Product Lifecycle Management

Year 2023/2024

Prof. Monica Rossi

monica.rossi@polimi.it

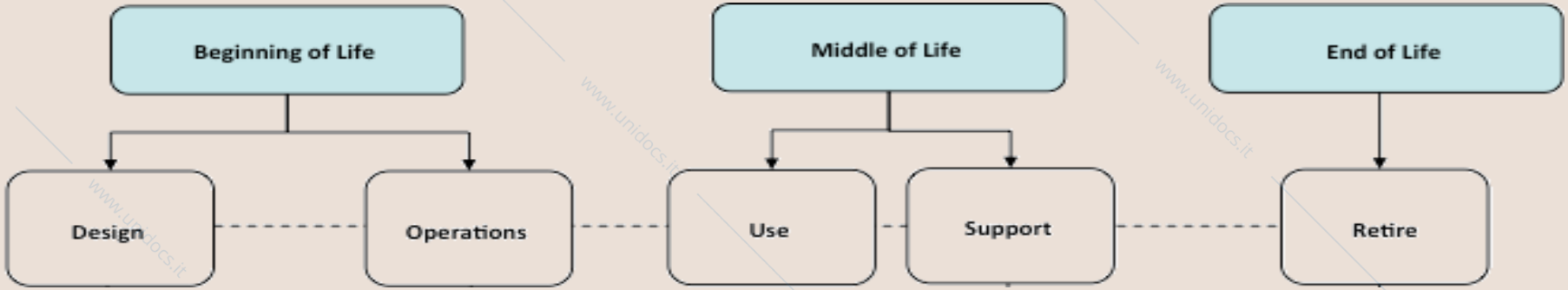
Lecture 03 – Lean Product & Process Development

POLITECNICO
MILANO 1863

SCHOOL OF MANAGEMENT

MAP OF CONTENTS

The subject: **Product Life Cycle Management**



Intro

Life cycle thinking.

Innovation, New Product Development Process and Concurrent Engineering

Lean Product and Process Development

You are here!

Front-End

QFD

VA/VE

Prototyping

Design Methods

Process Mapping

Collaborative Platforms + PLM & Beyond

PLM Implementation

PLM Evaluation

The teaching: **Structure of Lectures**

Supporting Material

Lecture 03 – Lean Product Development	
Slides (available at WeBeep)	*Lecture_03_Lean_Product_Development*
Additional reading (available at WeBeep)	Lean_Product_Process_Development_2017 (Lean Product and Process Development By Monica Rossi, Jim Morgan, John Shook. Chapter Six in The Routledge Companion to Lean Management, Torbjørn Netland and Daryl Powell, editors.)

Lecture Overview

Introduction to Lean Product and Process Development

i. Creating **Value**
ii. Value as **Knowledge** and **Learning**
iii. Sociotechnical **System**

What Is Lean Thinking?

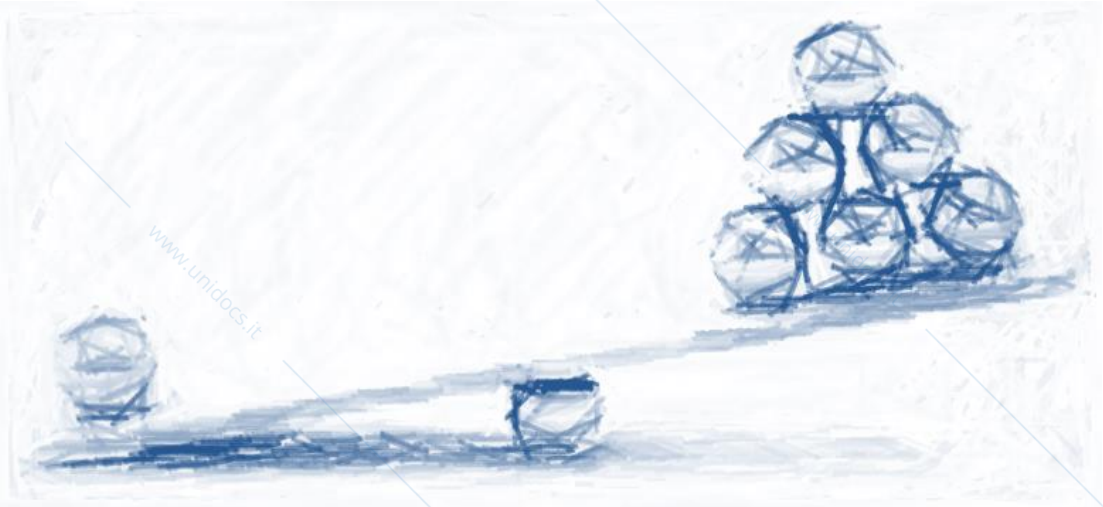
The main definition is:

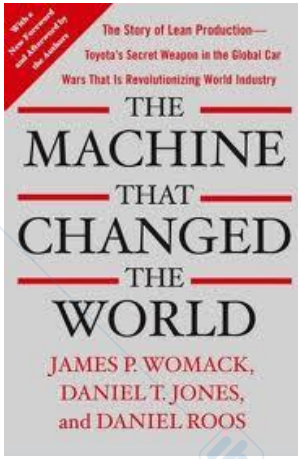
"Creating more value for customer, with fewer resources"

that is "Doing more, with Less".

Womack, Jones and Roos

The Machine that changed the World, 1990





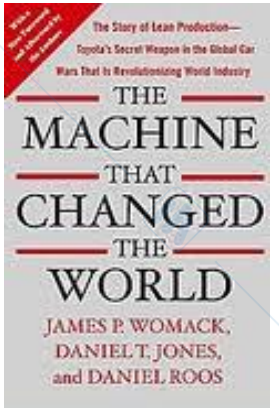
Lean Thinking, definitions

From waste reduction…

…to value creation

"Doing more with less"

[J. Womack *et al.*, The Machine that changed the World, 1990]



"Lean Thinking is the dynamic, knowledge-driven, and customer-focused process through which all people in a defined enterprise continuously eliminate waste with the goal of creating value."

(Murman et al., 2002)

Murman E.M. et al. Lean Enterprise Value, 2002 (Palgrave, New York, NY).

Lean Thinking is about…

Continuous Improvement (KAIZEN)

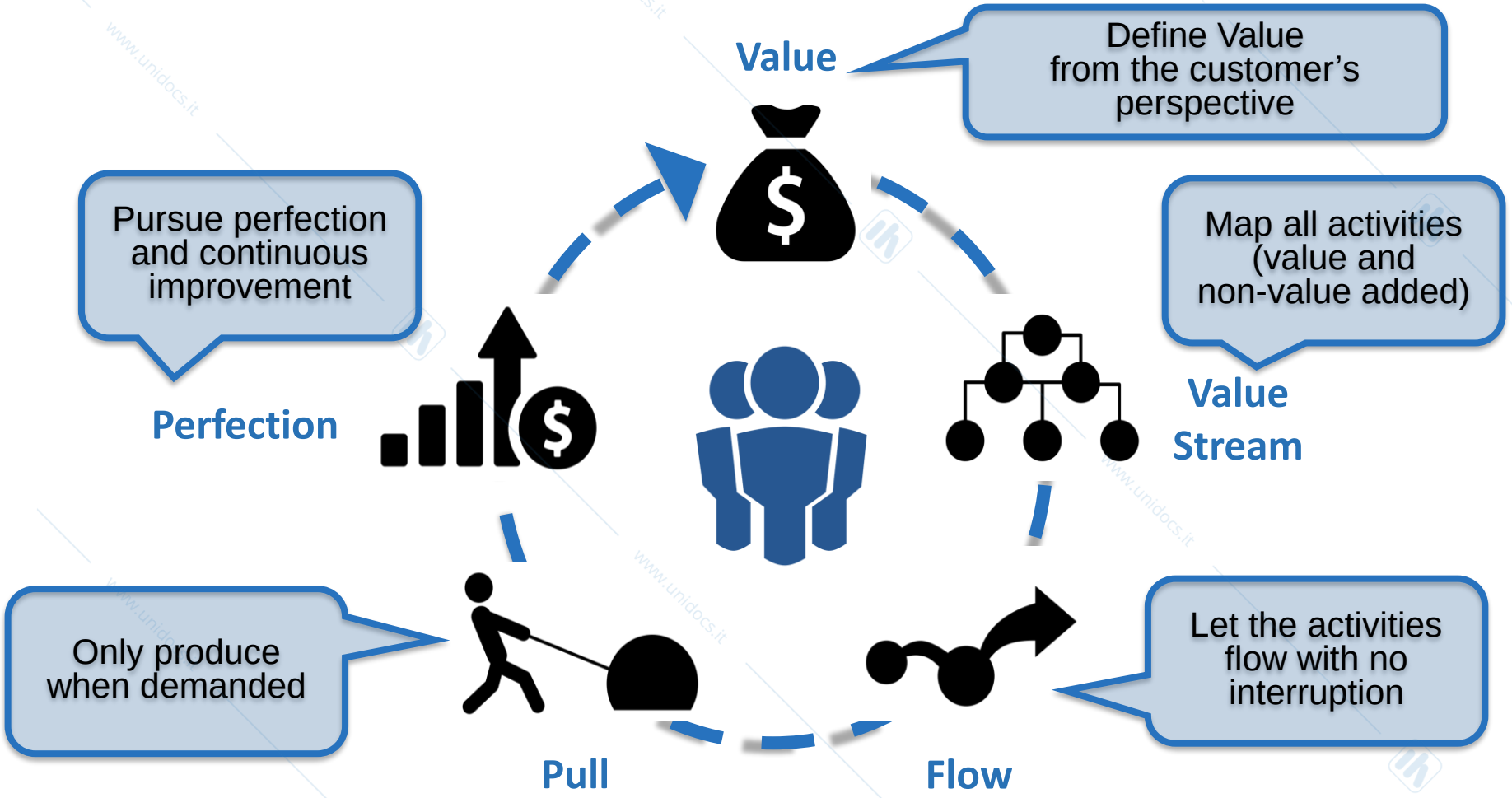
&

Respect for People

"We respect others, make every effort to understand each other, take responsibility and do our best to build mutual trust."
Toyota

