
LEAN
MANUFACTURING

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WHAT IS LEAN?

LEAN PRINCIPLES

SOME FURTHER CONCEPTS

THE LEAN TOOLBOX

MANAGING CHANGE

WHAT IS LEAN?

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WHAT IS LEAN?

Lean is so much more than a tidy, clean, well organised shop floor.

Although many organisations don't take it any further.

Lean originated as the Toyota Production System for automotive manufacturing.

It is a very specific set of interlocking principles, practices, tools and behaviours.

Most of which are just common sense and good practice.

It focusses on VALUE as defined by the customer.

Everything else is classified as WASTE.

A Lean system produces what customers want,

when they want it.

LEAN….. How will an organisation benefit?

It will become truly customer focussed,

Cut costs and losses by removing wasteful processes,

Be more profitable,

Have a more engaged & empowered workforce at all levels,

...and its people will be working better, not harder and faster.

LEAN….. How will an organisation benefit?

It will become tru… ustomer… …ssed

Cut … …d lo… …s,

Be mor…

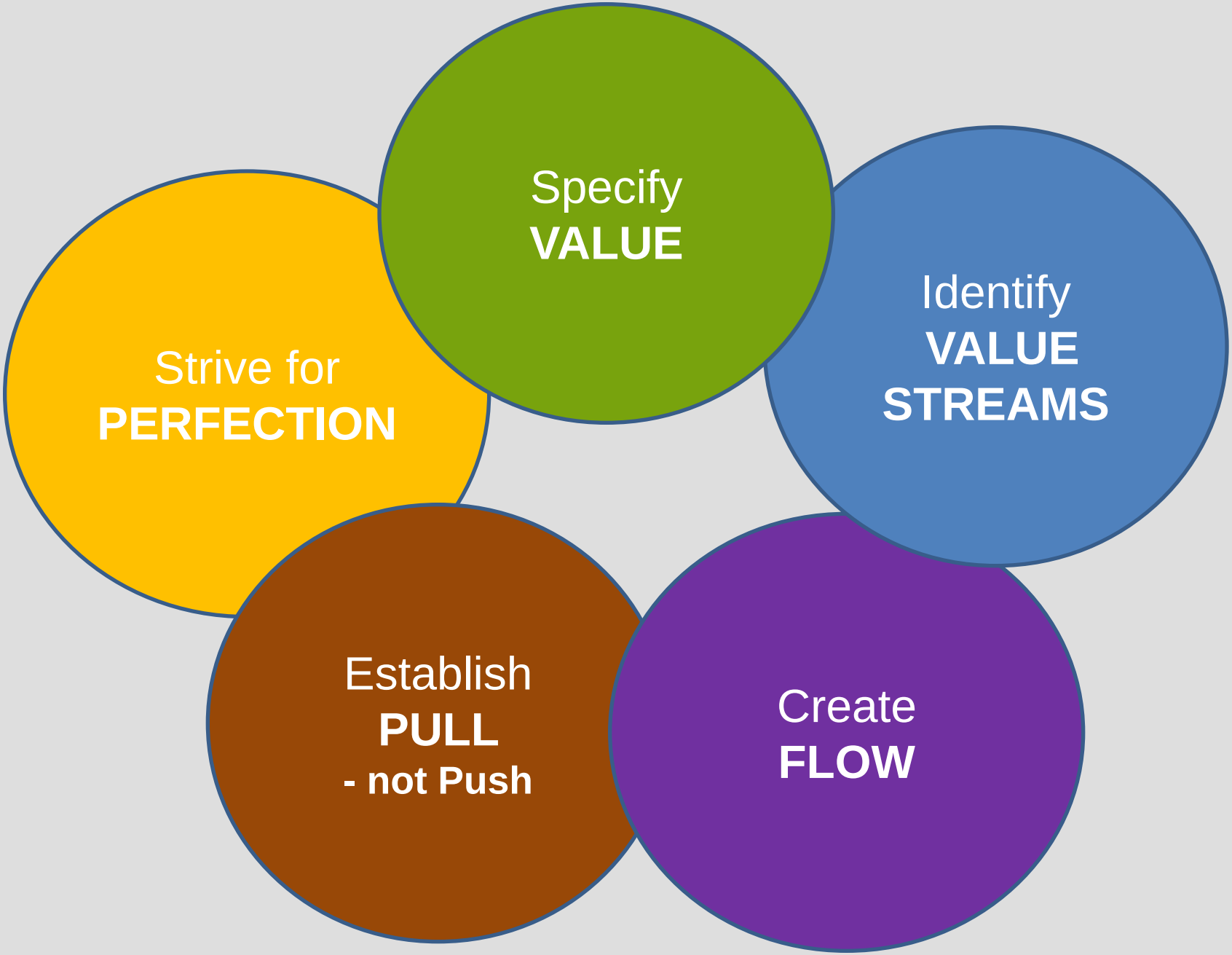
Hav… …evels,

…a… …d faster.

However, along the way there may well be angst, scepticism, resistance, hostility, fear, anger

……and maybe even tears!

THE 5 LEAN PRINCIPLES



Lean Principles…… VALUE

In Lean terms VALUE can only be defined by the customer.

A supplier or service provider must understand what the customer values.

Then it can supply the product or service for which The customer is paying :

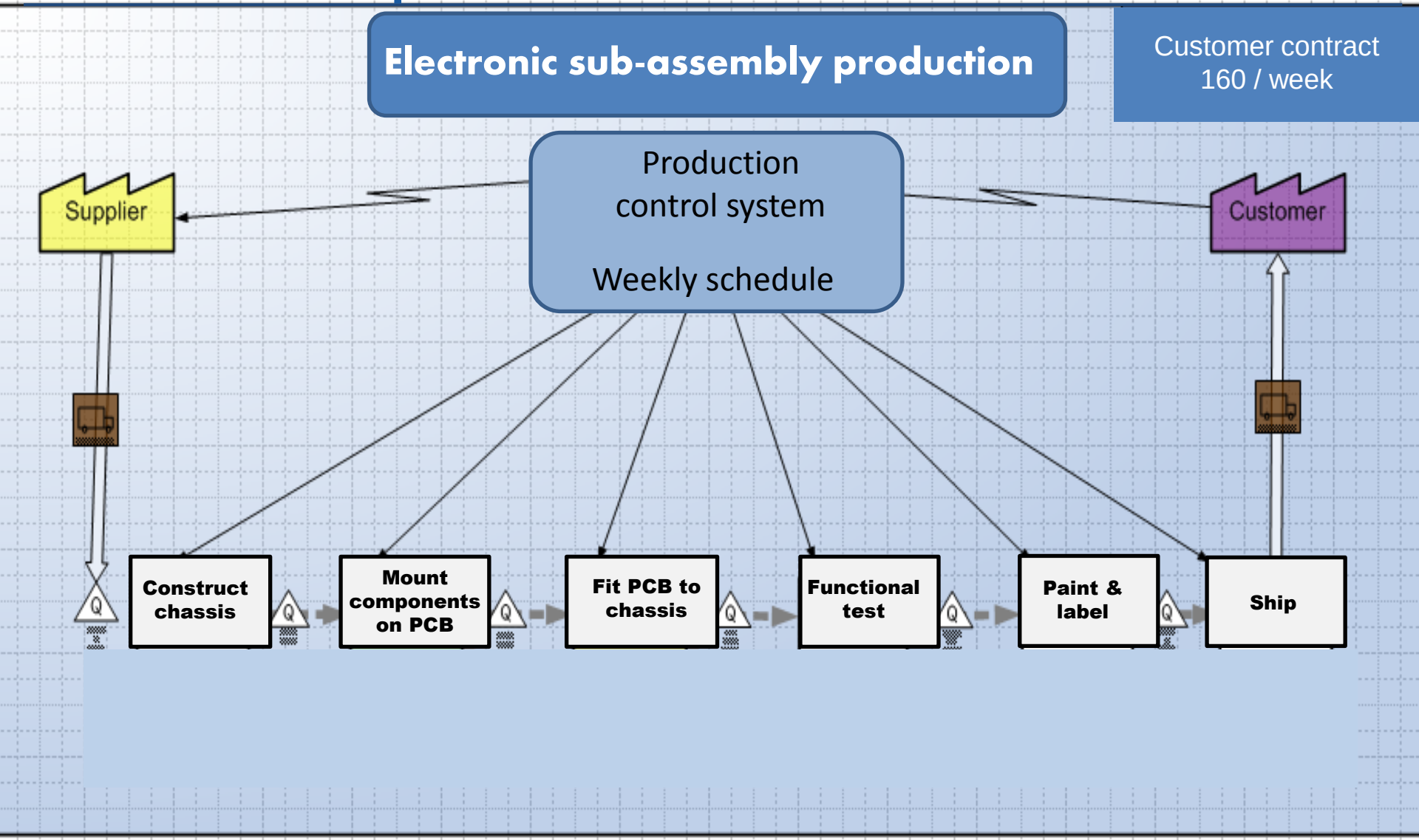
At the agreed price.

