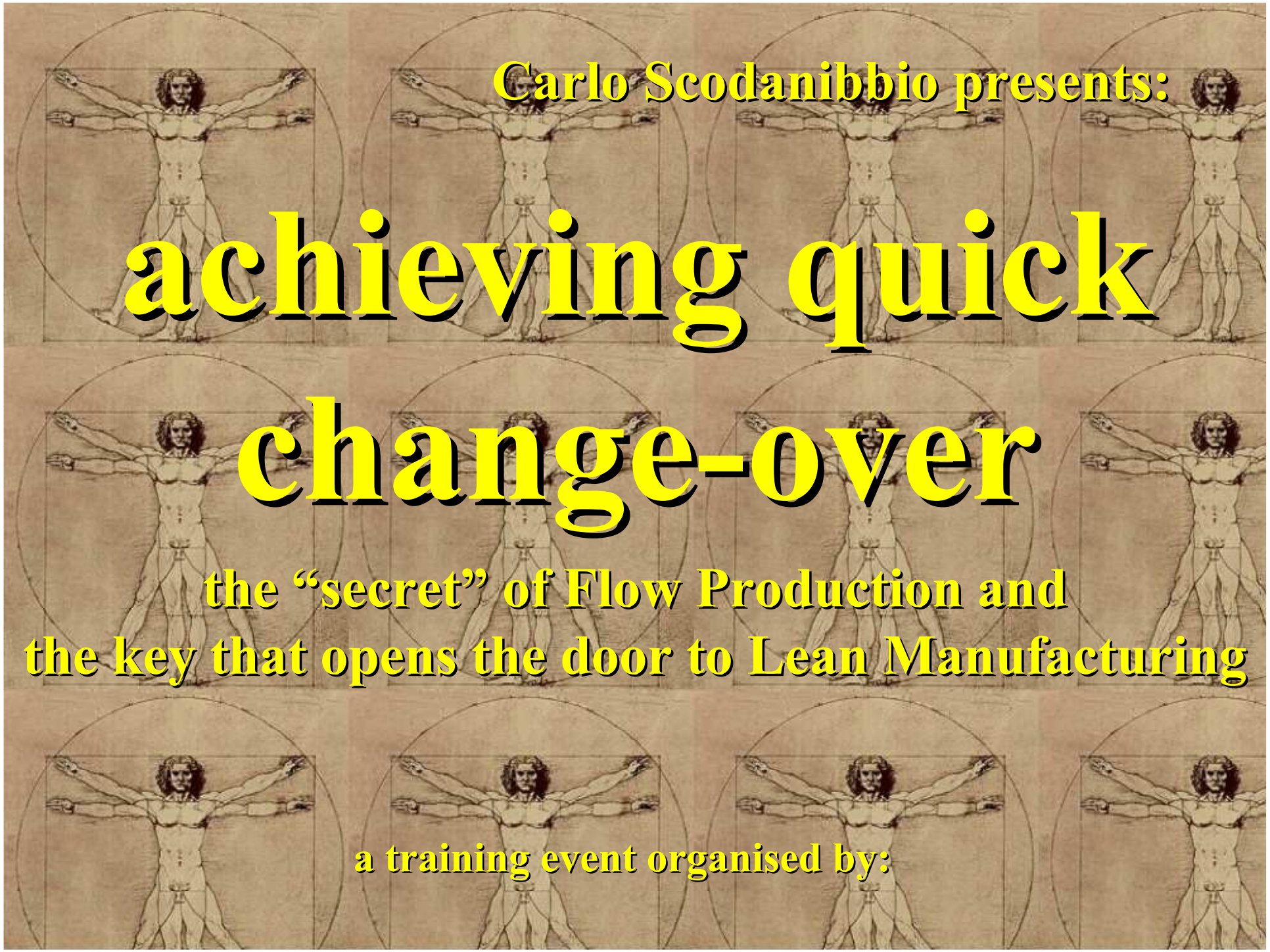
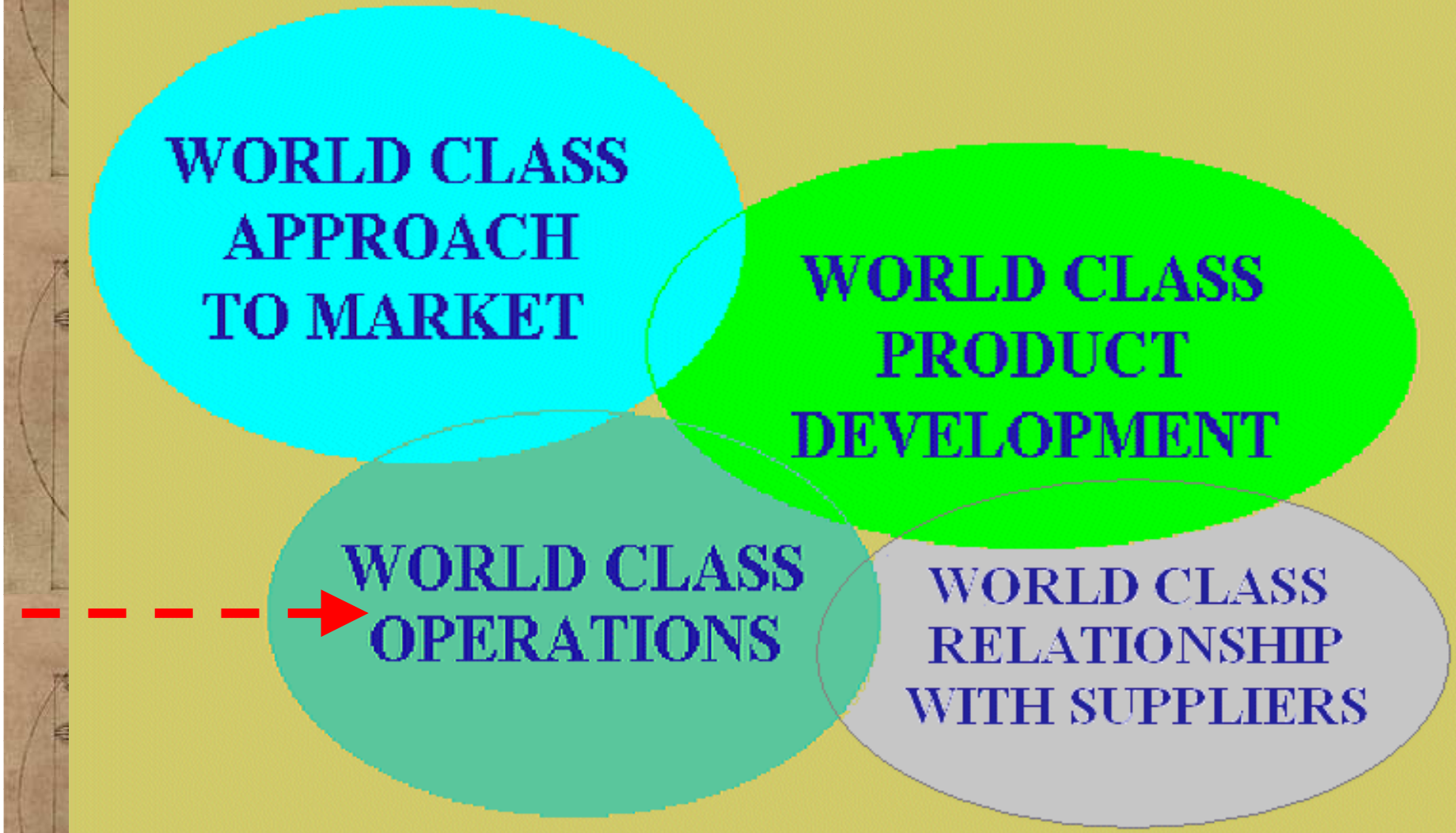
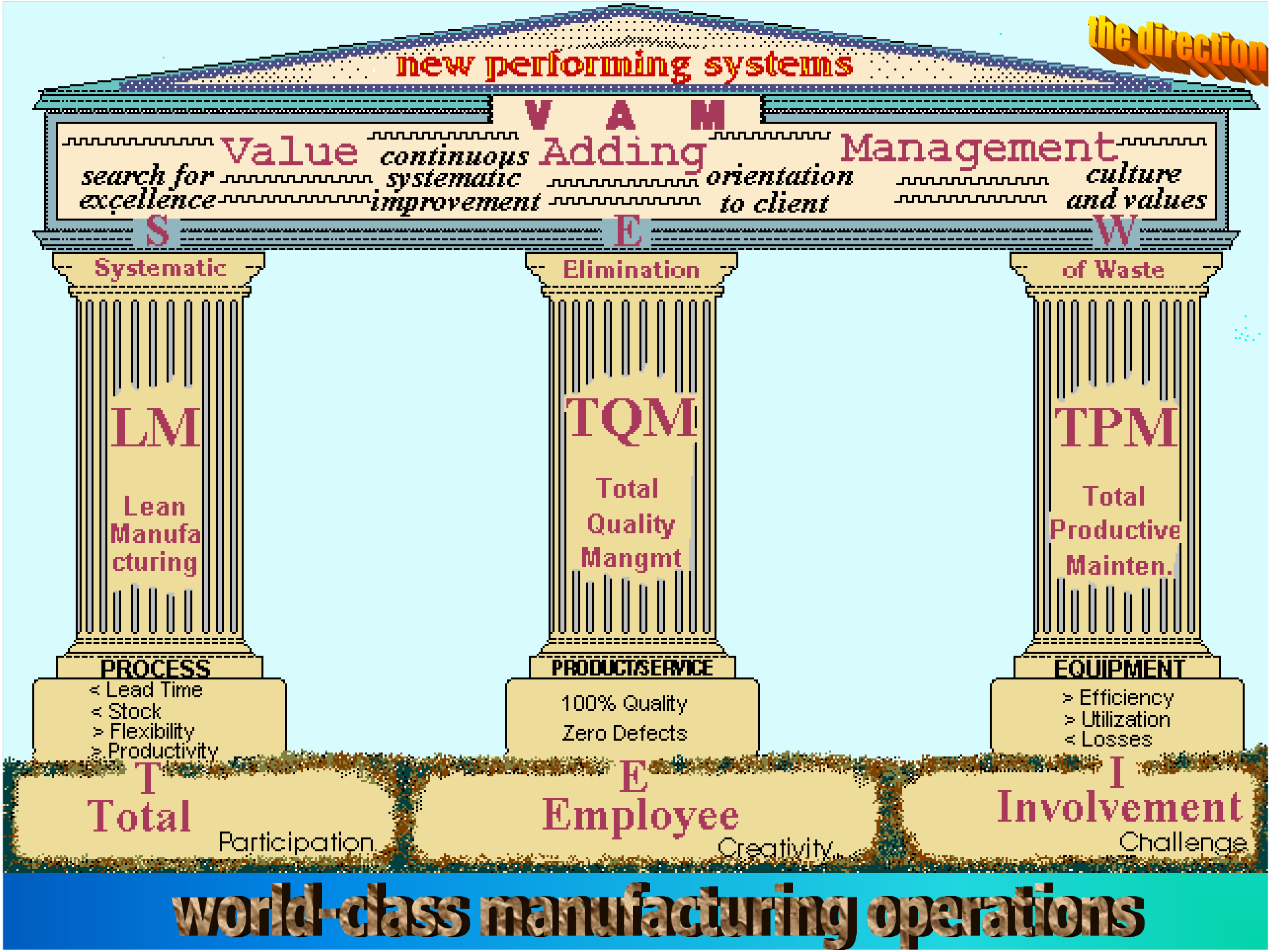