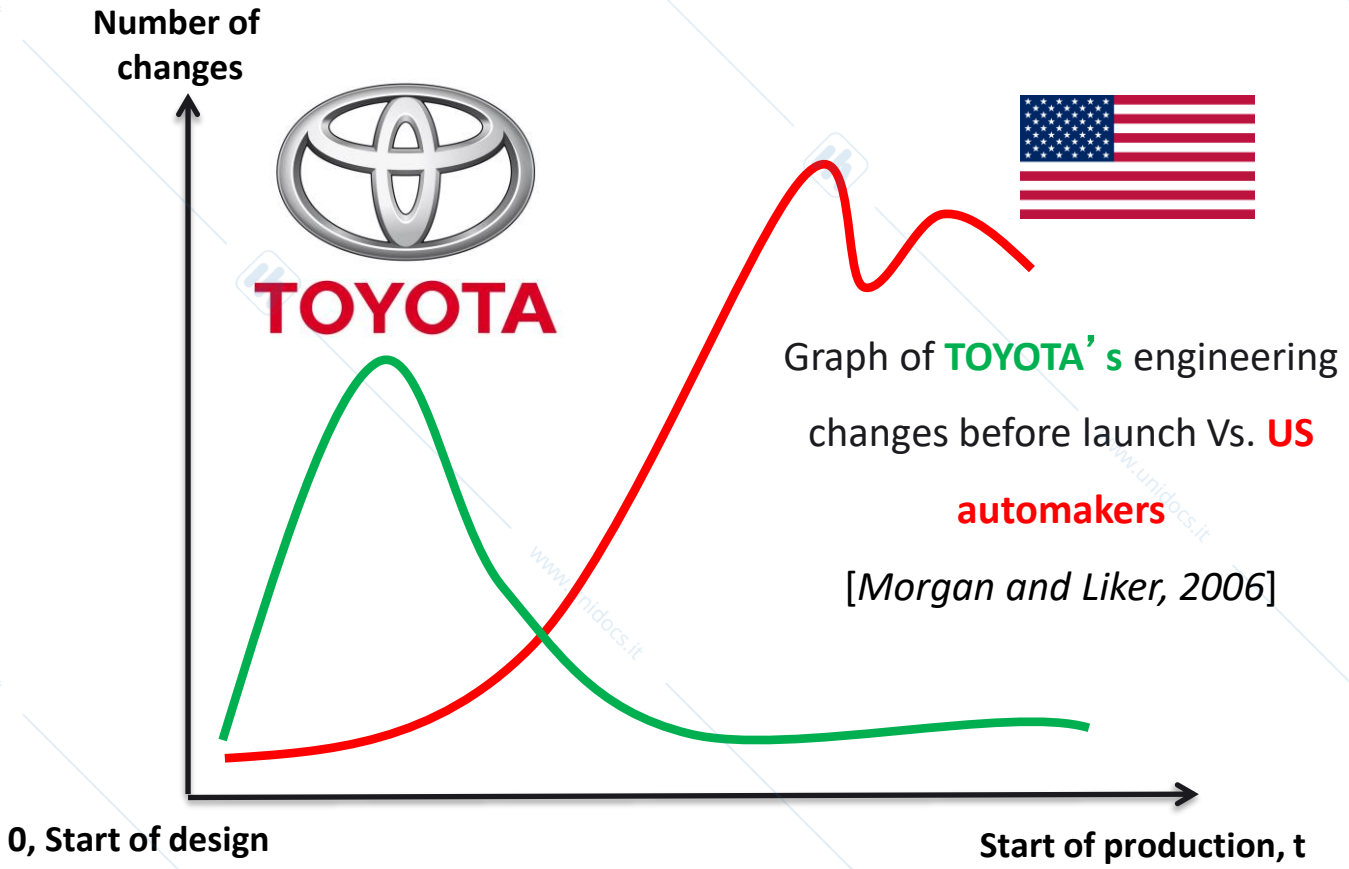
"We stimulate personal and professional growth, share the opportunities of development and maximize individual and team performance."
Toyota

The 5 Lean Principles



Toyota Inspired Lean Thinking, why?

Because of its outstanding performance.



Graph of **TOYOTA's** engineering changes before launch Vs. **US automakers**

[*Morgan and Liker, 2006*]

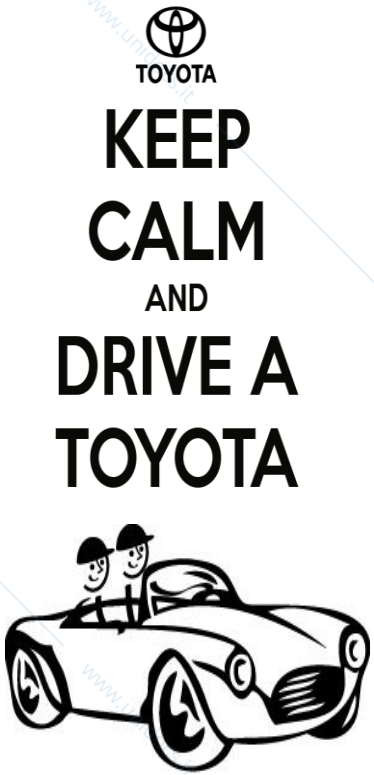
LPPD. Origins

The origin of LPPD is in Toyota

- Studies conducted in Michigan University observed that Toyota was completely different from the other manufactures in product development (same as in Manufacturing with Lean manufacturing).

"The Toyota style is not to create results by working hard. It is a system that says there is no limit to people's creativity. People don't go to Toyota to 'work' they go there to 'think' "

Taichi Ohno



1980-1990s Product development process in Toyota was:

- 30% faster
- 50% less resource consuming
- Awarded (Won Prizes)
- Constantly growing market share

In short, better cars, better features and cheaper.

The Second Toyota Paradox: How Delaying Decisions Can Make Better Cars Faster
Ward, Liker, Cristiano, Sobek; MIT Solan Management Review, April 15, 1995

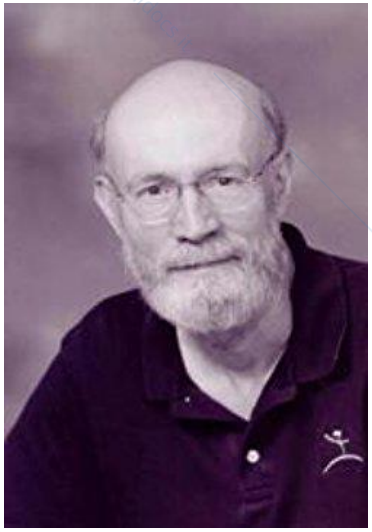
Toyota Inspired Lean Thinking, why?

The outstanding story of Toyota.

Clark (87), Clark and Fujimoto (89), Womack and Jones (90, 2003)

Measures	Toyota	North American	European
Avg. eng's. hrs. per new vehicle development (million hrs.)	**1.7**	3.1	2.9
Avg. development time (month)	**46.2**	60.4	57.3
Engineering change cost (% total cost)	**10-20%**	30-50%	10-30%
Employees per team	**485**	903	904
Ratio of delayed project	**1 in 6**	1 in 2	1 in 3
Achieve normal quality after launch (month)	**1.4**	11	12

LPPD. Origins



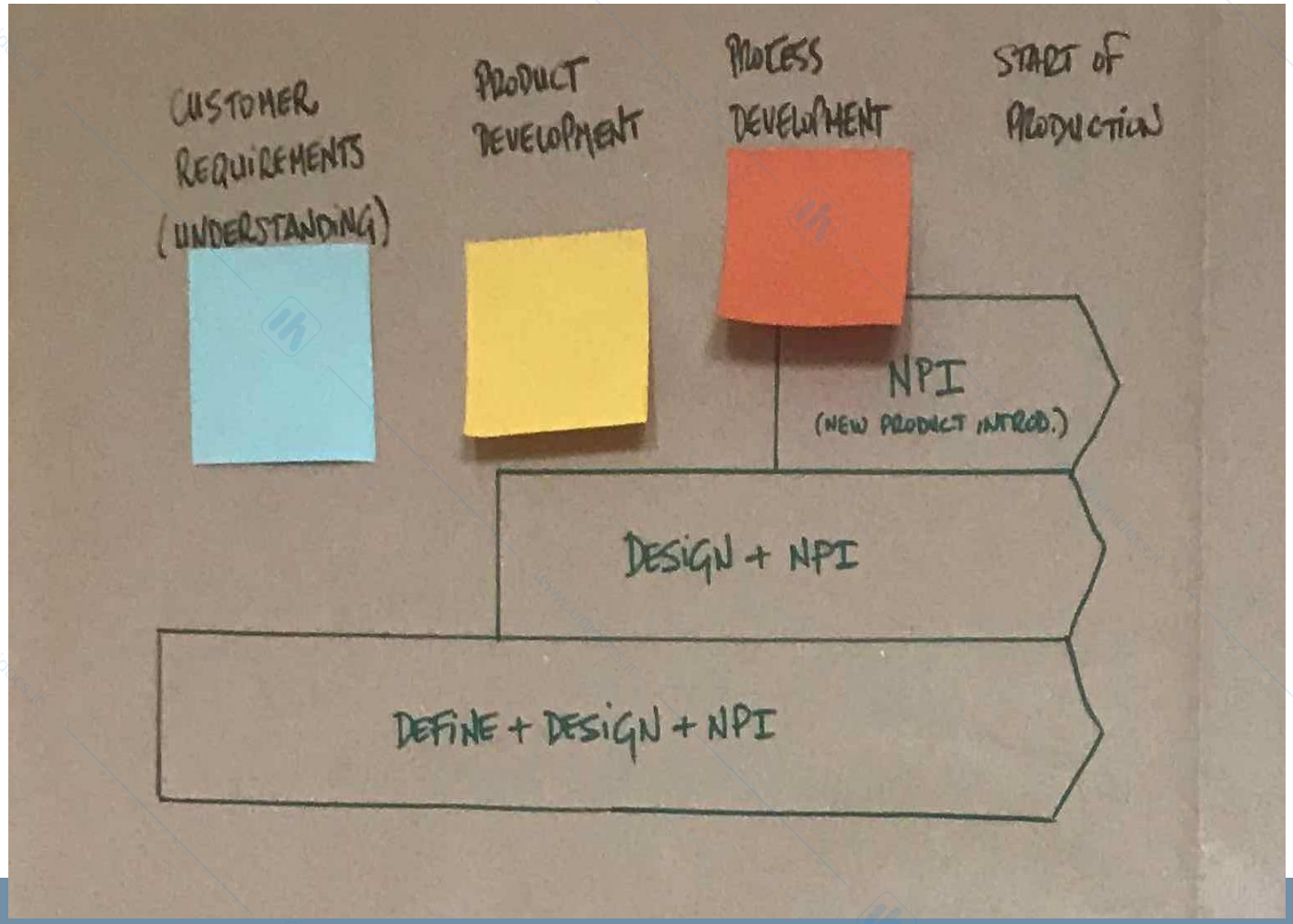
Womack's comment on LPPD:

- LPPD is relatively "new", very little crowd is practicing it
- Actually some managers started to do so
- LPPD is not as visible as Lean Manufacruring, hence it seems more complicated
- Message: I encourage you to experiment with LPPD