Delivered on time and in full.

To the customer's specification

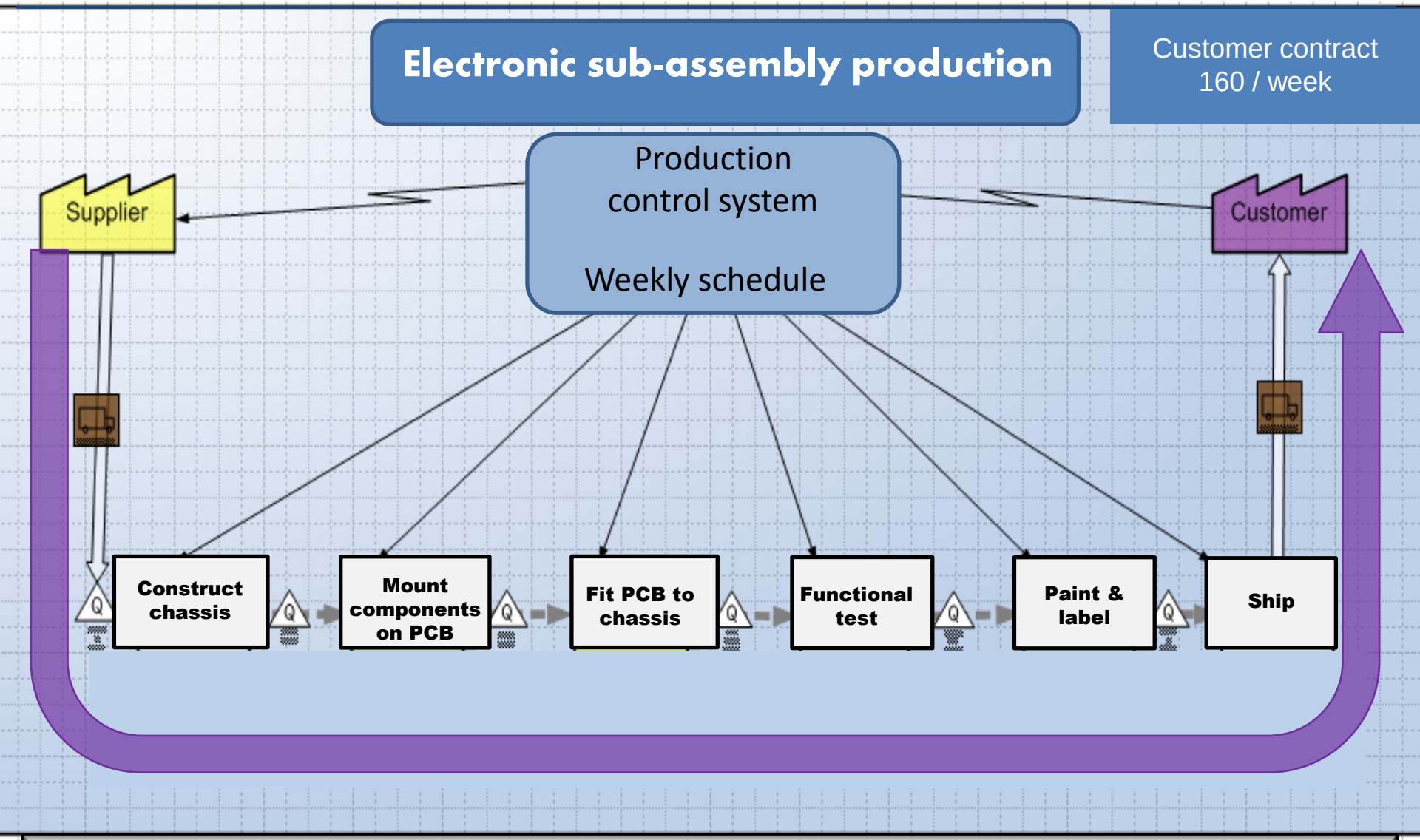
(*no more*…no less).

Lean Principles…… THE VALUE STREAM



THE VALUE STREAM : The key activities involved in the provision of a product or service.

Lean Principles…… FLOW



FLOW : The progress of the product along the Value Stream.