Carlo Scodanibbio presents:
achieving quick change-over
the "secret" of Flow Production and
the key that opens the door to Lean Manufacturing
a training event organised by:

clients are monsters….

Credits: J. Barta & Boris Vallejo

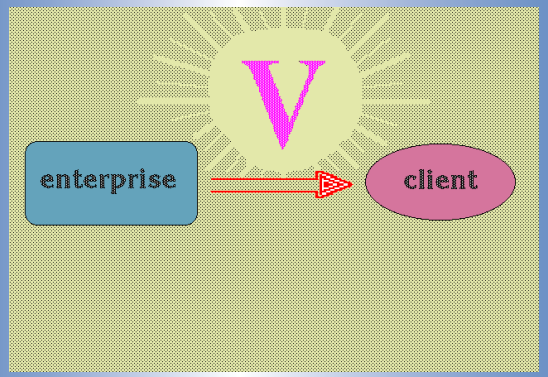
WORLD CLASS MANUFACTURING




the direction
new performing systems
V A M
Value Adding Management
search for excellence
continuous systematic improvement
orientation to client
culture and values
S
E
W
Systematic
Elimination
of Waste
LM
Lean Manufacturing
TQM
Total Quality Mangmt
TPM
Total Productive Mainten.
PROCESS
< Lead Time
< Stock
> Flexibility
> Productivity
PRODUCT/SERVICE
100% Quality
Zero Defects
EQUIPMENT
> Efficiency
> Utilization
< Losses
T
Total
Participation
E
Employee
Creativity
I
Involvement
Challenge
world-class manufacturing operations