Womack, Sept 2014

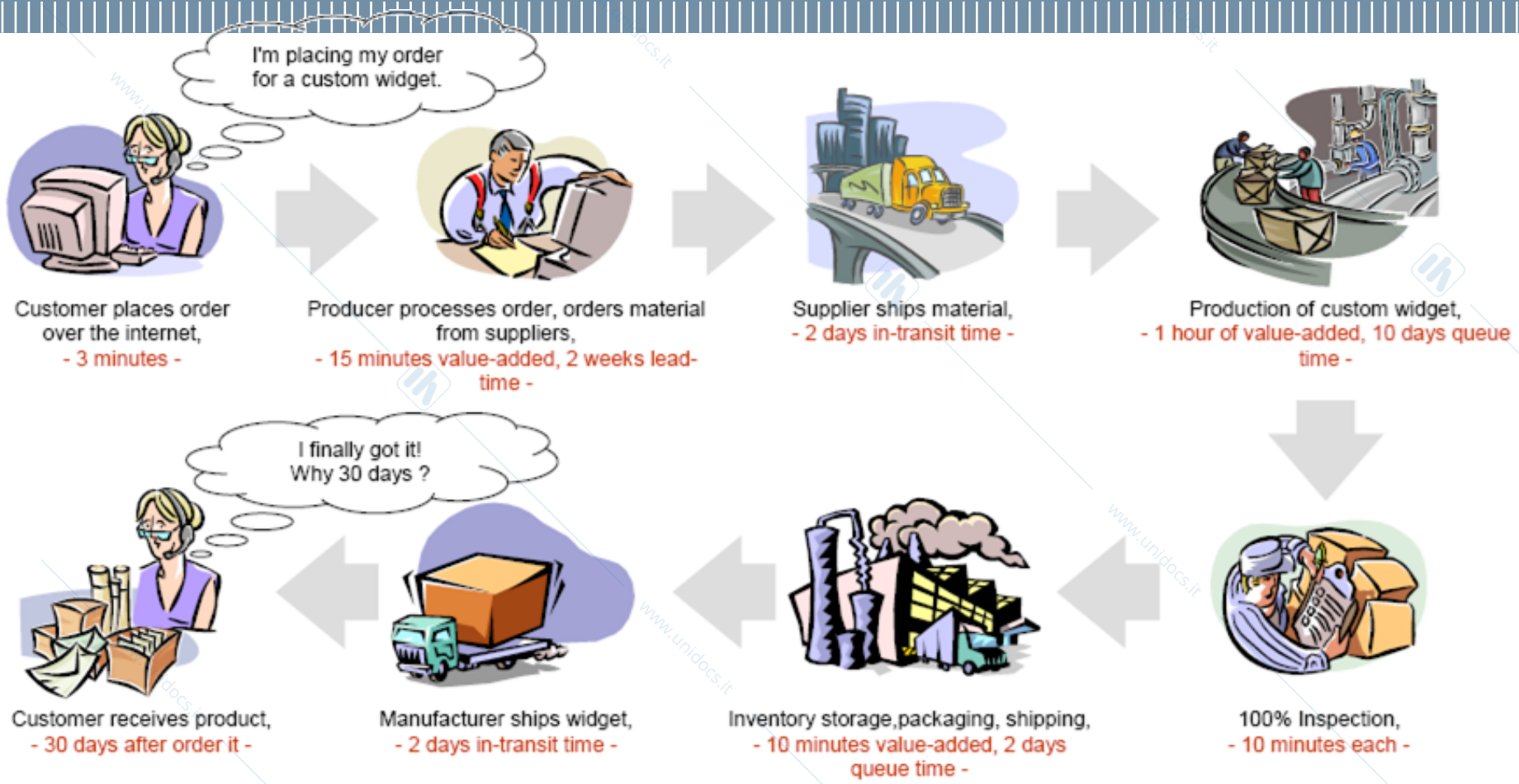
What is LPPD for…..?

Product and/or Service



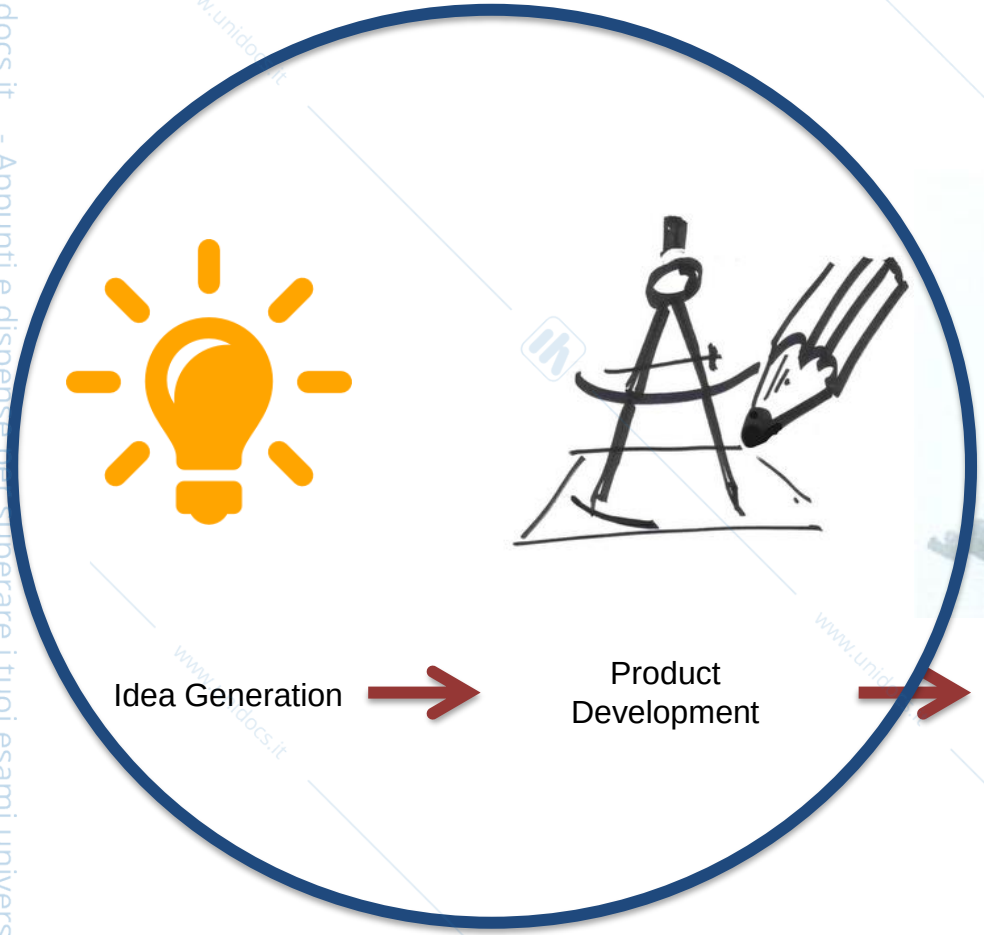
NPI=
New Product Introduction

Example of waste in product order.



- Elapsed Time from Order to Delivery : **30 Days.**
- Value-Added Time : **1 Hour, 25 Minutes.**

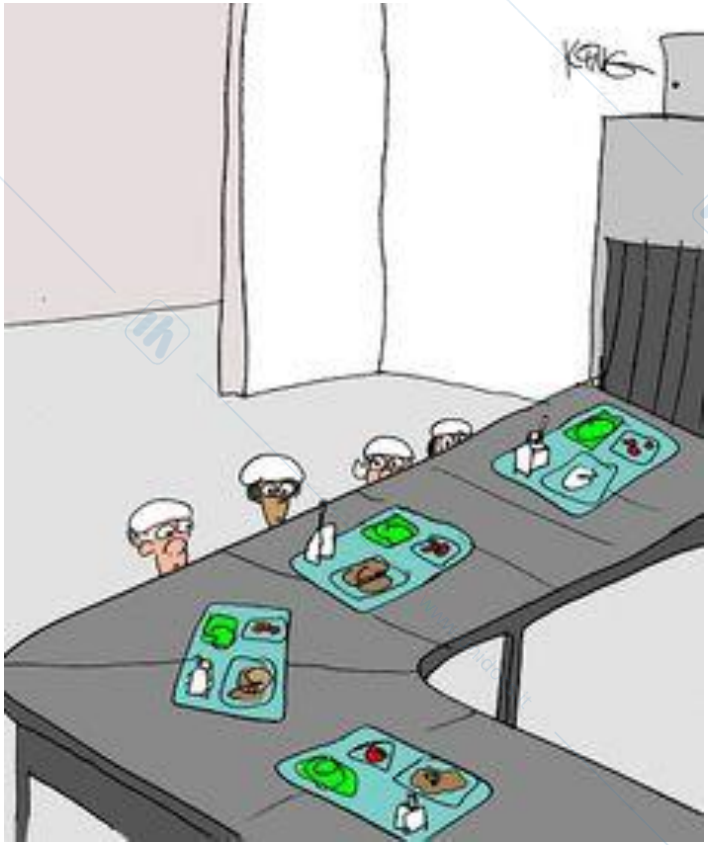
And in product development?



Idea Generation → Product Development → Production → Delivery

Example of waste/value in production

Differences Between Manufacturing and Design



*Manufacturing is made of a **physical** flow of material, components, products.*

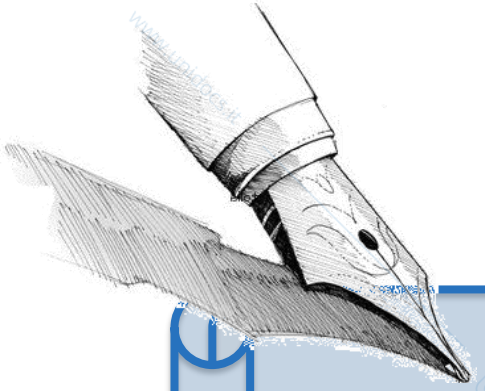
Differences Between Manufacturing and Design

*Product design and development is made of a flow of **data**, **information** and **knowledge**.*

How 5 Lean Principles in Product Design and Development

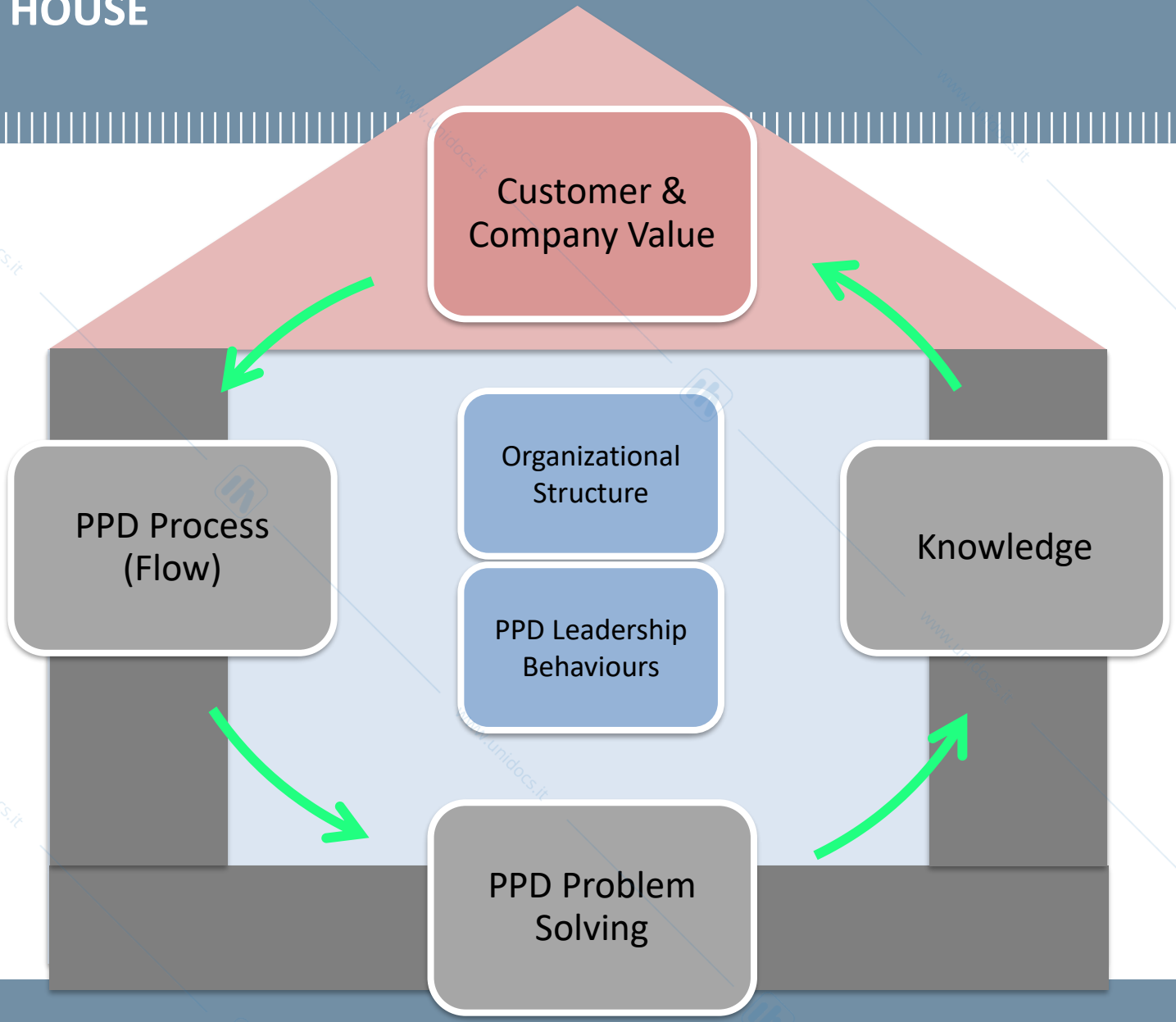
	Manufacturing	Engineering
Value	Visible at each step, defined goal	Harder to see, emergent goals
Value Stream	Parts and material	Information and knowledge
Flow	Iterations are waste	Planned iterations must be efficient
Pull	Driven by takt time	Driven by needs of enterprise
Perfection	Process repeatable without errors	Process enables enterprise improvement