Lean Principles…… FLOW

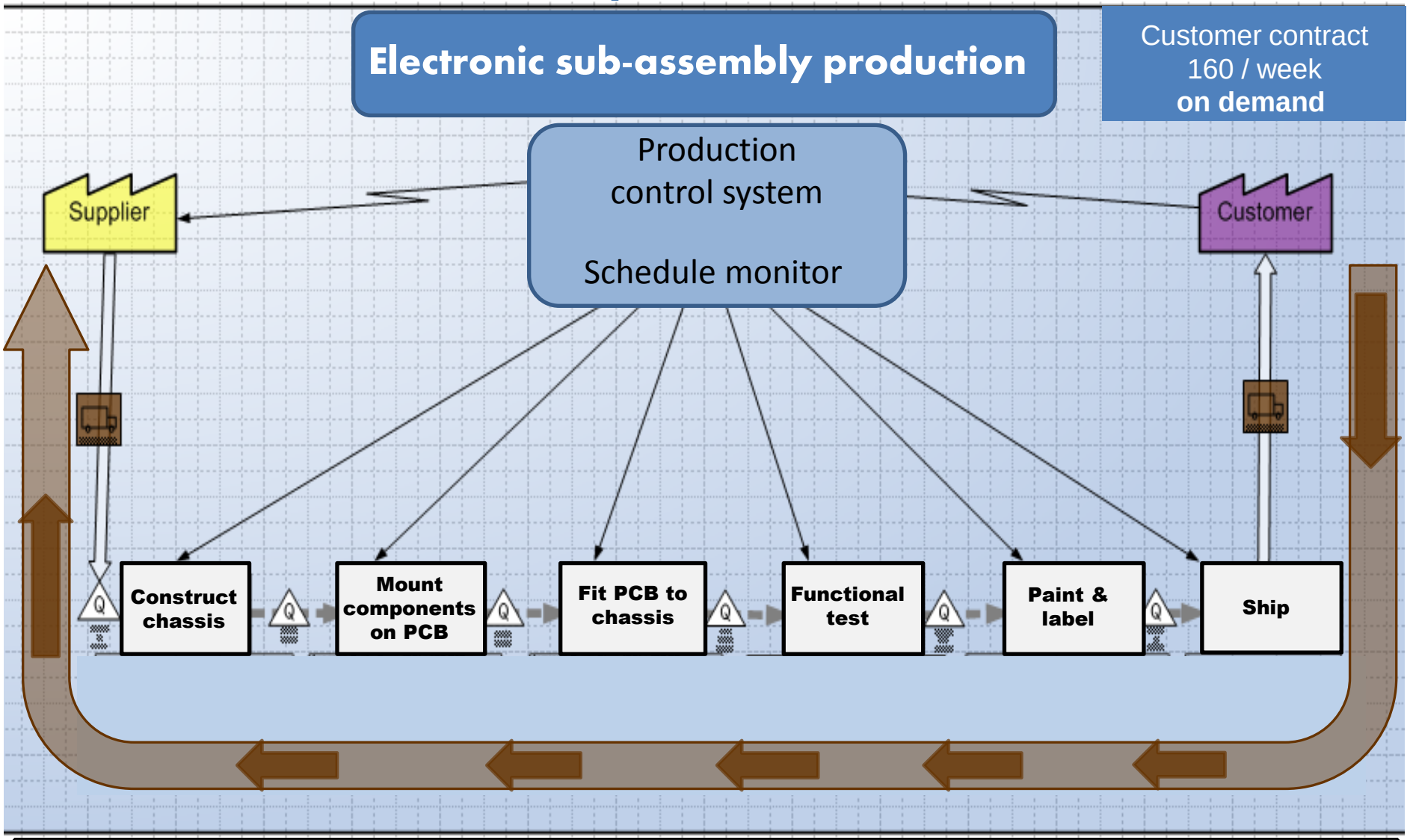
Henry Ford

1908 : Manufacture of Model T

1913 : Introduction of rolling production lines

FLOW : **The progress of the product along the Value Stream.**

Lean Principles……PULL



PULL : The demand system.
Everything is PULLED by the customer.

Lean Principles……PULL

1975 : Toyota Production System TPS

Taiichi Ohno

A ‘pulled’ manufacturing system

incorporating Just in Time.

PULL : The demand system.
Everything is PULLED by the customer.

Lean Principles……PULL

Just In Time (JIT)

Parts are delivered to points on the Value Stream *just in time* for use.

In a ‘pushed’ system the delivery is to a pre-arranged schedule.

In a Lean ‘pulled’ system the parts are delivered *just in time*,

……. but only on demand.

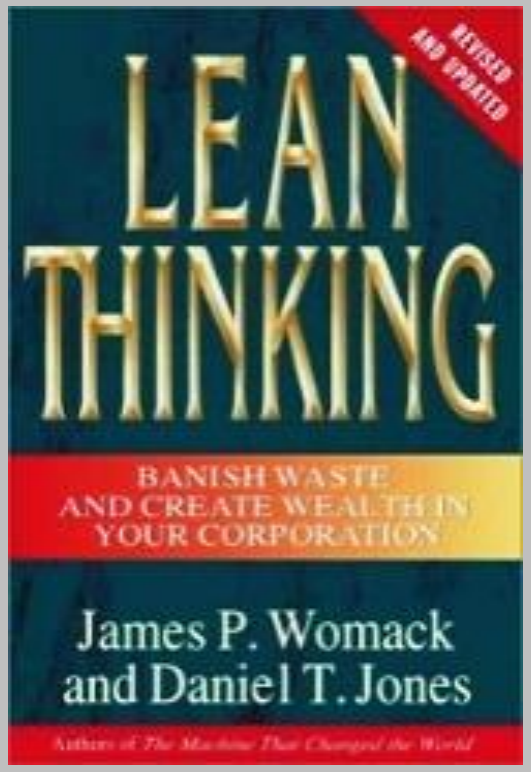
PULL : The demand system.
Everything is PULLED by the customer.

Lean Principles……PERFECTION

KAIZEN

Constantly look for ways to improve.

1996 : USA – Womack & Jones



Lean……Some further concepts

Value Added / Non-Value Added

The 7 Lean Wastes

Value Added / Non-Value Added

Activities in a process are only **'Value Added'** if they directly increase the value of the product (or service) to the customer.

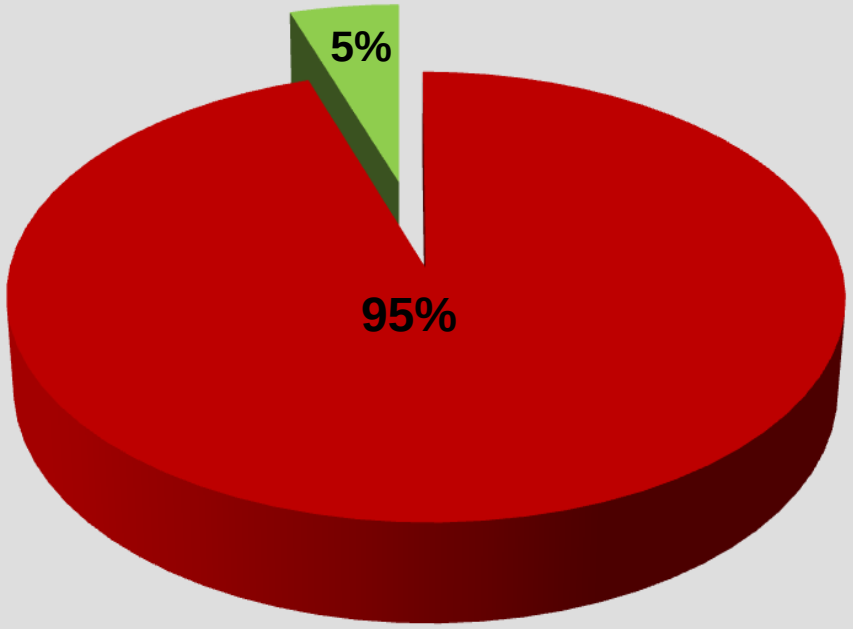
This is what the customer is paying for.