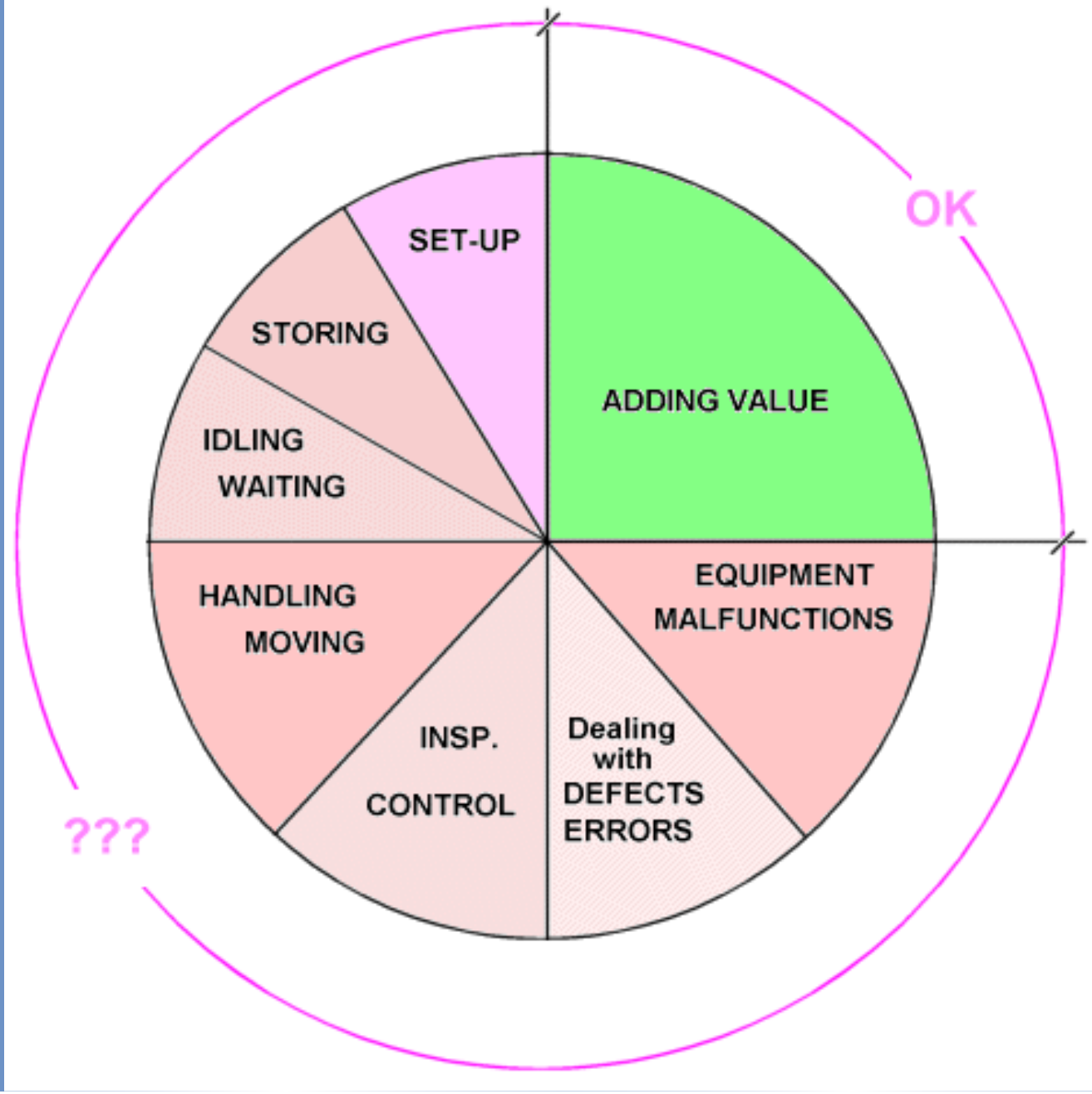
VAM

VALUE ADDING MANAGEMENT



the VAM approach to the productive process

process time analysis



SEW

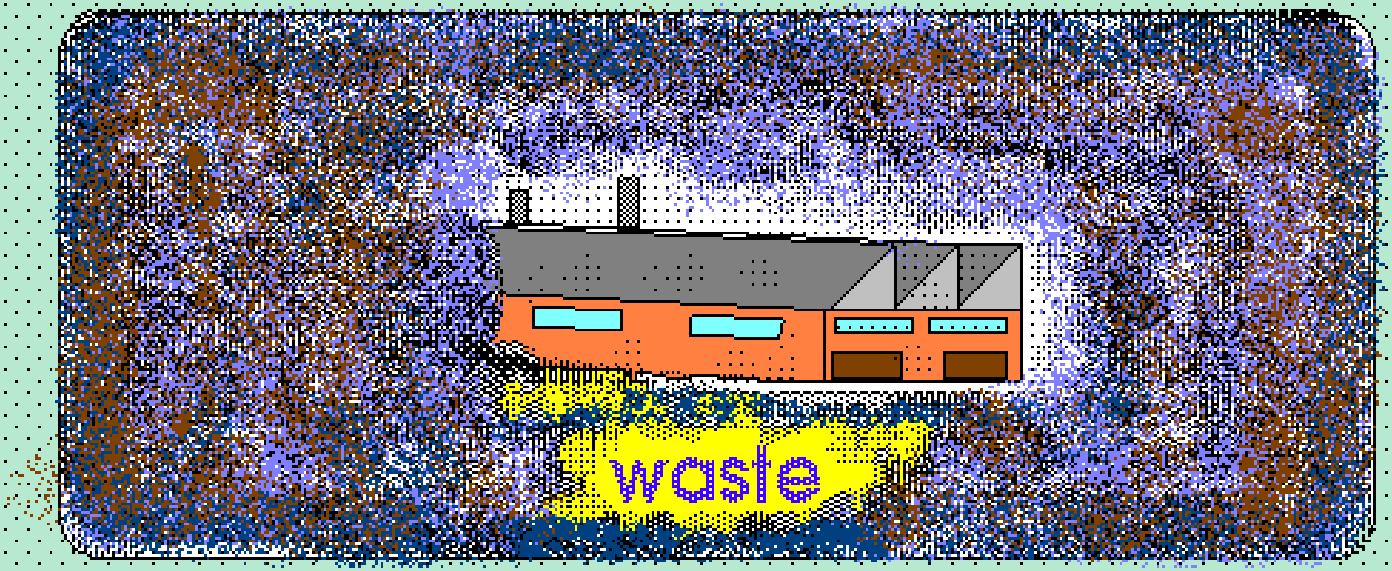
SYSTEMATIC
ELIMINATION OF WASTE

VALUE!


WASTE DOES NOT ADD
ANY VALUE

FIGHTING WASTE IN PRODUCTION

...in many factories waste has proliferated to such an extent that waste is no longer in the factory, but rather the factory is IN the waste...



FIGHTING WASTE IN PRODUCTION

CLASSIFICATION OF WASTE

SUMMARY OF THE MAIN TYPES OF WASTE

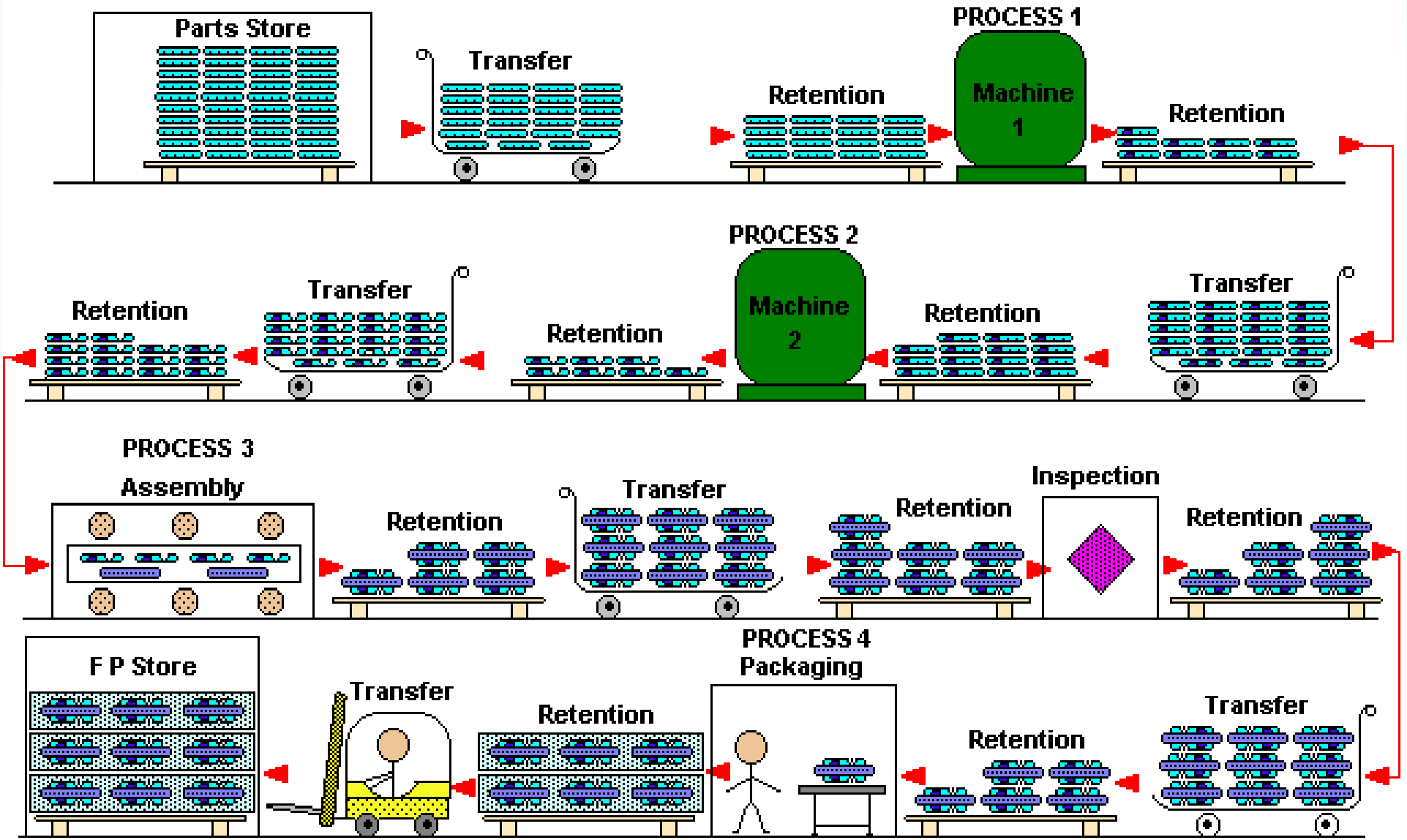
- Overproduction
- Stock
- Un-needed processing steps
- Motion
- Control
- Defects
- Waiting/idling
- Transportation

movie time

spot the waste!