How Lean Thinking Applies in Product Development



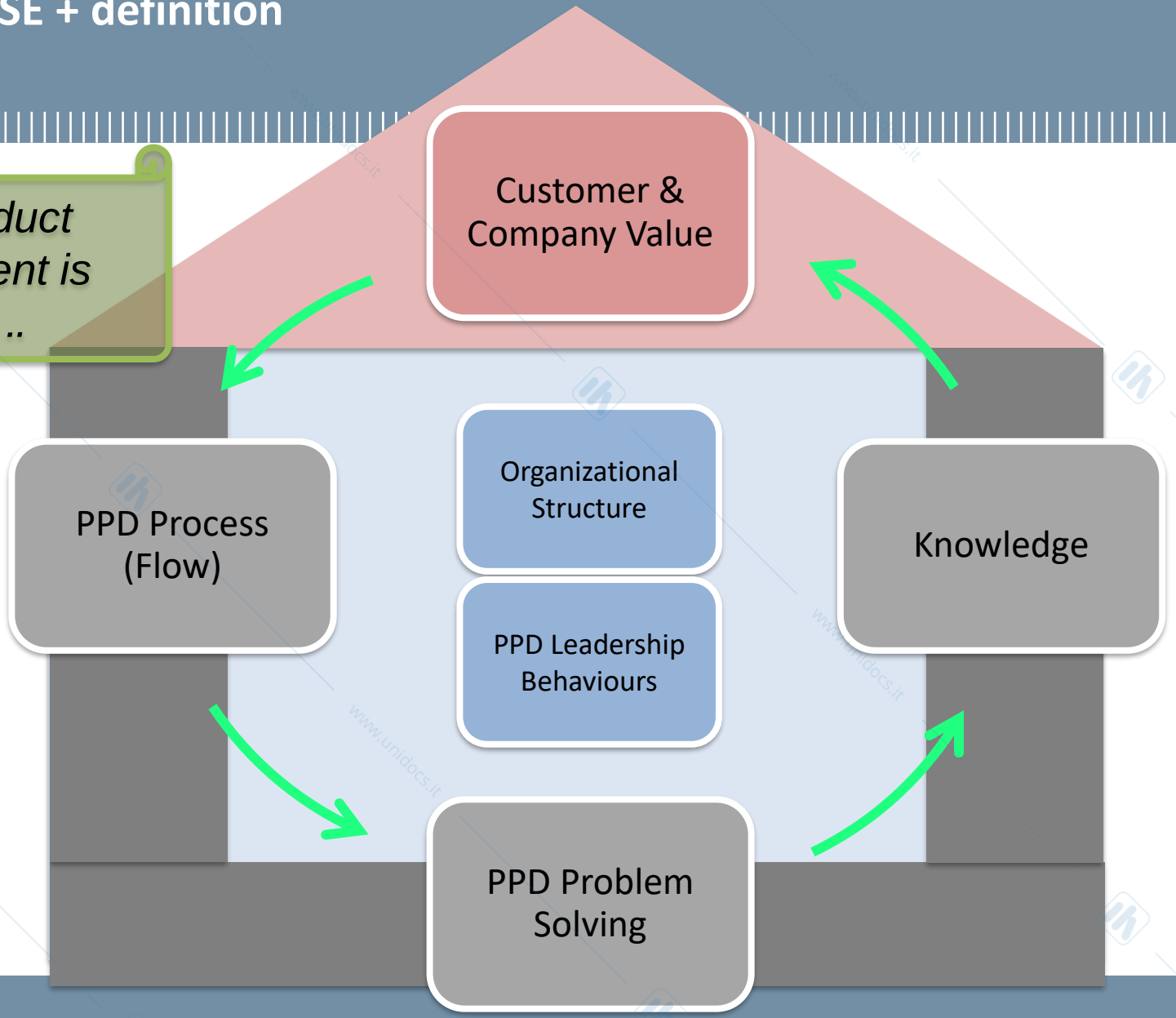
Lean product development is about (i) creating value through (ii) a process that builds on knowledge and learning enabled by (iii) an integrated system (made of people, processes, and technology).

LPPD HOUSE

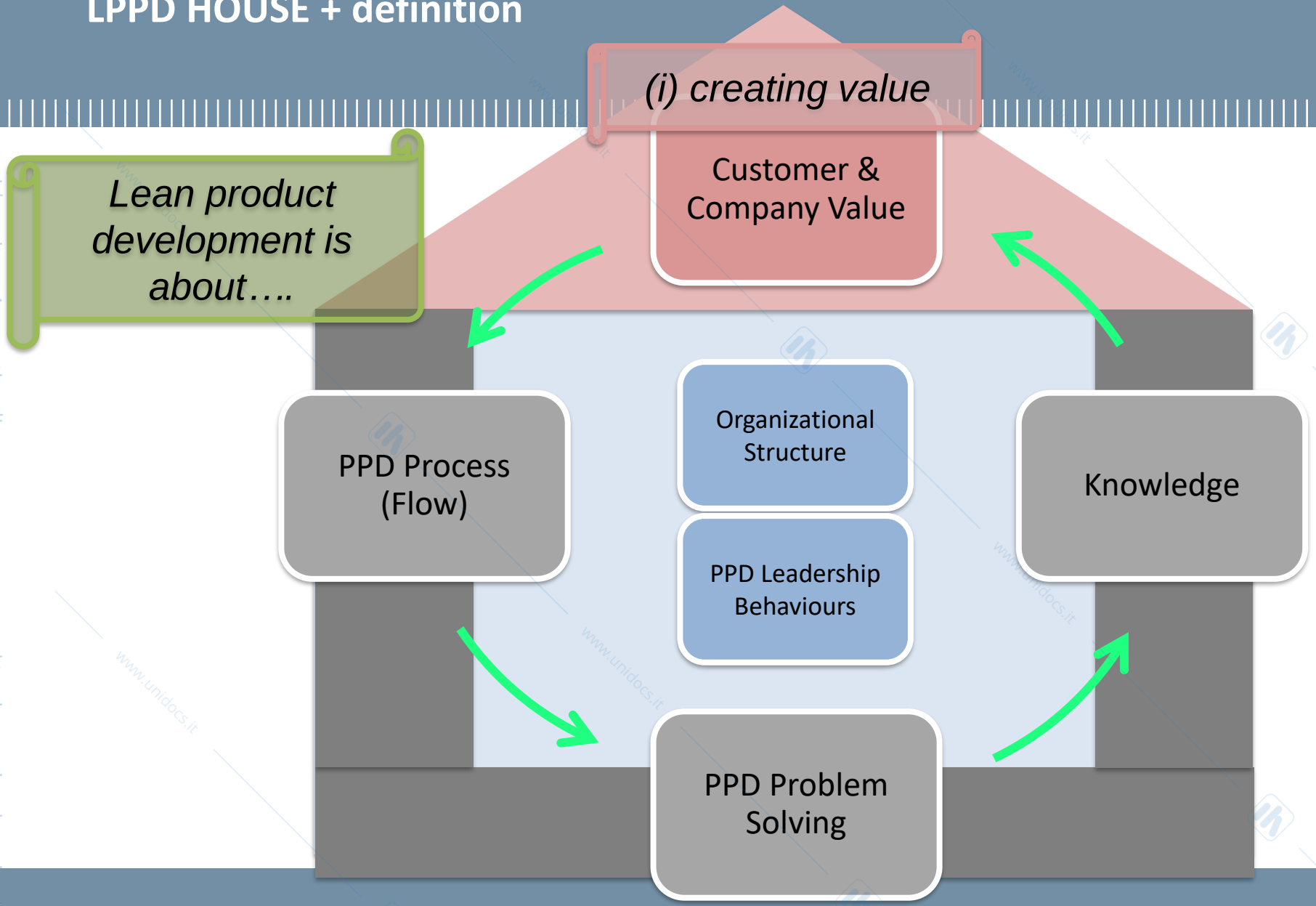


LPPD HOUSE + definition

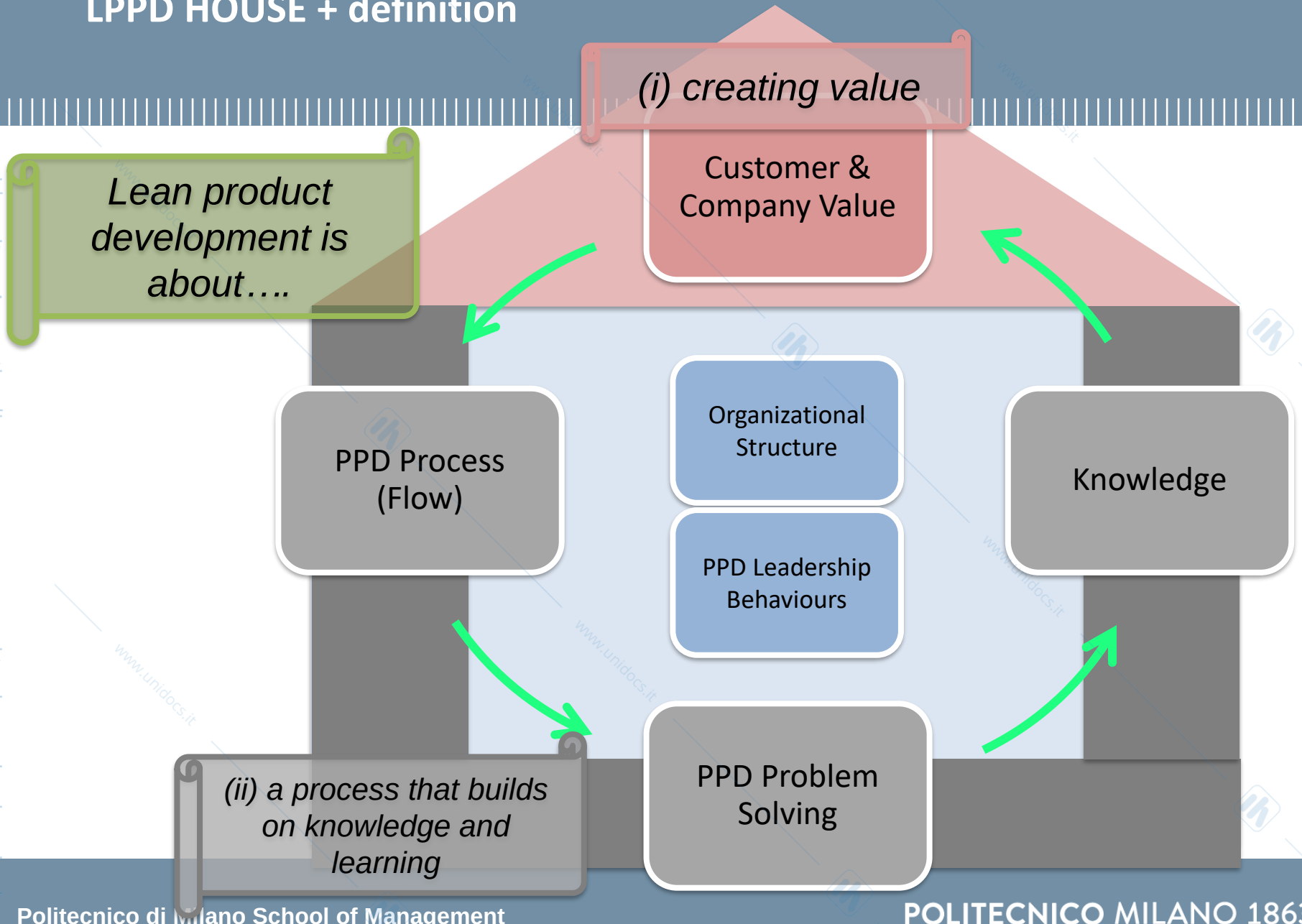
Lean product development is about….