Everything else is **'Non-Value Added'** or **Waste**

Typically :

V.A. **5%**

N.V.A. **95%**



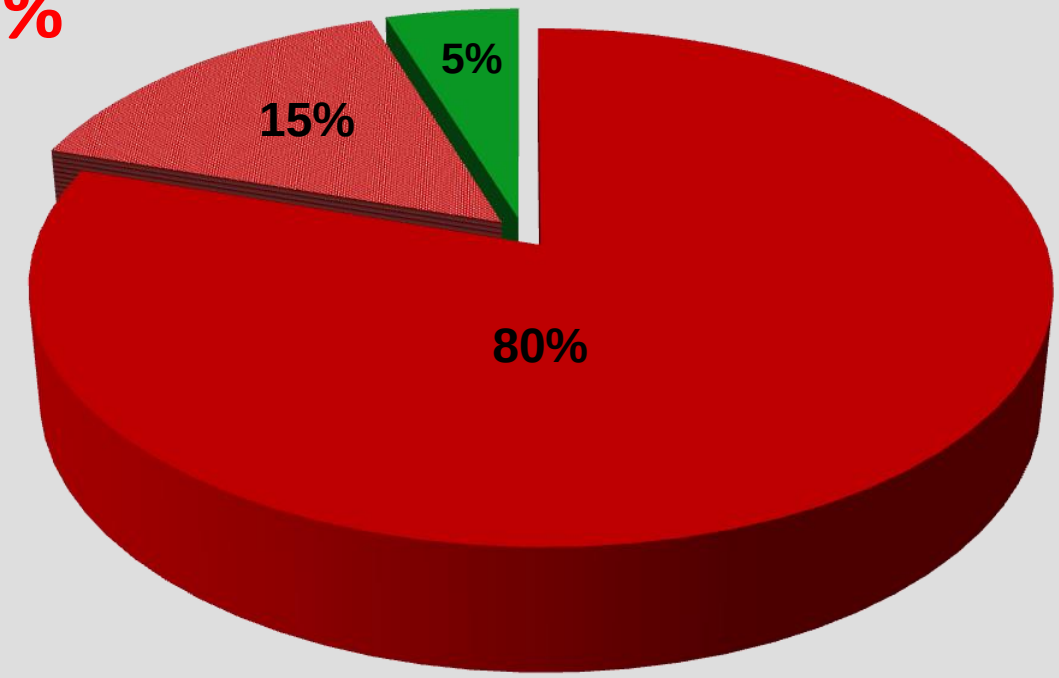
Value Added / Non-Value Added

In practice some N.V.A activities are essential for maintaining the viability of the operation.