Manufacturing Industry

traditional "lot" manufacturing



the productive process in manufacturing

some definitions

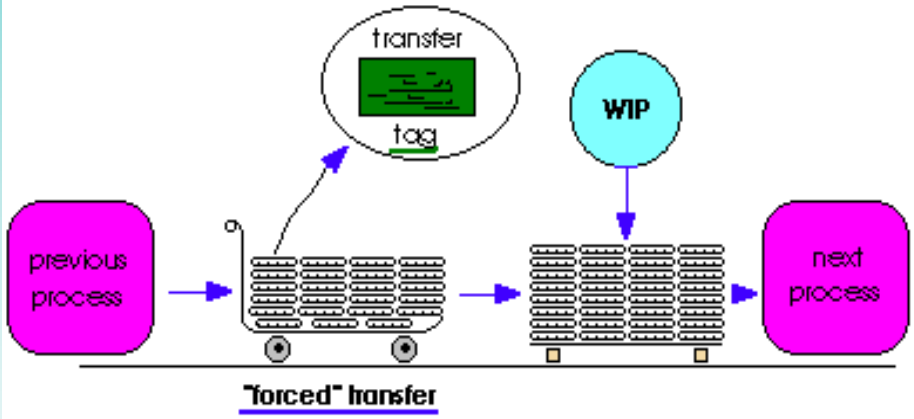
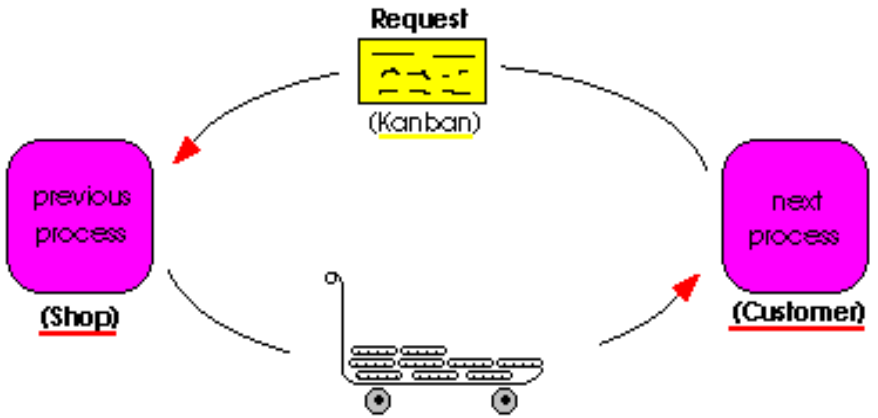
PUSH and PULL PRODUCTION METHODS

"Independent process production" (each process follows its own schedule, independently of all other processes)	"Next-process dependent production"
Not flexible at all to changes in production schedules.	Extremely flexible to changes in production schedules.
P-Time > D-Time	**P-Time <= D-Time**

the productive process in manufacturing

some definitions

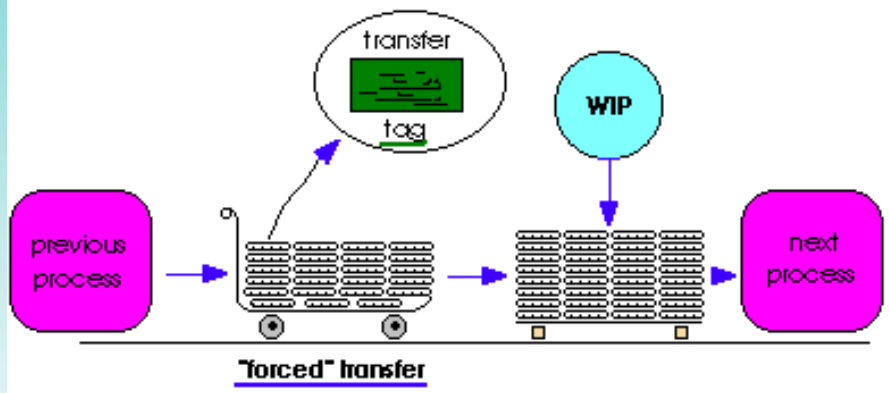
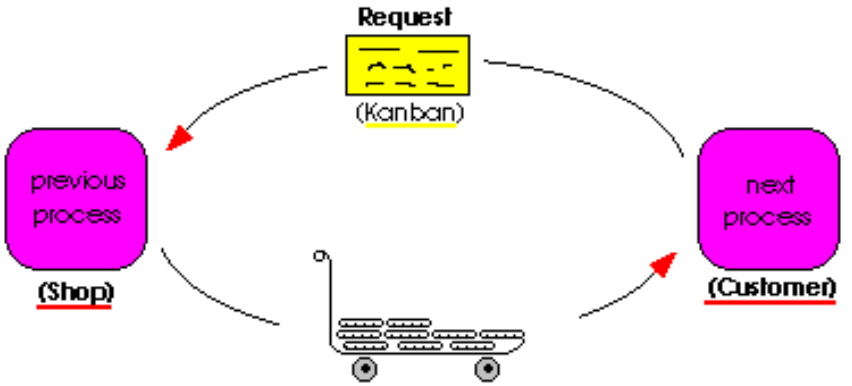
PUSH and PULL PRODUCTION METHODS

push	*pull*
	
Workpieces manufactured by previous process are transferred to next process irrespective of its readiness to receive and process goods	Next process "orders" from previous process "just" what, when, and in the quantity it needs.