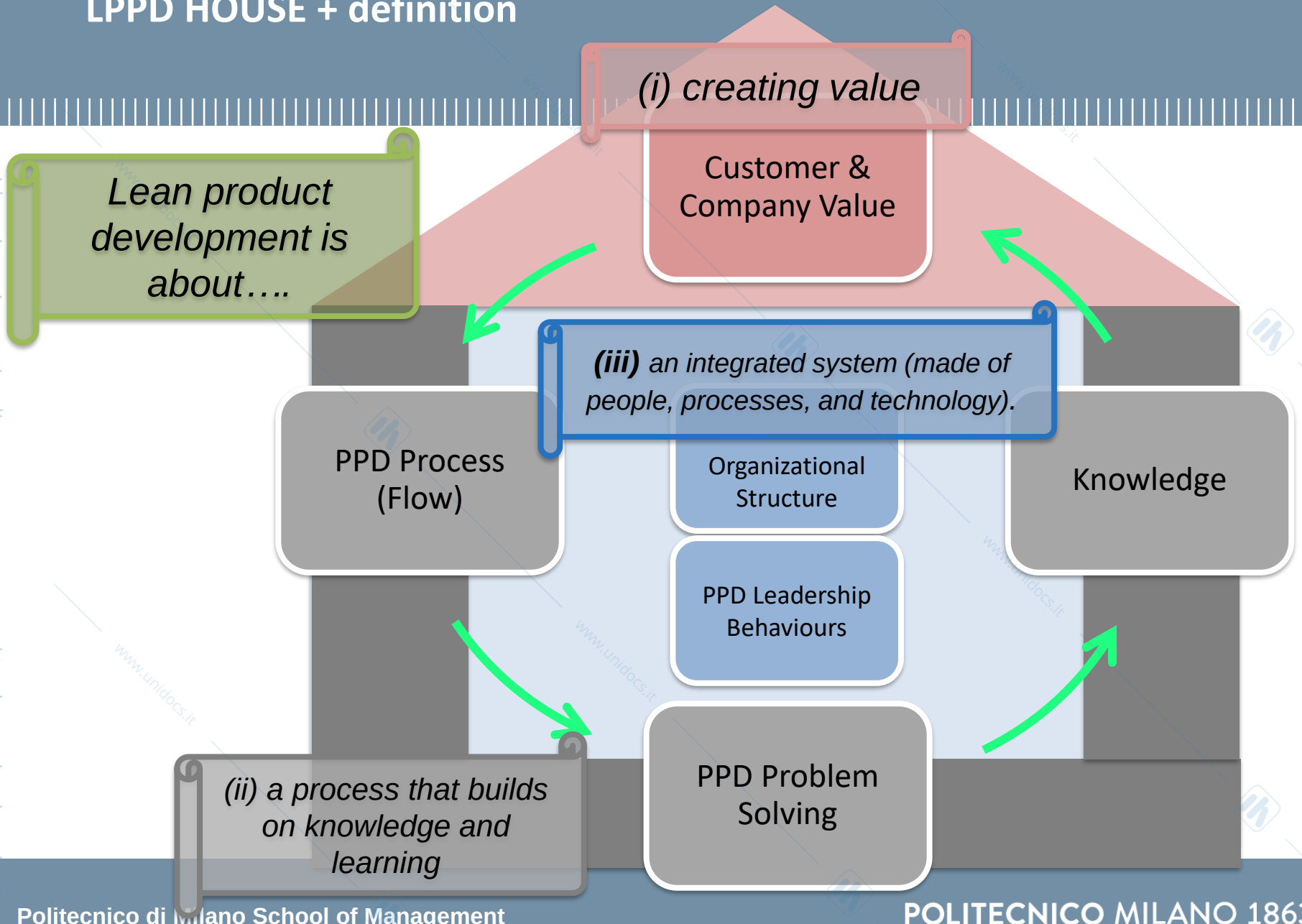
LPPD HOUSE + definition



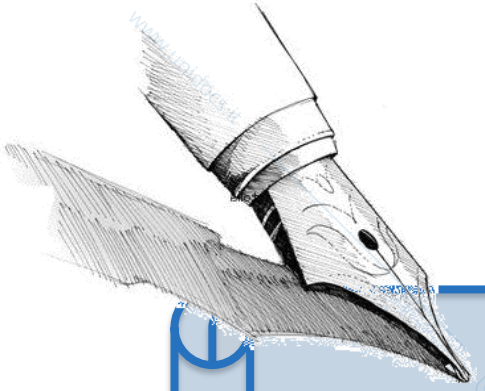
LPPD HOUSE + definition



LPPD HOUSE + definition

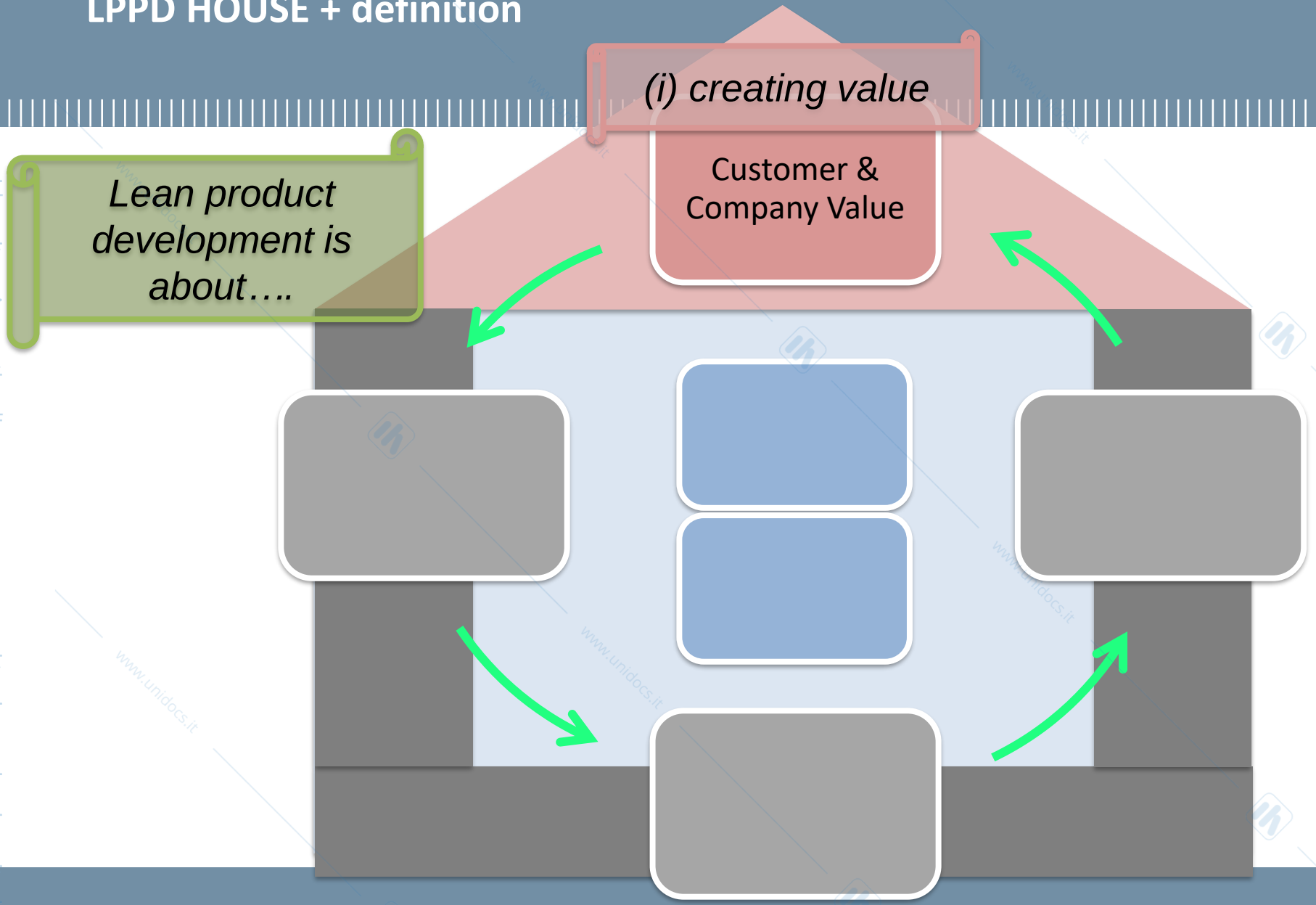


How Lean Thinking Applies in Product Development



*Lean product development is about (i) **creating value** through (ii) a process that builds on knowledge and learning enabled by (iii) an integrated system (made of people, processes, and technology).*

LPPD HOUSE + definition



(i) Creating Value: What is Value?