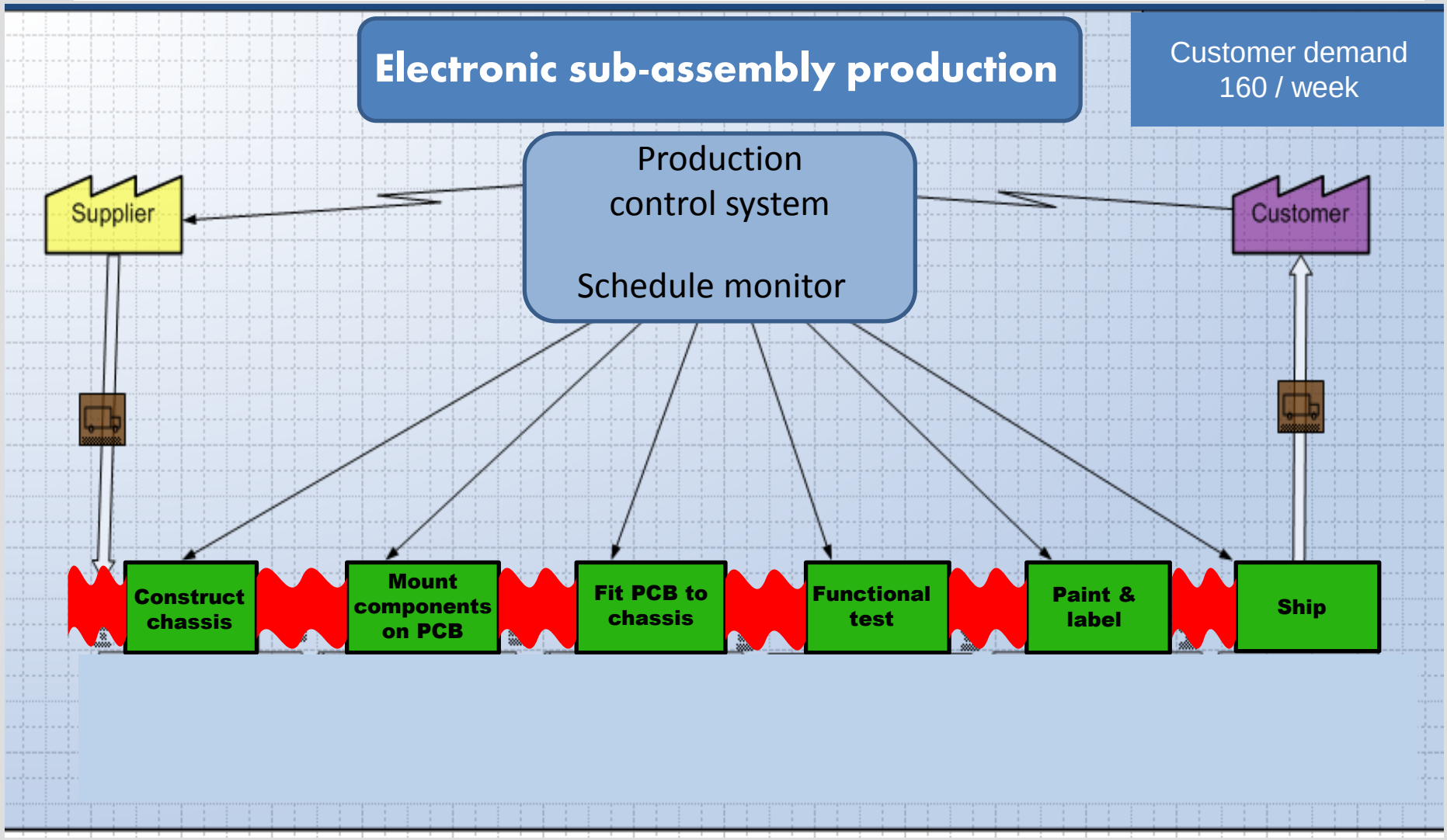
V.A. 5%

(Essential) **N.V.A. 15%**

N.V.A. 80%

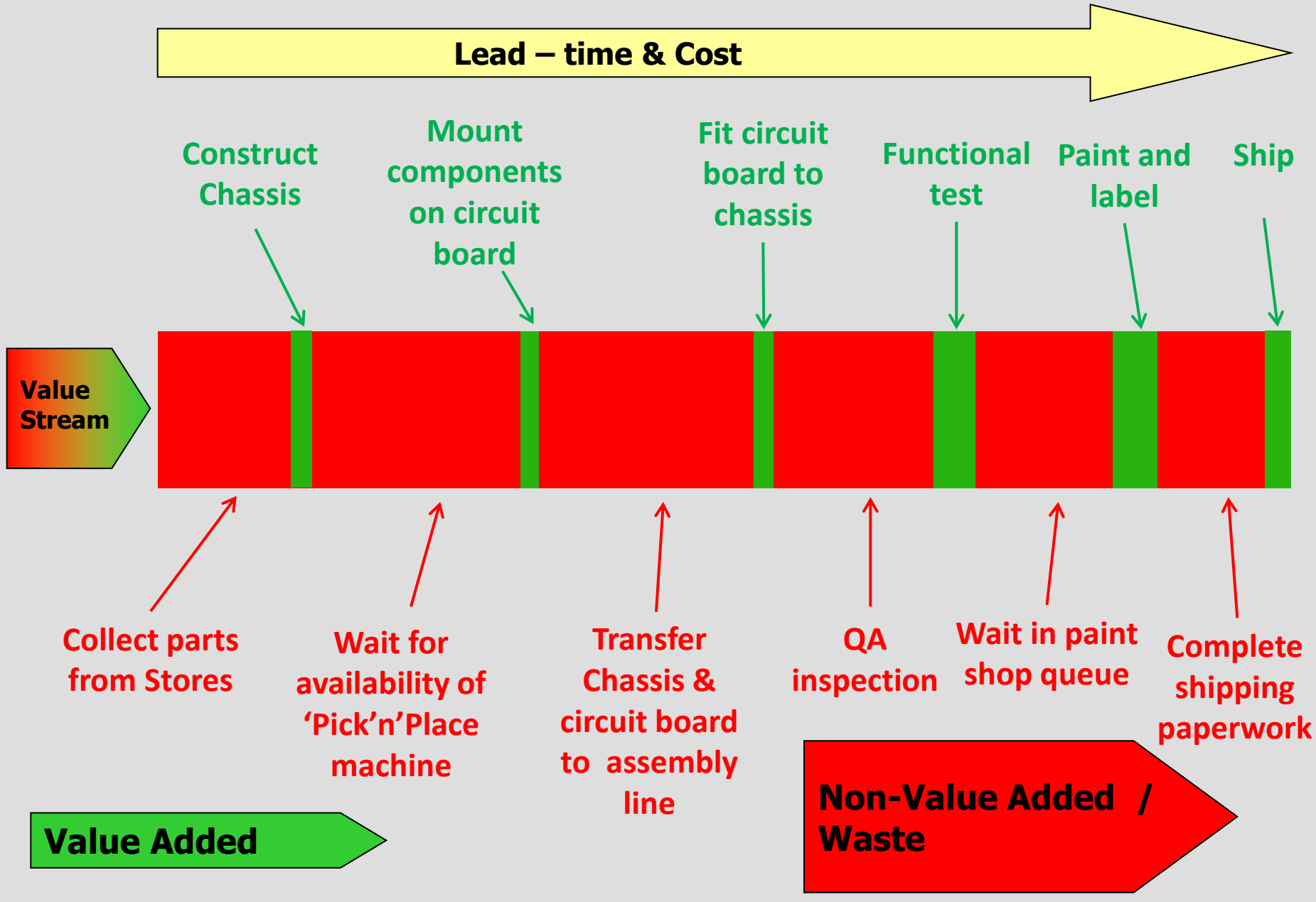


VALUE ADDED NON–VALUE ADDED

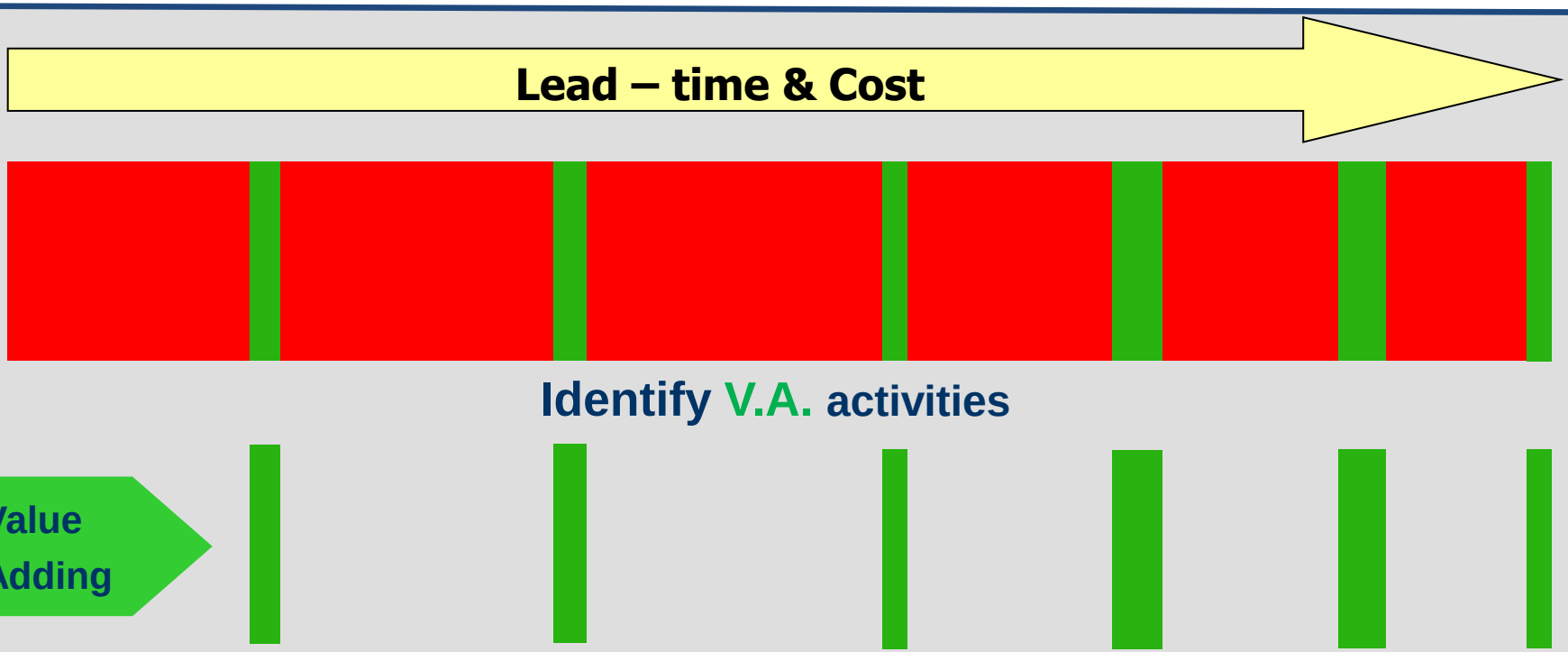


VALUE ADDED

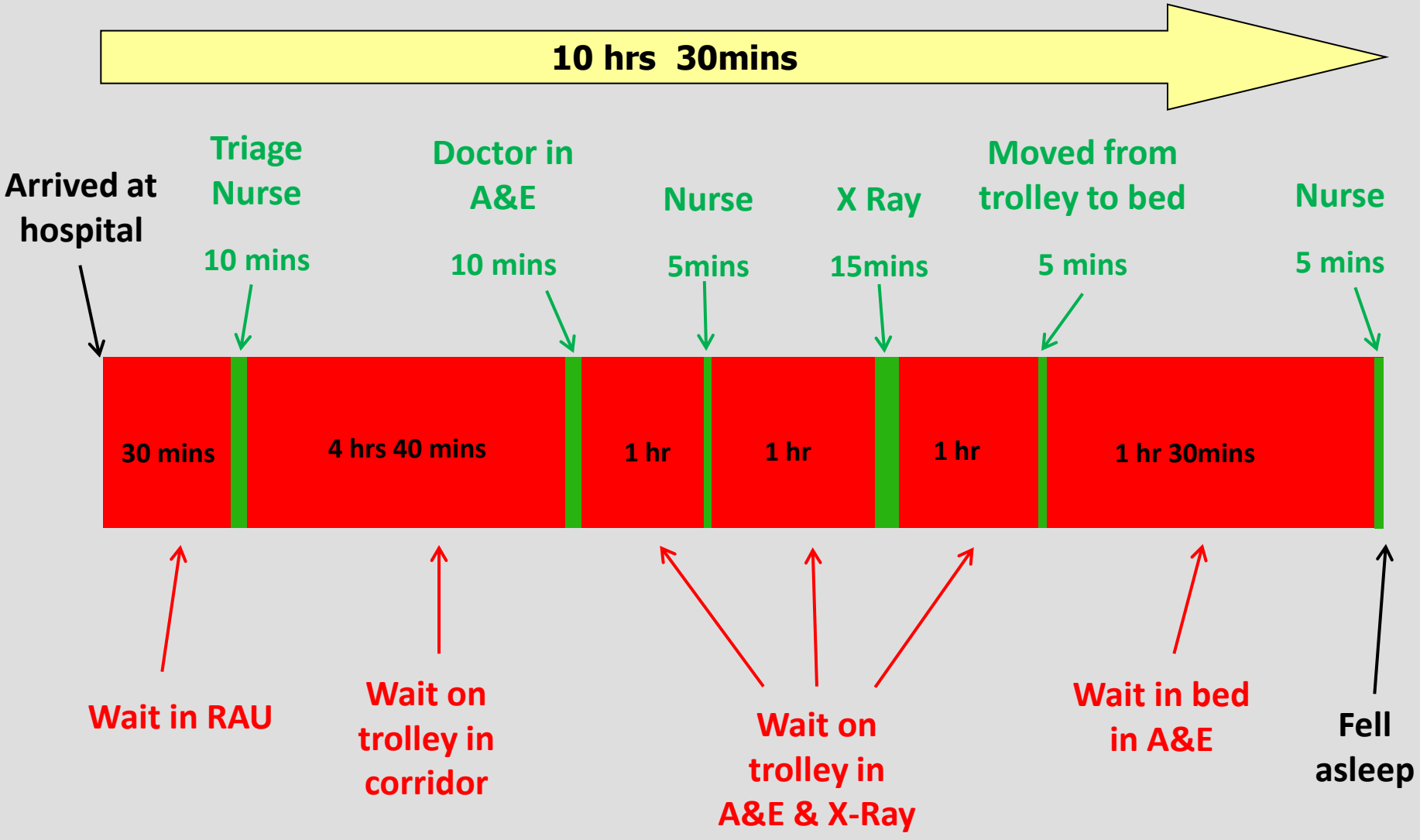
NON-VALUE ADDED


VALUE ADDED
NON–VALUE ADDED
Lead – time & Cost
Construct Chassis
Mount components on circuit board
Fit circuit board to chassis
Functional test
Paint and label
Ship
Value Stream
Collect parts from Stores
Wait for availability of 'Pick'n'Place machine
Transfer Chassis & circuit board to assembly line
QA inspection
Wait in paint shop queue
Complete shipping paperwork
Value Added
Non-Value Added / Waste

Reducing Lead time



V.A. / N.V.A. A&E example



Patient's perception of V.A. = 50mins = 7.9%

LEAN The 7 Wastes

Transportation

Defects

Inventory

Motion

Overproduction

Over processing

Waiting

LEAN The 7 Wastes

The Lean Toolbox

Workplace organisation / The Visual Workplace