the productive process in manufacturing

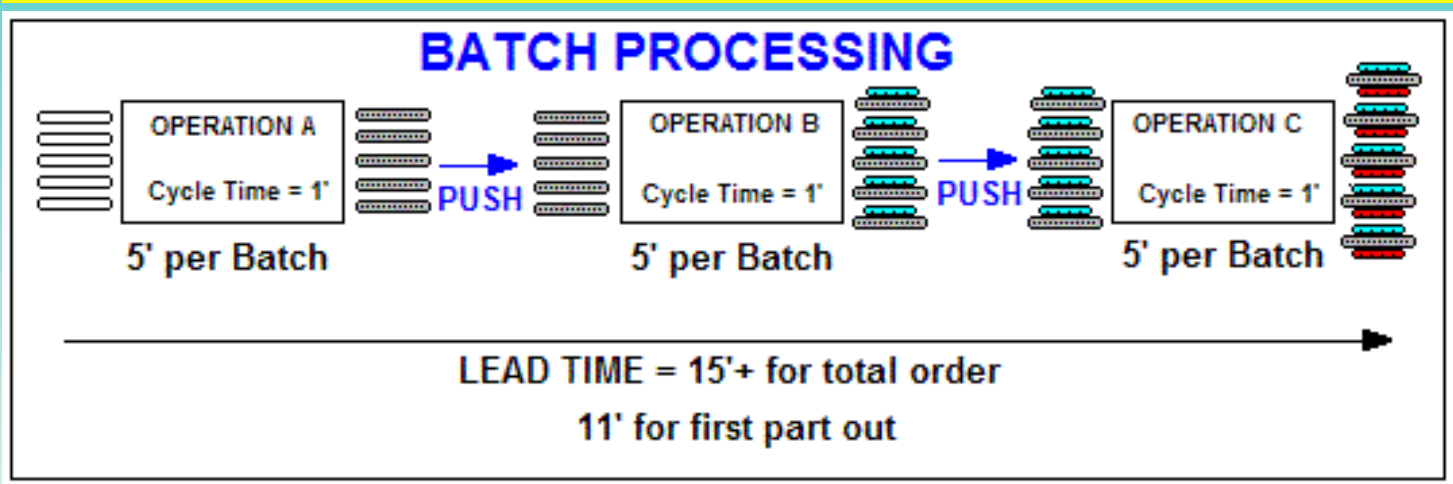
some definitions

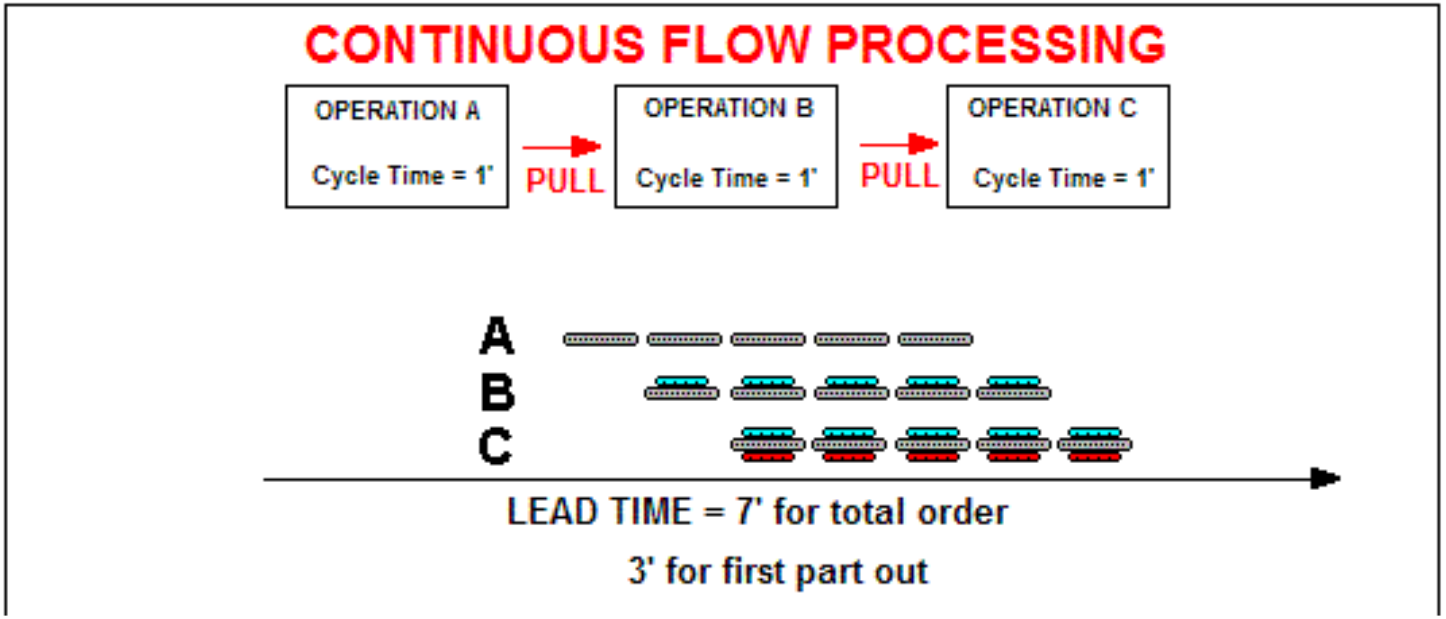
PUSH and PULL PRODUCTION METHODS

push	*pull*
	
Flow of information and flow of materials are different. (Required Volume Planning - Material Requirement Planning: MRP1 Manufacturing Resources Planning: MRP2)	Flow of information and flow of materials are parallel. Nothing takes place upstream unless something has taken place downstream.

the productive process in manufacturing

BATCH (PUSH) PRODUCTION vs.
CONTINUOUS FLOW (PULL) PRODUCTION





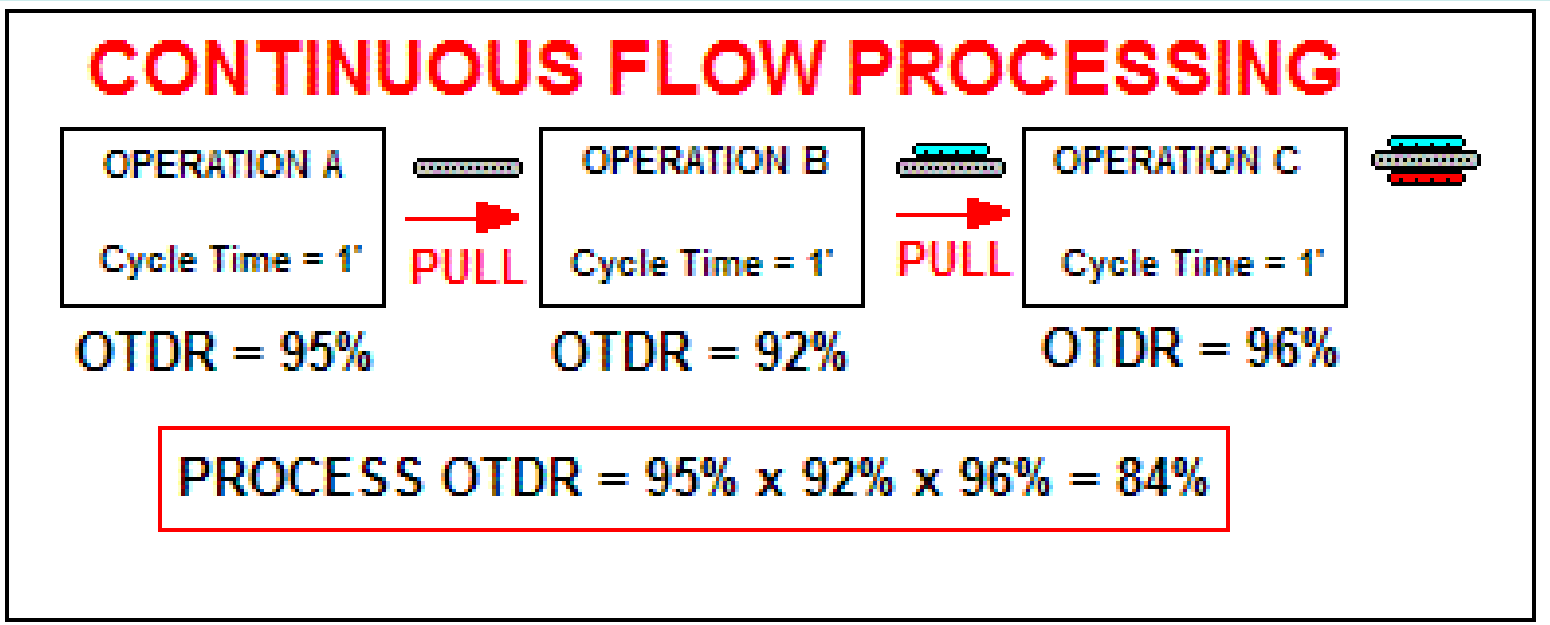
the productive process in manufacturing

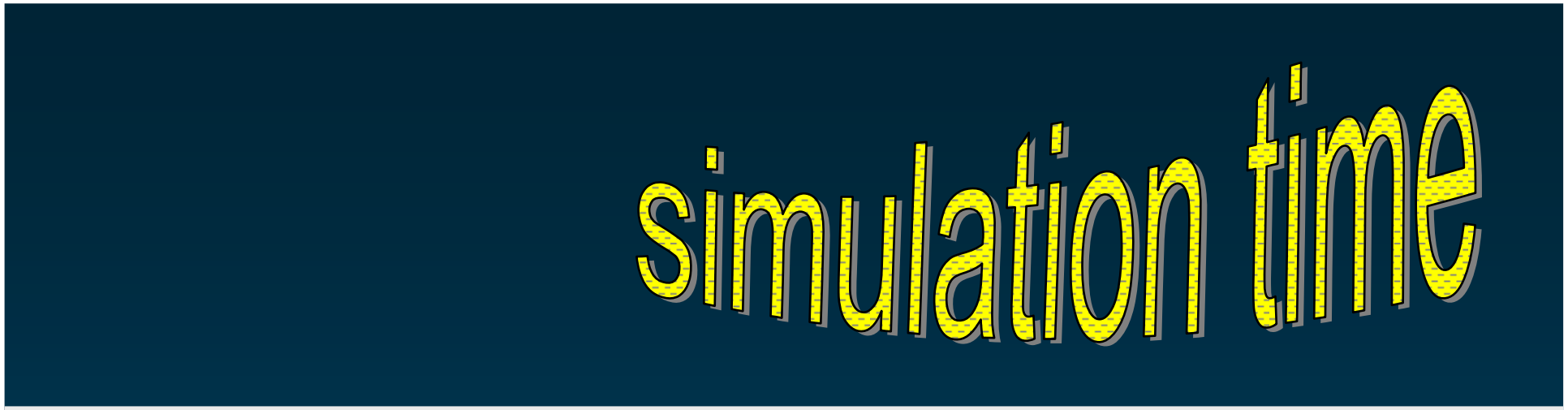
some definitions

ON-TIME DELIVERY RATE (OTDR)

Degree of **reliability** of any upstream operation to release in due time its output to a downstream operation.

A Flow System may compound problems and reduce considerably the overall process' OTDR unless the entire process is improved/streamlined:



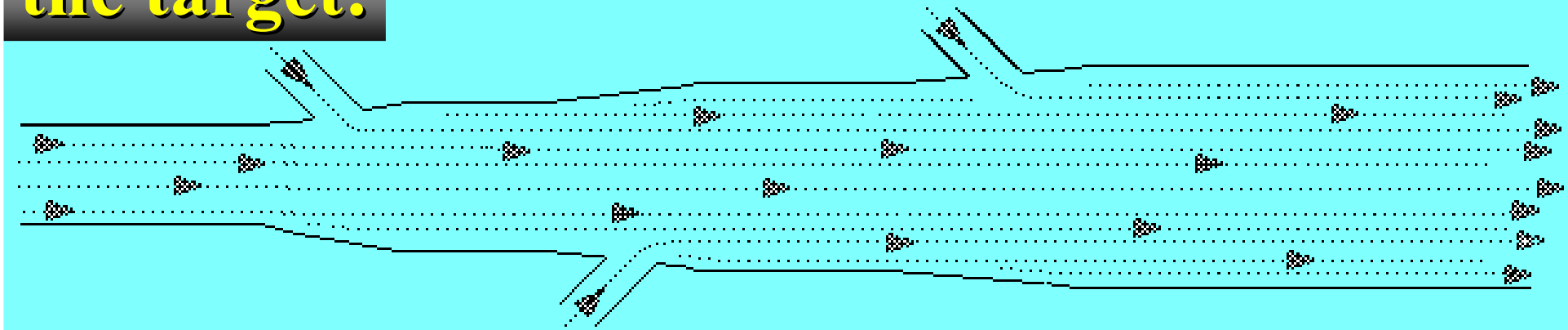


“batch production” vs. “one-piece flow”