Value
everything a customer is willing to pay for

Waste (Muda, in Japanese)
any activity that has no value for a customer

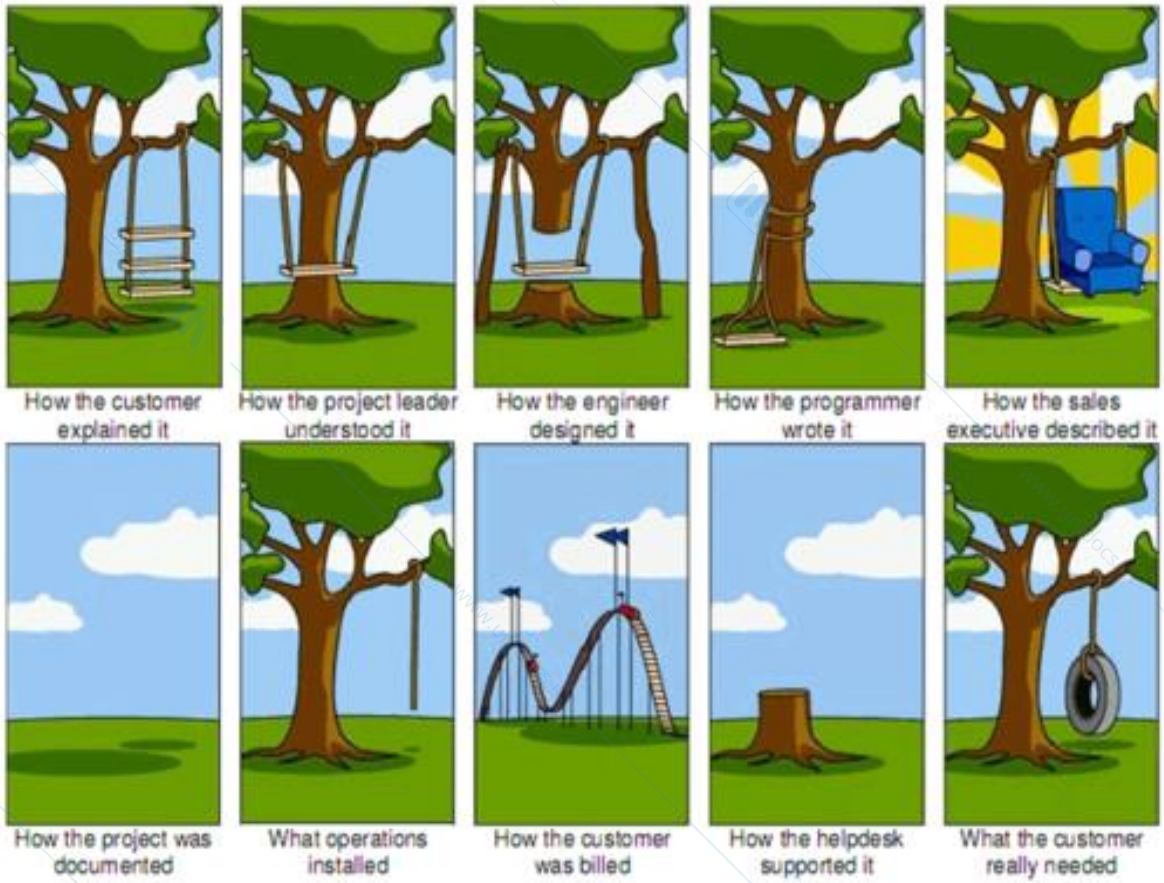
From **waste reduction**…

…to **value creation**

On ***customer*** **expectations…**

(i) Creating Value: What is Value?

Different functions in the same company can have **different visions** of customer value.



(i) Creating Value: What is Value?

Providing the right product/service to the right customer at the right time!

(i) Creating Value: What is Value?

Value
everything a customer is willing to pay for

Waste (*Muda*, in Japanese)
any activity that has no value for a customer

(i) Creating Value: What is Value?

PROJECT TYPES

A type project ..... Which I don’t know how to design and produce

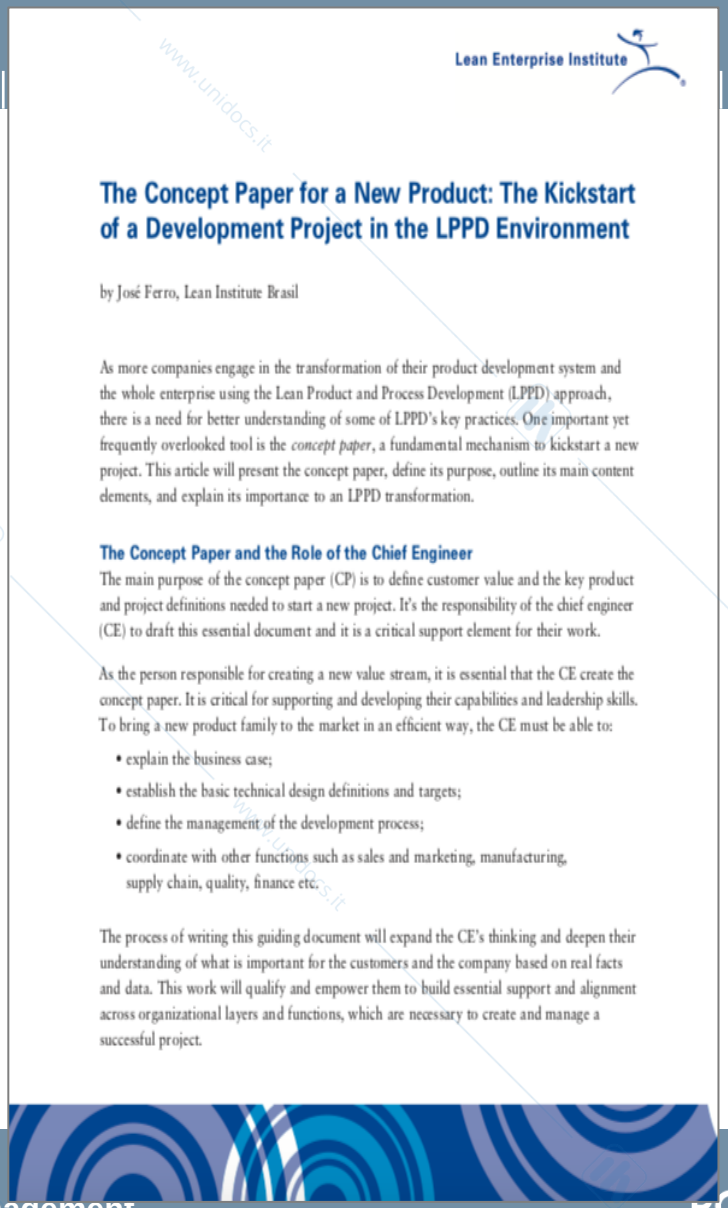
B type project ..... Which I don’t know how to design but know to produce

C type project ..... Which I know how to design and produce – Big Change

D type project ..... Which I know how to design and produce – Small Change

E type project ..... Improvement quality and cost of the current products

Concept Paper



Lean Enterprise Institute

The Concept Paper for a New Product: The Kickstart of a Development Project in the LPPD Environment

by José Ferro, Lean Institute Brasil

As more companies engage in the transformation of their product development system and the whole enterprise using the Lean Product and Process Development (LPPD) approach, there is a need for better understanding of some of LPPD's key practices. One important yet frequently overlooked tool is the *concept paper*, a fundamental mechanism to kickstart a new project. This article will present the concept paper, define its purpose, outline its main content elements, and explain its importance to an LPPD transformation.

The Concept Paper and the Role of the Chief Engineer

The main purpose of the concept paper (CP) is to define customer value and the key product and project definitions needed to start a new project. It's the responsibility of the chief engineer (CE) to draft this essential document and it is a critical support element for their work.

As the person responsible for creating a new value stream, it is essential that the CE create the concept paper. It is critical for supporting and developing their capabilities and leadership skills. To bring a new product family to the market in an efficient way, the CE must be able to:

- explain the business case;
- establish the basic technical design definitions and targets;
- define the management of the development process;
- coordinate with other functions such as sales and marketing, manufacturing, supply chain, quality, finance etc.

The process of writing this guiding document will expand the CE's thinking and deepen their understanding of what is important for the customers and the company based on real facts and data. This work will qualify and empower them to build essential support and alignment across organizational layers and functions, which are necessary to create and manage a successful project.

(i) Creating Value: More Value, Less Waste

Defining customer value

Reusable Knowledge

(i) Creating Value: More Value, Less Waste

(i) Creating Value: What are Wastes?

(i) Creating Value: While Waste in Manufacturing is Quite Easy to Understand…

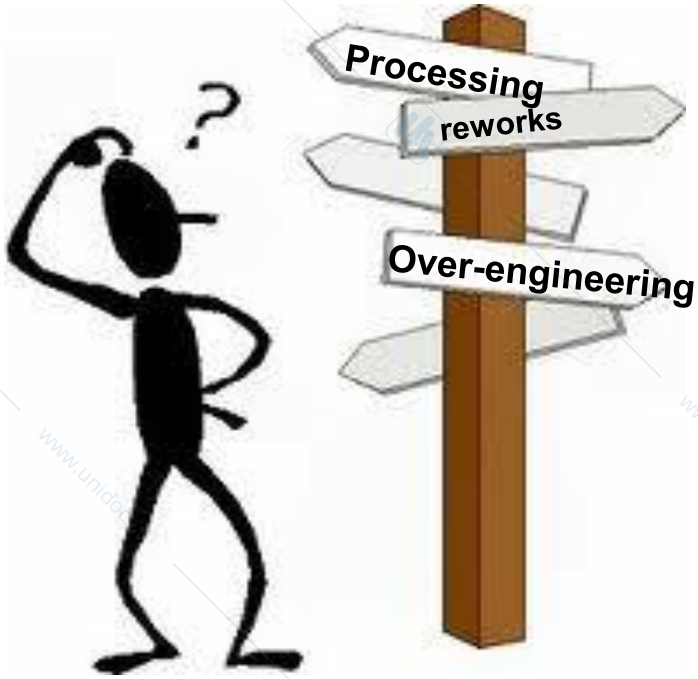
(i) Creating Value: …in Product Design and Development
Waste Identification is Tricky!

The meaning of **waste** in design is **fuzzy** and **hard to catch** and we are always unwilling to consider our job **inefficient** or **ineffective**.

«Am I producing wastes? Not at all, I'm just doing my job!»

(i) Creating Value: Different Kinds of Waste

While waste in production is easier to see...



…in product development are less intuitive!

(i) Creating Value: Different Kinds of Waste

Wrong planning of **installation** activities.

Big Flop

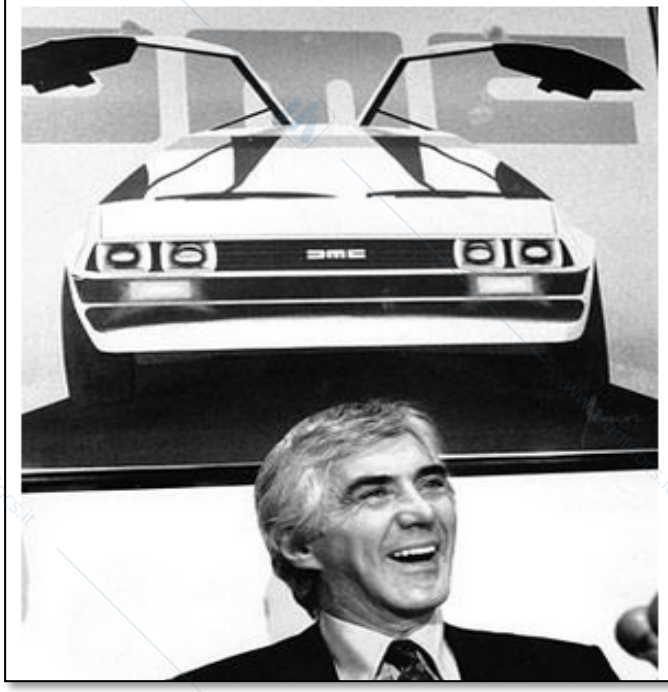
(i) Creating Value: Different Kinds of Waste

Products **not aligned with market** needs/expectations.

Top 25 Biggest Product Flops Of All Time

GALLERY VIEW | LIST ALL | PRINT

12 of 31 ◂ Previous Next ▸



No. 15: DeLorean Car

Auto pioneer John DeLorean quit General Motors in 1973 to start his own company. His company's car was an unusual car featuring an unpainted, stainless-steel exterior and gull-wing doors. The car debuted in 1981, but when the company failed less than two years later it had produced less than 9,000 vehicles.