Process mapping

Setup time reduction…….Quick changeover

Error Proofing

Line balancing

Workplace Organisation (5S)

5S comes directly from the Toyota Production System

Seiri Seiton Seiso Seiketsu Shitsuke

整理・整頓・清掃・清潔・躾

SORT

SET

SHINE

STANDARDISE

SUSTAIN

Workplace Organisation (5S)

1 SORT - Clear out rubbish & unwanted items.

2 SET - Organise equipment, documentation, machinery etc.

3 SHINE - Make the workplace professional looking.

4 STANDARDISE – Establish common working practices.

5 SUSTAIN – Resist the temptation to fall back into old ways.

Workplace Organisation (5S)

"Tidiness is in the eye of the beholder."

5S / Visual Workplace

5S / Visual Workplace….. Shadow board

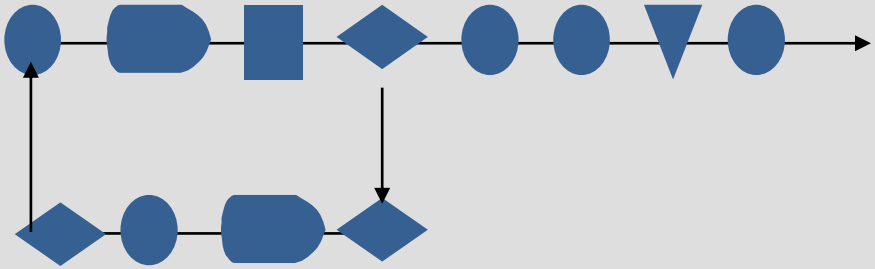
5S / Visual Workplace….. Floor markers

5S / Visual Workplace…….. Too Far ?

Process mapping

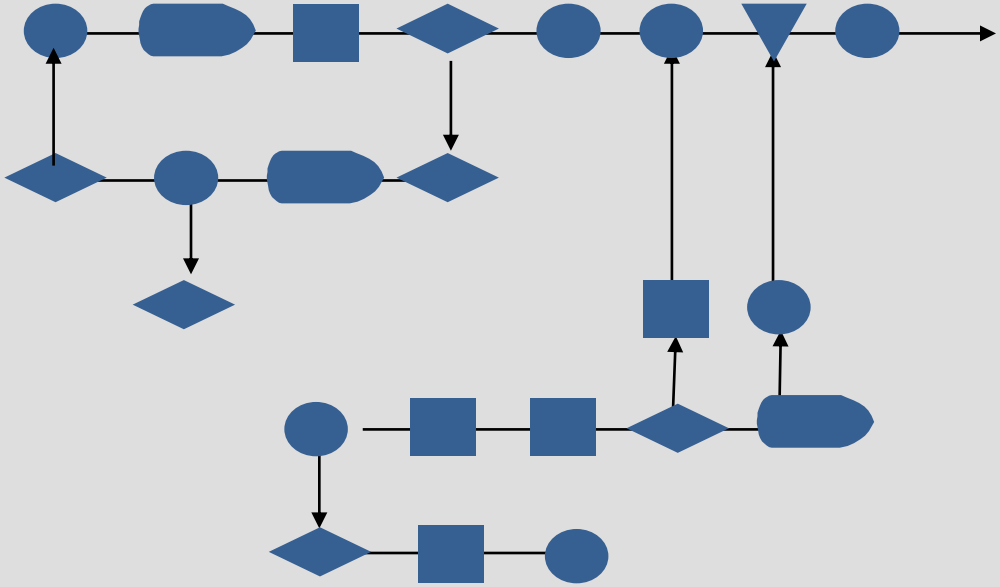
Any Process Has at Least 3 Versions.

1 - What you ***THINK*** it is.