LEAN MANUFACTURING and FLOW PRODUCTION

continuous flow

the target:

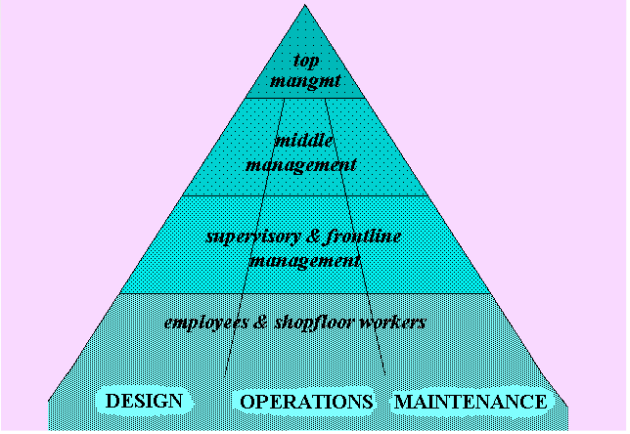


pipeline flow

HEAVY MECHANISATION / AUTOMATION
LEAN MANUFACTURING and TPM

TOTAL PRODUCTIVE MAINTENANCE

lean disciplines



THE 6 BIG LOSSES

TYPE	LOSS	FEATURES	TPM goal
INACTIVITY LOSSES	***BREAKDOWN LOSSES***	They cause: QUANTITY LOSSES (No production) QUALITY LOSSES (Defective production) *Sporadic or Chronic	0
	SET-UP & ADJUSTMENT LOSSES	Falling under AQCO Discipline * Chronic	Min.

THE 6 BIG LOSSES

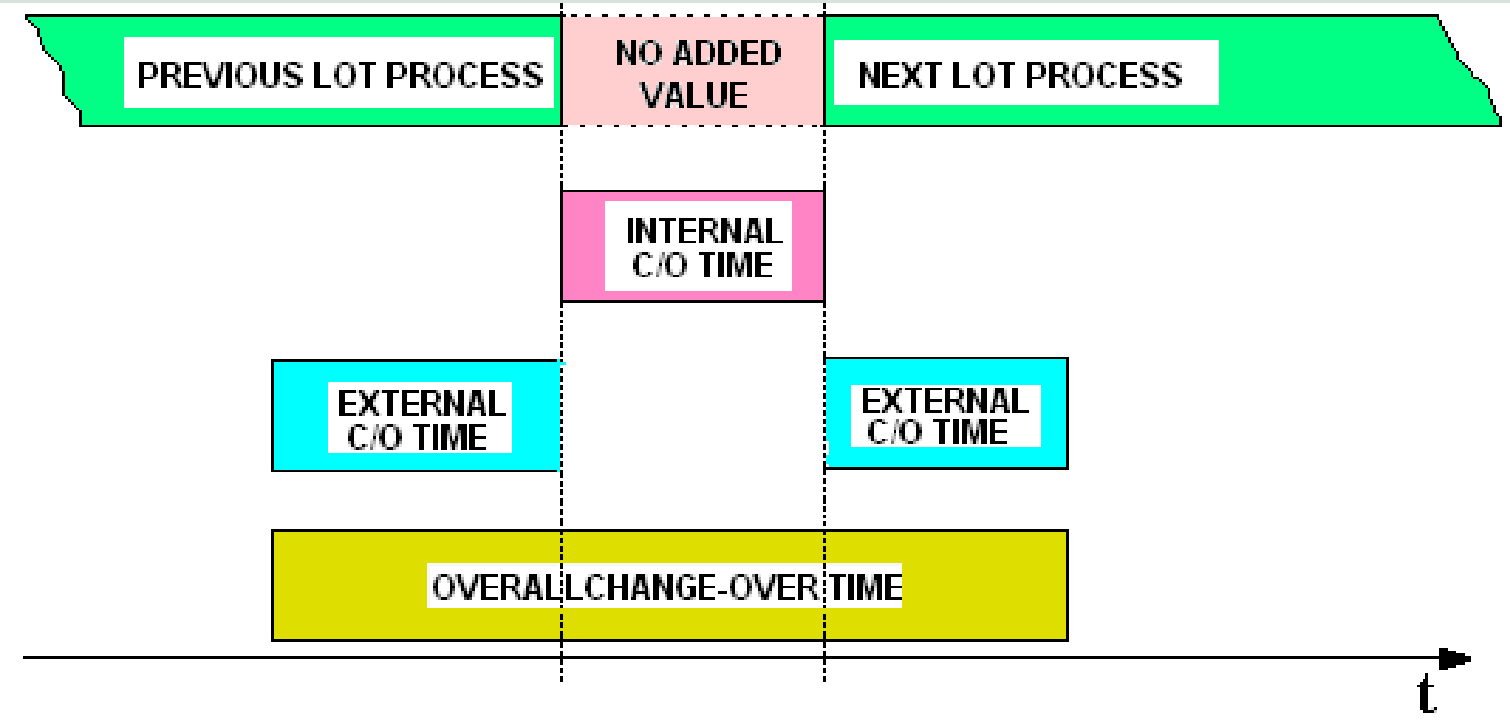
TYPE	LOSS	FEATURES	TPM goal
SPEED LOSSES	***IDLING & MINOR STOPPAGE LOSSES***	Difficult to quantify -----> often overlooked. They are temporary malfunctions, different from Breakdowns, because a "stopgap" remedial is normally easy (= removing the cause of idling or stoppage) * Normally Chronic	0
	REDUCED SPEED LOSSES	They take into account the difference between design or ideal speed and actual operating speed. Causes: mechanical problems, defective quality, history of past problems, fear of abusing the equipment..... Often, ideal speed is not even known. * Chronic	1st step: 0 2nd step: > design speed

THE 6 BIG LOSSES

TYPE	LOSS	FEATURES	TPM goal
DEFECTS	***QUALITY DEFECTS & RE-WORK***	Losses in quality of output product caused by malfunctioning equipment. When applicable, re-work losses should be included. * Sporadic or Chronic	+ - 0
LOSSES	***START-UP (YIELD) LOSSES***	Yield losses occurring during early stages of production, from machine start-up to stabilisation. They include "Trial Runs" losses. Yield losses are latent losses, often difficult to eliminate because of uncritical acceptance of their inevitability. * Normally Chronic	Min.

lean disciplines

ACHIEVING QUICK CHANGE-OVER



change-over time

= interval of time elapsed between production of last defect-free item (product, by-product, work-piece....) of previous lot, and first defect-free item of next lot

OBSOLETE, TRADITIONAL ASSUMPTIONS ON C/O

1. Changing-over efficiently and effectively requires a high level of knowledge and ability, which are the result of long training and experience