Despite horrific sales, the car gained a cult following after the release of the 1985 movie 'Back to the Future' which featured the car as a time-travel machine. Last year it was announced that the car would be returning with very limited production.

Next: Product Flop No. 14

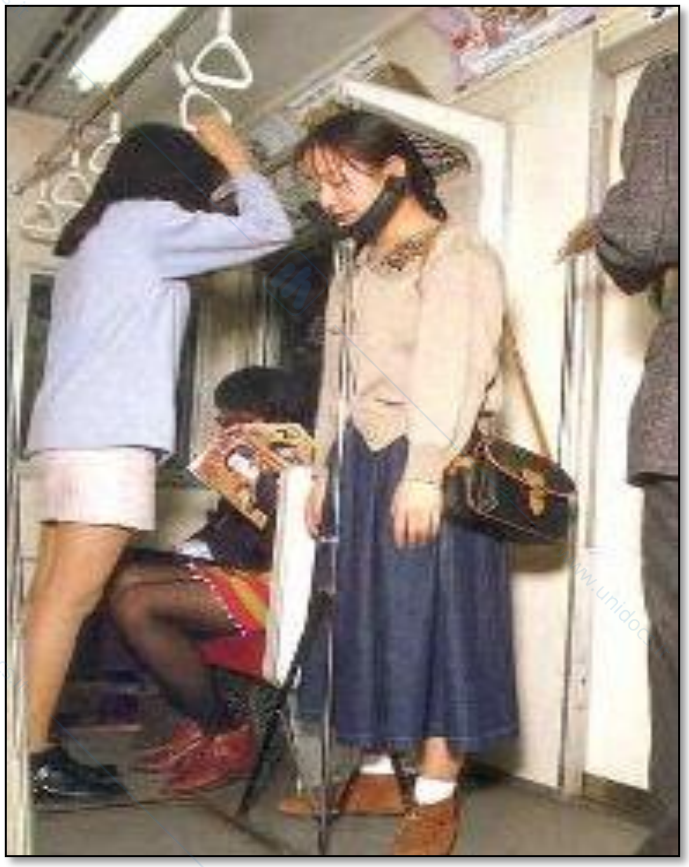
(i) Creating Value: Different Kinds of Waste

Defect products due to design mistakes.

Inappropriate **Solutions**

(i) Creating Value: Different Kinds of Waste

Inappropriate design solutions.

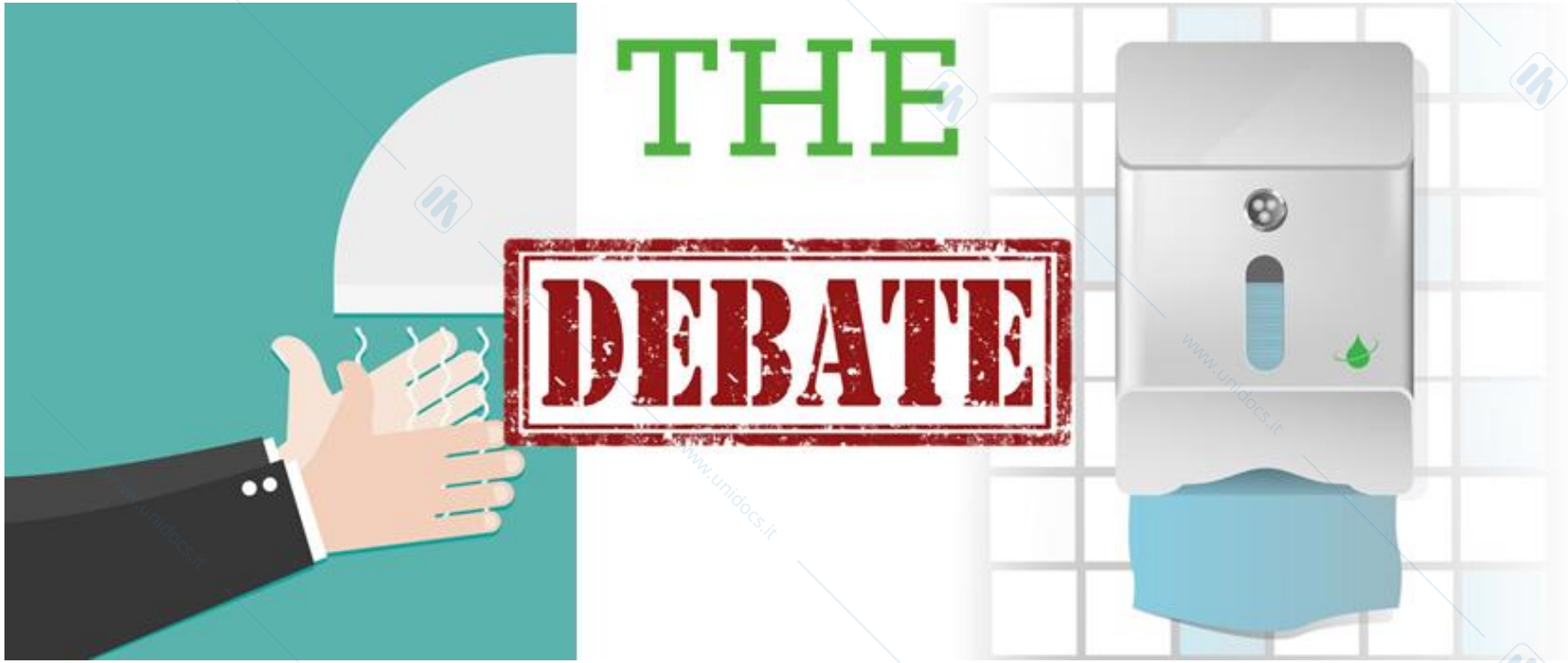


(i) Creating Value: Different Kinds of Waste

Poor **Design**

(i) Creating Value: Different Kinds of Waste

Poor quality.



(i) Creating Value: Different Kinds of Waste

Poor testing.

(i) Creating Value: Indeed Waste Exists!

And there are different **sources** of waste in product design and development.

Wastes as **result** of the **process**:

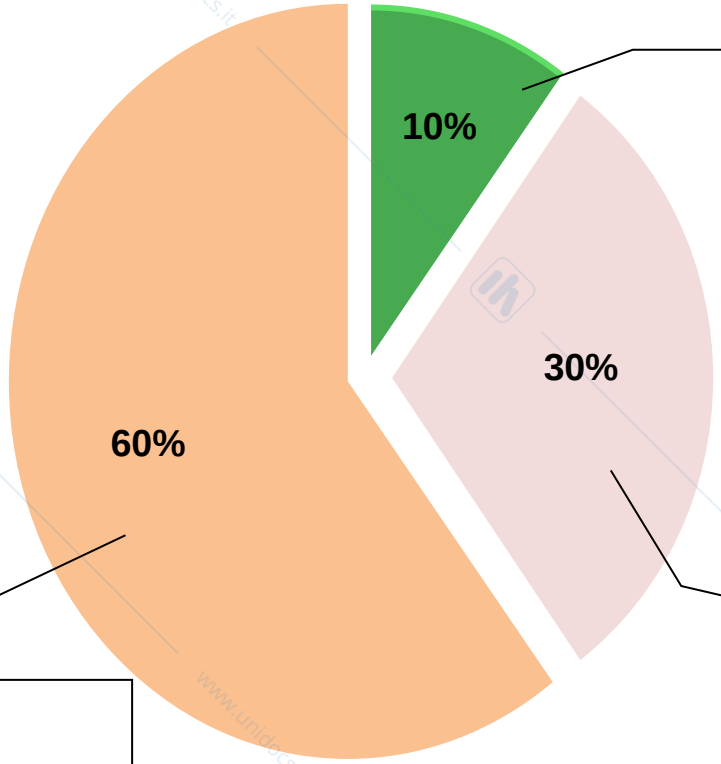
- Defect products
- Commercial flops
- Call-back, warranties
- etc…

Wastes **hidden** in the **process**:

- Idle time
- Imprecise knowledge
- Unused knowledge
- Product design alternatives not evaluated
- Organizational conflicts
- etc…

(i) Creating Value: Waste in Design is More Diffused Than One Would Expect

From a research of PLM Alliance, 2007



Value Added

Design,
Modeling,
Testing,
Studying…

Non Value Added, but needed

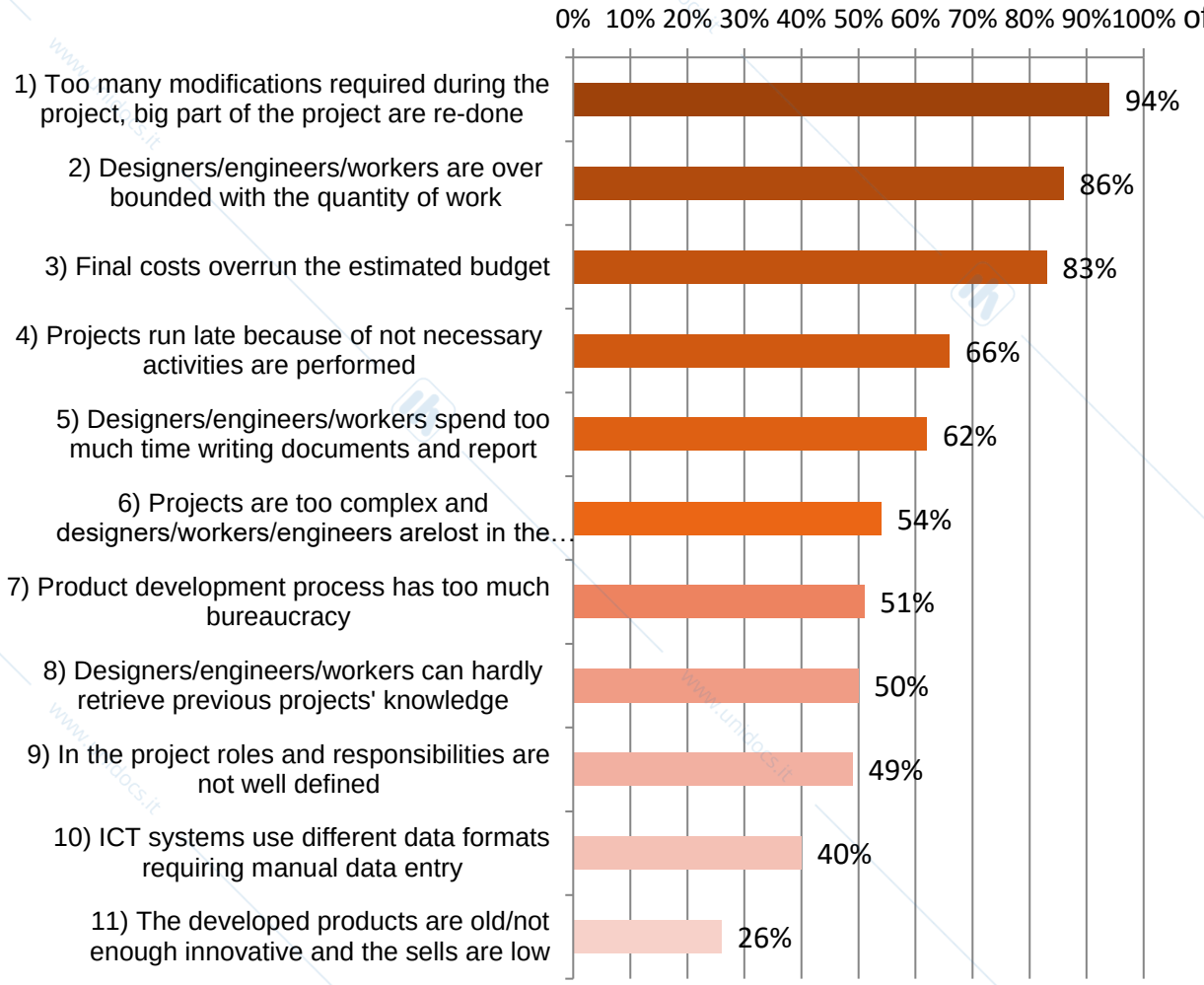
Specs,
ineffective meetings,
certifications…

Wasted time

Working with wrong data,
Recreating existing knowledge,
Searching for data,
Waiting for data,
Data translation…

Some activities are wastes but cannot be completely avoided!