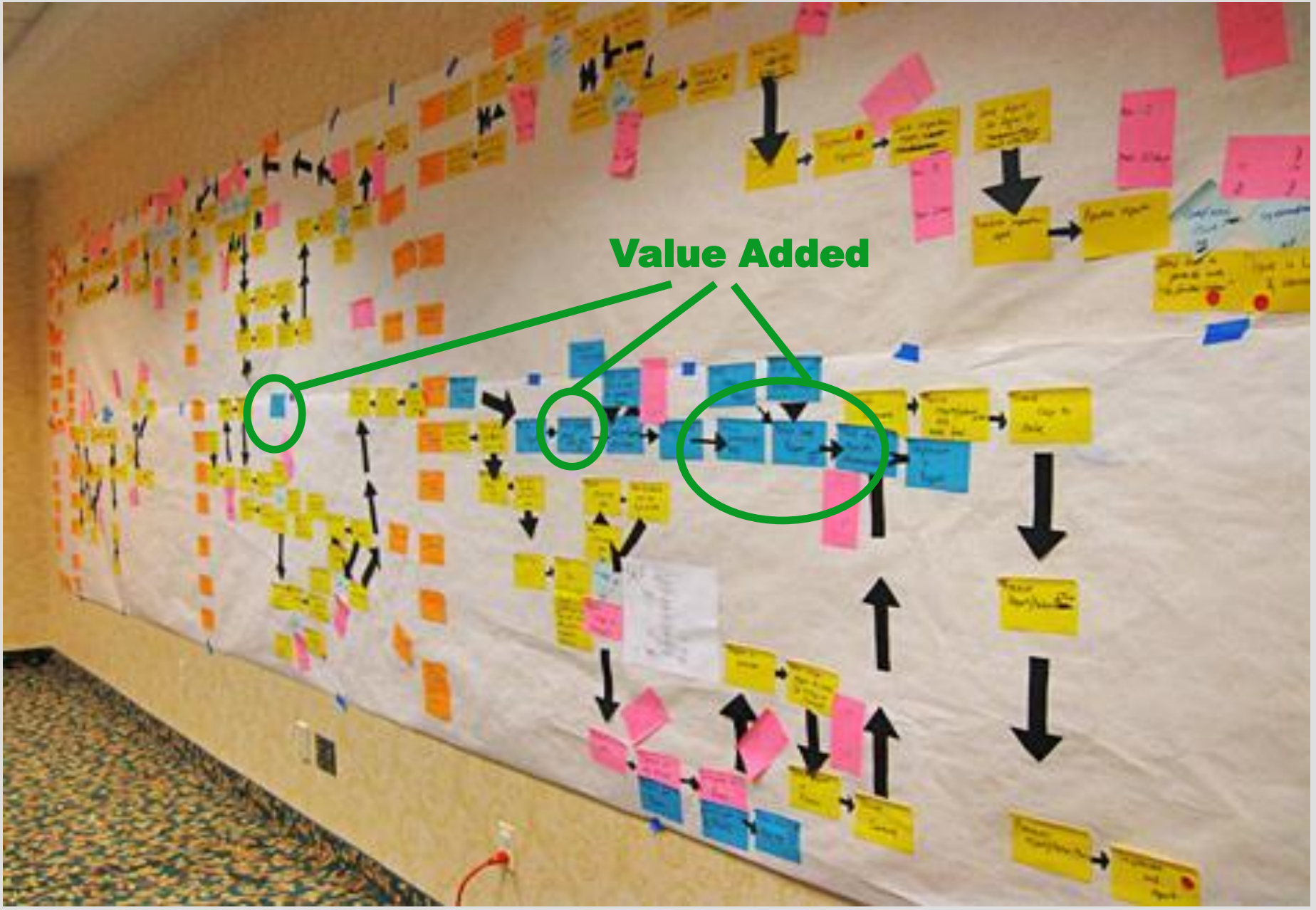
3 - What it ***SHOULD*** be.

2 - What it ***ACTUALLY*** is.



Process mapping

Process mapping



Process mapping

Process mapping

THE ORIGINAL PROCESS - Current State

THE NEW PROCESS

Future State

Setup time reduction…….Quick Changeover

Setup time is non-Value Added so should be minimised.

Optimise loading and unloading of machines , assembly jigs etc in a value stream.

Use adaptors and interfaces to enable quick changeover between different product types.

Use quick changeover fixings such as wing nuts and quick-release clamps.

Quick Changeover……. example

Before
Washers, bolts, Allen keys

Changeover time 6 minutes

After
Twist and lock quick-release clamp

Changeover time 1 minute

Error Proofing

Make errors an impossibility……Reducing Risk

Make it physically impossible to perform a process incorrectly.

eg :

Use non-symmetrical guide rails, different sized dowel pins etc.

This ensures that items can only fit into assembly jigs and test benches correctly.

Error Proofing

Make errors an impossibility……Reducing Risk

Make it physic **ncorrectly.**

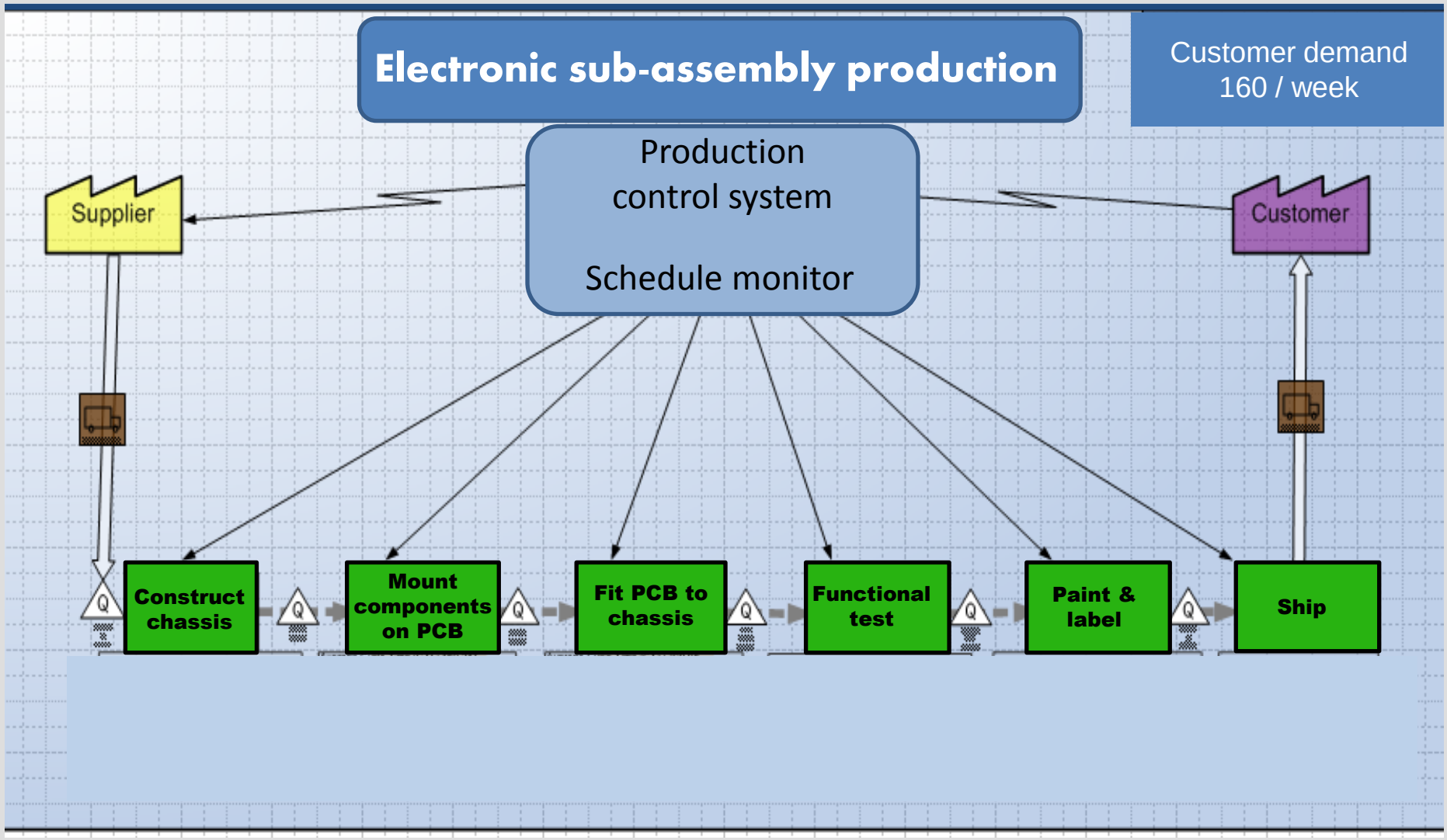
eg :