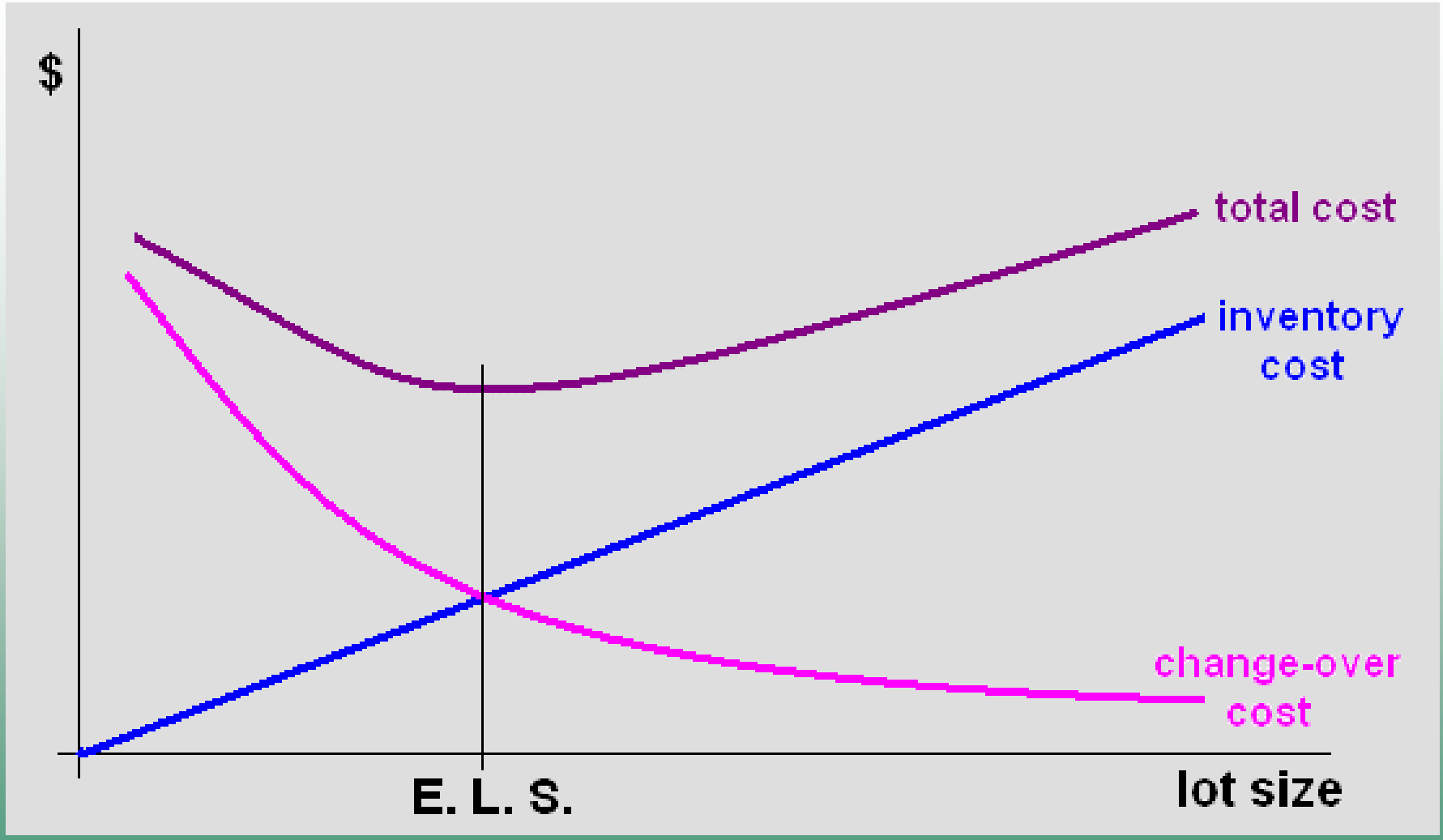
OBSOLETE, TRADITIONAL ASSUMPTIONS ON C/O

2. Producing in large lots mitigates the effects and counterbalances the costs of long c/o times

OBSOLETE, TRADITIONAL ASSUMPTIONS ON C/O

3. Producing with the criterion of "economic lot size" does also counterbalance the cost of (large) inventory, consequent to large-lot production

OBSOLETE, TRADITIONAL ASSUMPTIONS ON C/O



E.L.S. (ECONOMIC LOT SIZE) = E.O.Q. (ECONOMIC ORDER QUANTITY)

OBSOLETE, TRADITIONAL ASSUMPTIONS ON C/O

considerations

- increasing the size of a small lot brings a substantial improvement to the (unit) overall operation time - but with further lot size increases, the rate of improvement decreases
- the longer the set-up time, the more effective the benefits of increasing lot size
- in any case, with traditional approach to set-up activities, large-lot production apparently is the best method to reduce and even minimise the negative effects of set-up

OBSOLETE, TRADITIONAL ASSUMPTIONS ON C/O

common assumption: change-over time cannot be drastically reduced

BUT IT CAN !!

if a 3 hrs set-up time can be reduced to 3 minutes, producing in large lots would be meaningless

- **and days of limited product variety and large-scale mass production are gone forever ....!!**

MAIN TYPES OF CHANGE-OVER OPERATIONS

1. EXCHANGING DIES & BLADES: dies, moulds, drill bits, sawblades and other tools, silk-screening plates, etc. - also: cleaning and replacing filters (ex. in plastic extruders) and similar operations which cause a temporary halt to production.

2. CHANGING STANDARD PARAMETERS: in NC machines, dairy processes, chemical processes.....

3. "SWITCHOVER" or "RE-TOOLING":

in assembly lines - includes exchanging supplies of components and materials, assembly jigs and equipment, etc.

in certain machines – includes new material feed to machine (f.i. new rolls of paper in winders, or new rolls of paper/material/plastic films in printers, etc.

4. GENERAL SET-UP prior to manufacturing: arranging the equipment, assigning tasks, checking drawings & work schedules, etc.

4 BASIC STEPS IN THE CHANGE-OVER PROCESS

every set-up operation generally includes:

1. PREPARATION, CHECKING OF PARTS, TOOLS & MATERIALS, AND AFTER-PROCESS ACTIVITIES

2. REMOVING AND MOUNTING PARTS, DIES, TOOLS, MATERIALS.....

3. MEASUREMENTS, SETTINGS AND CALIBRATIONS

4. TRIAL RUNS AND ADJUSTEMENTS

movie time

effects of long set-ups

ACHIEVING QUICK CHANGE-OVER

today's classification of change-over operations

- **INTERNAL CHANGE-OVER OPERATIONS**
  Those that cannot be implemented unless the process is stopped
- **EXTERNAL CHANGE-OVER OPERATIONS**
  Those that can be implemented independently of the process
- **WASTE**
  Inessential operations (not necessary, or operations that could be avoided or eliminated) and wasteful operations inherent in the two classes above. Examples: waiting for a fork-lift, searching for jigs and tools, un-necessary adjustments.....

INTERNAL CHANGE-OVER TIME

Interval of time during which the productive process stops: this should be the real and proper change-over time, that begins when the current lot process finishes, and ends when the next lot process produces the 1st defect-free item.

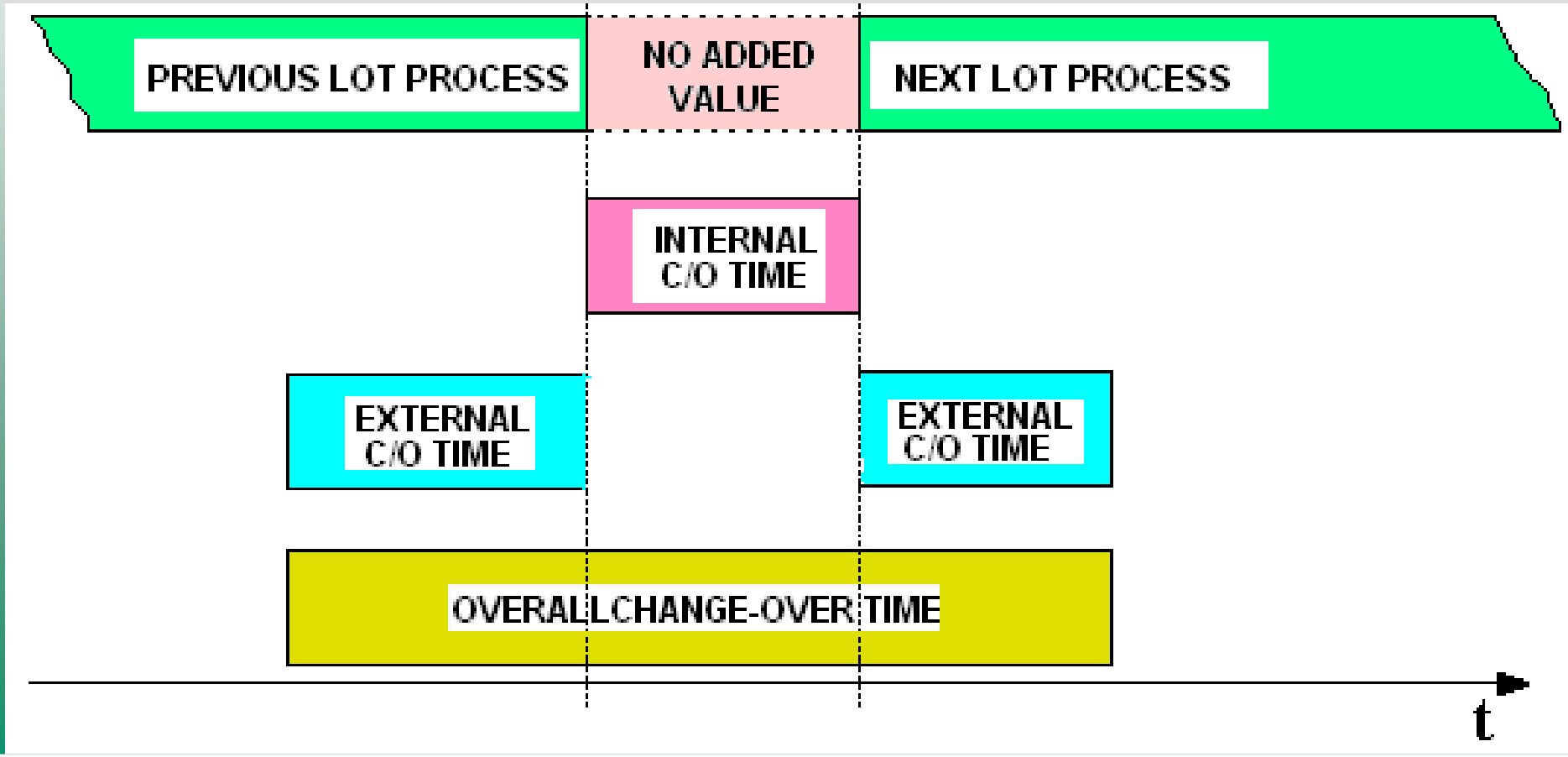
throughout this time no value is added to products

EXTERNAL CHANGE-OVER TIME

Interval of time during processing (of previous and next lot), during which change-over related activities (like transport, preparation, etc.) may and should be implemented by various personnel (fitters, workers, operators....).

part of this time may elapse before Internal Change-Over Time, and part after

OVERALL CHANGE-OVER TIME = Internal Change-Over Time + External Change-Over Time.

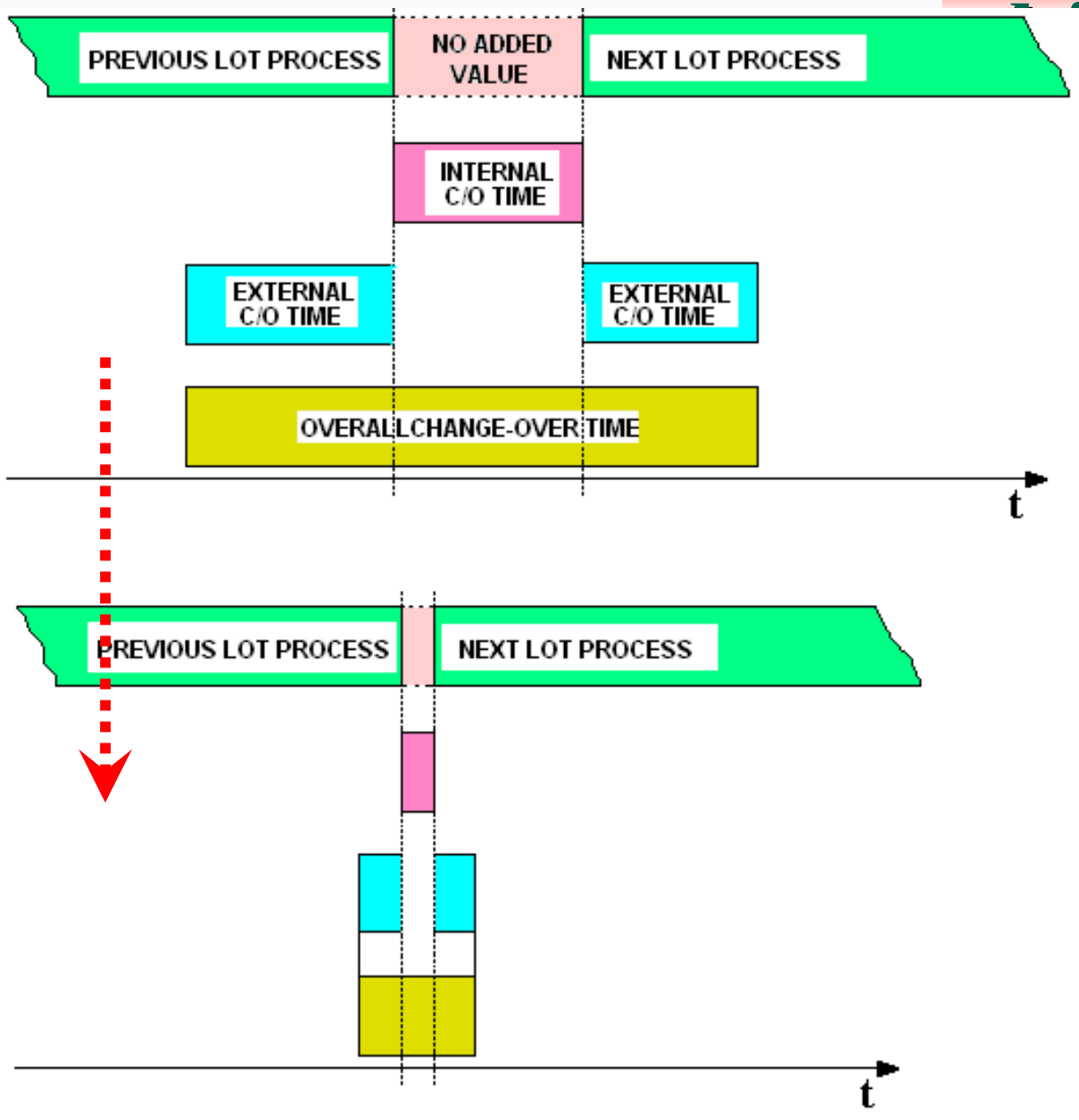


ACHIEVING QUICK CHANGE-OVER

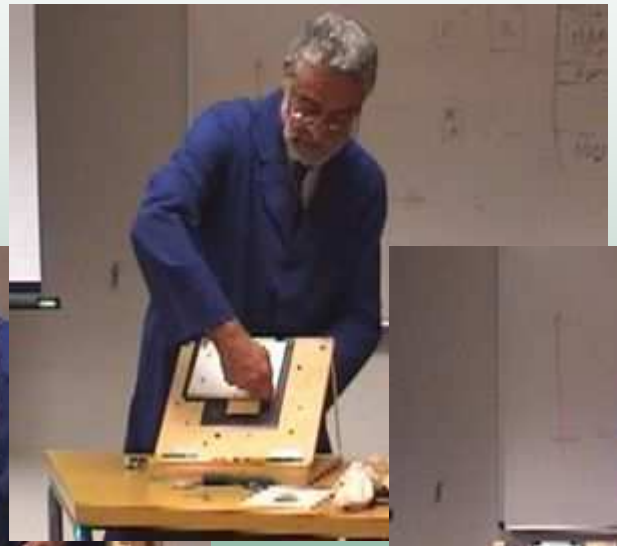
objectives

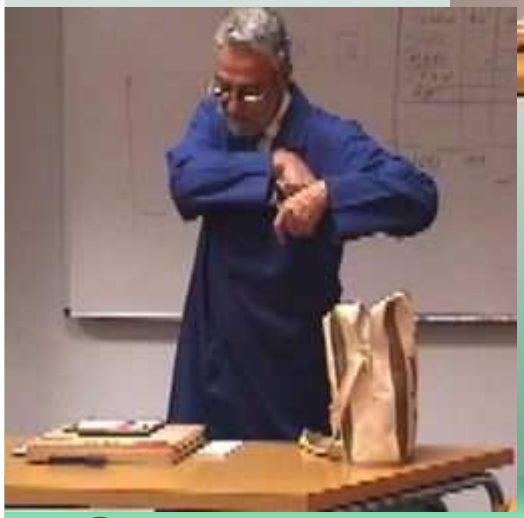
- eliminate waste
- make easy all c/o operations, so that they can be implemented by medium/low-skilled workers
- minimise time required for (essential) internal c/o activities
- eliminate/minimise adjustments
- streamline (essential) external c/o activities

ACHIEVING QUICK CHANGE-OVER



show time





flow production and quick change-over

the missing link...

Charlie Rev. 0
22 minutes

interactive exercise

traditional improvement vs. AQCO improvement

ACHIEVING QUICK CHANGE-OVER

Power Point Presentation by Carlo Scodanibbio

http://www.scodanibbio.com