Use non-symm **vel pins etc.**

This ensures t **s and test benches corre**

Error Proofing

LINE BALANCING



LINE BALANCING

Takt Time – the ‘drumbeat’ of the facility

(Derived from the German *taktzeit* : cycle time)

$$\textbf{Takt Time} = \frac{\textbf{Available working time}}{\textbf{Customer demand rate}}$$

Available daily working time = 8hrs

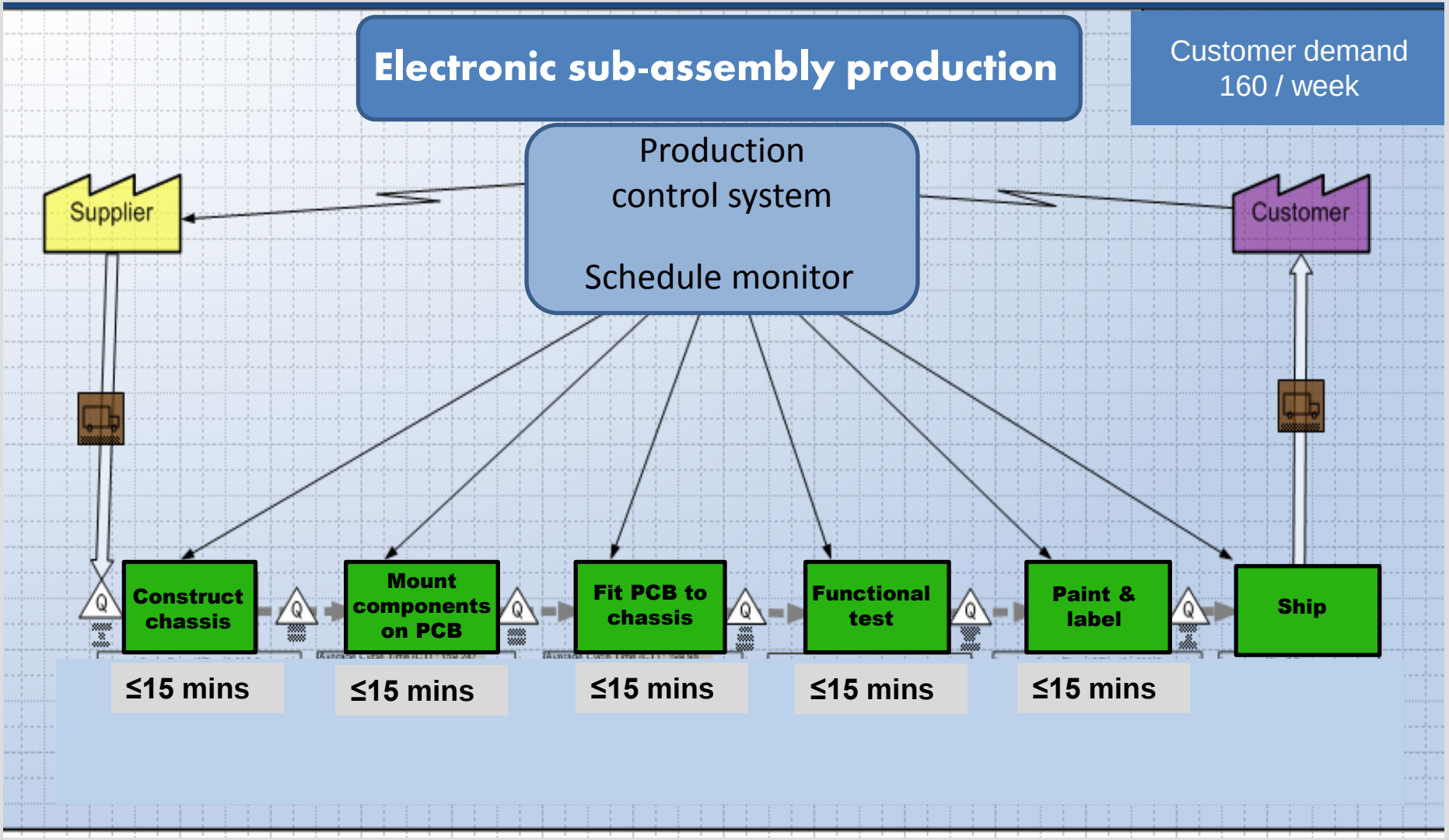
Weekly output requirement = 160 units

Daily output requirement = 32 units

Takt Time = 8 **/** 32 = **0.25hr**

= **15 mins**

LINE BALANCING



Time at each work station = 15mins (max)

Managing Change……the people

Directors & senior management :

They must believe it's the right thing to do…make the decision.

Commit resources….money…people's time.

Middle management :

Manage the staff…work with improvement practioners.

Be prepared to listen to ideas from their teams.

Be prepared to delegate.

The workforce :

Use the opportunity to input ideas.

Enjoy putting right those things that have niggled for years.

"Stop moaning…… get involved".

Lean…….Managing Change….How?

By Diktat

“You’re going to improve”

Not much actually happens

Lean…….Managing Change….How?

Bring in teams of external improvement consultants

They make all the required changes and set up new systems.

Impose the systems and train the workforce to use them.

They then withdraw.

Improvements adopted half-heartedly…… and fade away

Lean…….Managing Change….How?

Create Lean Improvement teams

Involve the whole workforce in improvements.

Convince everyone of the benefits.

Provide companywide Lean training.

Users of systems identify any improvements and changes, and then put them in place themselves.

Improvements and changes are maintained.

Managing Change……the challenge

Scepticism….. **“Yet another initiative……**
we’ve seen it all before”.

Fear of change….. **“I’ve always done the job this way**
so why is it wrong now?”

“Just another way of cutting jobs”

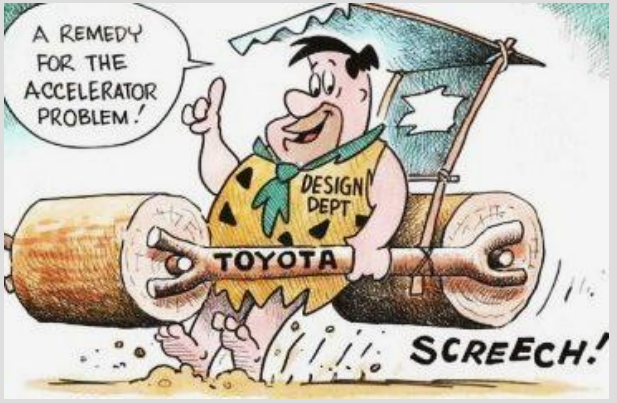
Opposition & hostility……. “It’s a load of cr#p !”

“I am NOT cooperating!”

Blame Culture…. “If I suggest something and it
goes wrong I’ll be in big trouble”.

Surprises…….

LEAN……..HEALTH WARNING!



Lean is a means to an end… …….not an end in itself.

Lean Manufacturing