(i) Creating Value: Wastes in Italy



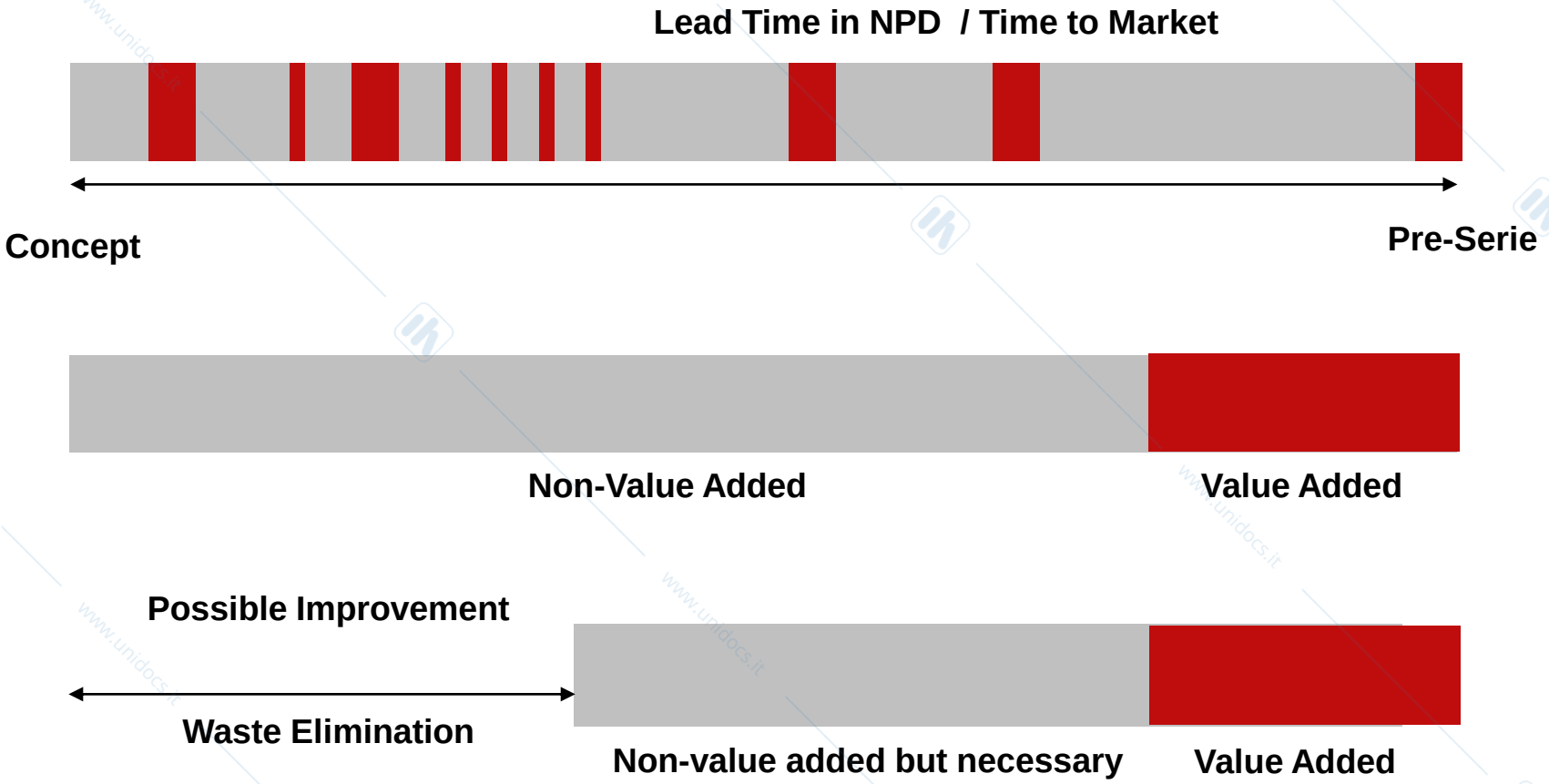
POLITECNICO DI MILANO
GRADUATE SCHOOL
OF BUSINESS

GeCo Observatory

Research among
103 Companies in
Italy in 2013
(60% large, 40% SMEs)

http://www.osservatori.net/progettazione_plm

(i) Creating Value: Wastes in New Product Development



Different **sources of waste** in *product development*

(i) Creating Value: 8 Categories of Waste in Lean Thinking

Overproduction	producing more, faster, or at an earlier stage than is required by the next process (or customer)
Waiting	waiting on work to be completed by a previous process or person
Conveyance	the movement of documents/information/project tasks from person to person
Processing	performing unnecessary processing on a task
Inventory	buildup of more material or information that is needed
Motion	excess movement or activity during task execution
Rework	any kind of correction, such as late engineering changes
Unused Employee Capabilities	failing to develop and/or utilize human capabilities

(i) Creating Value: 8 Categories of Waste in Lean Thinking

Overproduction	1. Specifications not needed and/or not implemented are formulated 2. Specifications are formulated with too much details and/or too much earlier (for the specific NPD phase) 3. Product functionalities not asked / needed are implemented 4. Projects not needed and/or not convenient are studied 5. Design data and info are formulated with too much details and/or too much earlier (for the specific NPD phase) 6. Components / materials not needed are used in the product
Waiting	7. Time spent (without adding value) waiting to process information 8. Waiting for decisions, persons, resources, data, information, documents
Conveyance	9. Information are available in different formats and ICT systems (e.g. CAD, PDM, ERP) can't interoperate 10. Information might be manually retyped from one process / system to another

(i) Creating Value: 8 Categories of Waste in Lean Thinking

Processing	11. Unneeded and not useful activities are performed along the development phase 12. Unnecessary and not useful tests are performed 13. Unnecessary and not needed tolerances are included 14. Development of parts / components / products already designed and existing, without re-using previous works and projects 15. Too many authorizations / controls are needed to perform an activity 16. Unnecessary, not useful, not appropriate, immature, not error-free technologies are used 17. Development of changes not asked or not needed 18. Time spent for bad definition of priorities 19. Time is spent for reworks and revisions due to changing priorities, information, data, requirements 20. Time is spent working with incomplete / incorrect / inappropriate / not reliable information, data, requirements are performed 21. The development process is performed in different ways, depending by customers / suppliers / others

(i) Creating Value: 8 Categories of Waste in Lean Thinking

Inventory	22. Designs wait for the next available resources 23. Batches of projects remains untouched
Motion	24. Unneeded travels might be done for visit customers 25. Unneeded travels might be done for managing projects and teams 26. Unneeded and not useful meetings are continuously organized with customers 27. Unneeded and not useful meetings are continuously organized inside the company
Rework	28. Reworks and revisions derived by poor-quality products 29. Reworks and revisions due to incomplete / incorrect / inappropriate / not reliable (of suspect quality) information, data, requirements 30. Reworks and revisions derived by not successful products
Unused Employee Capabilities	31. Communications failure and non-conformance 32. Inability to reuse previous knowledge 33. New employees can't retrieve company knowledge easily

(i) Creating Value: How to Eliminate Waste?

(i) Creating Value: How to Eliminate Waste?

(i) Creating Value and eliminate waste: MyWaste method

Probability P

- **Does this waste occur?**
  - 0 – Never
  - 1 – Rarely
  - 2 – Sometimes
  - 3 – Often
  - 4 – Always

Severity S

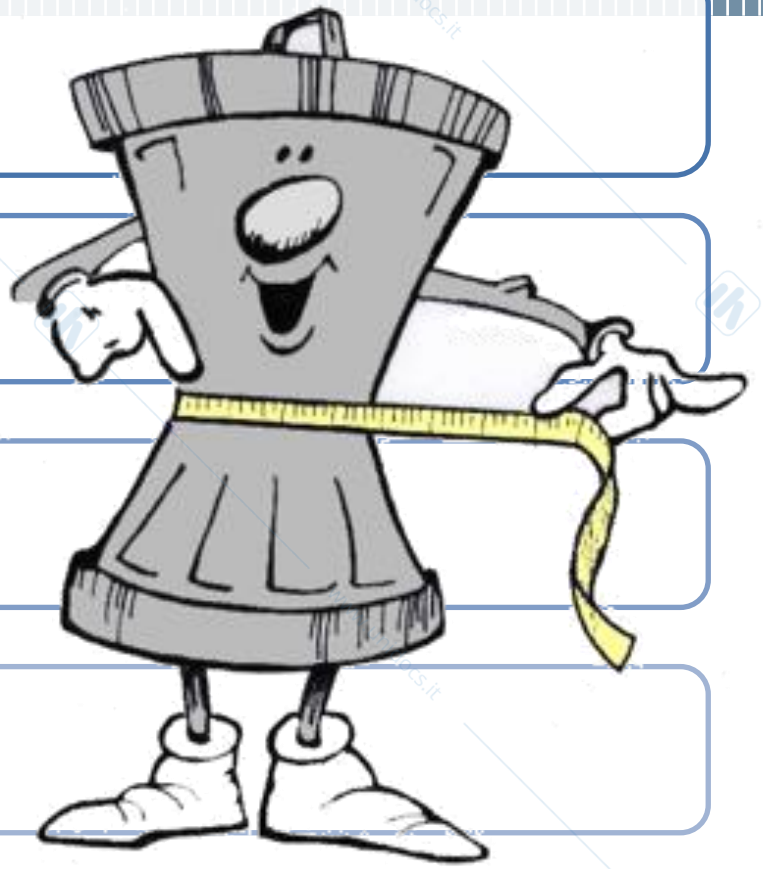
- **How serious is the waste for your enterprise?**
  - 1 – Uninportant
  - 2 – A little bit serious
  - 3 – Sufficiently serious
  - 4 – Highly serious

Detectability D

- **How easy is to detect this waste?**
  - 1 Very Easy
  - 2 Easy Enough
  - 3 Hard Enough
  - 4 Impossible

Avoidability A

- **Is it possible to avoid this waste?**
  - 4 Avoidable
  - 3 Quite Easy to Avoid
  - 2 Difficult to Avoid
  - 1 Not Avoidable



Priority index of interventions (PII) = P*S*D*A

(i) Creating Value: How to Eliminate Waste?

MyWaste

Waste 19	Time is spent for reworks and revisions due to changing priorities, information, data, requirements

1.
Does this waste occur?

☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ Always

2.
How serious is this waste?

□ *Unimportant*
□ *A Little bit serious*
□ *Sufficiently serious*
□ *Highly serious*

3.
How easy is to detect this waste?

□ *Very Easy*
□ *Easy Enough*
□ *Hard Enough*
□ *Impossible*

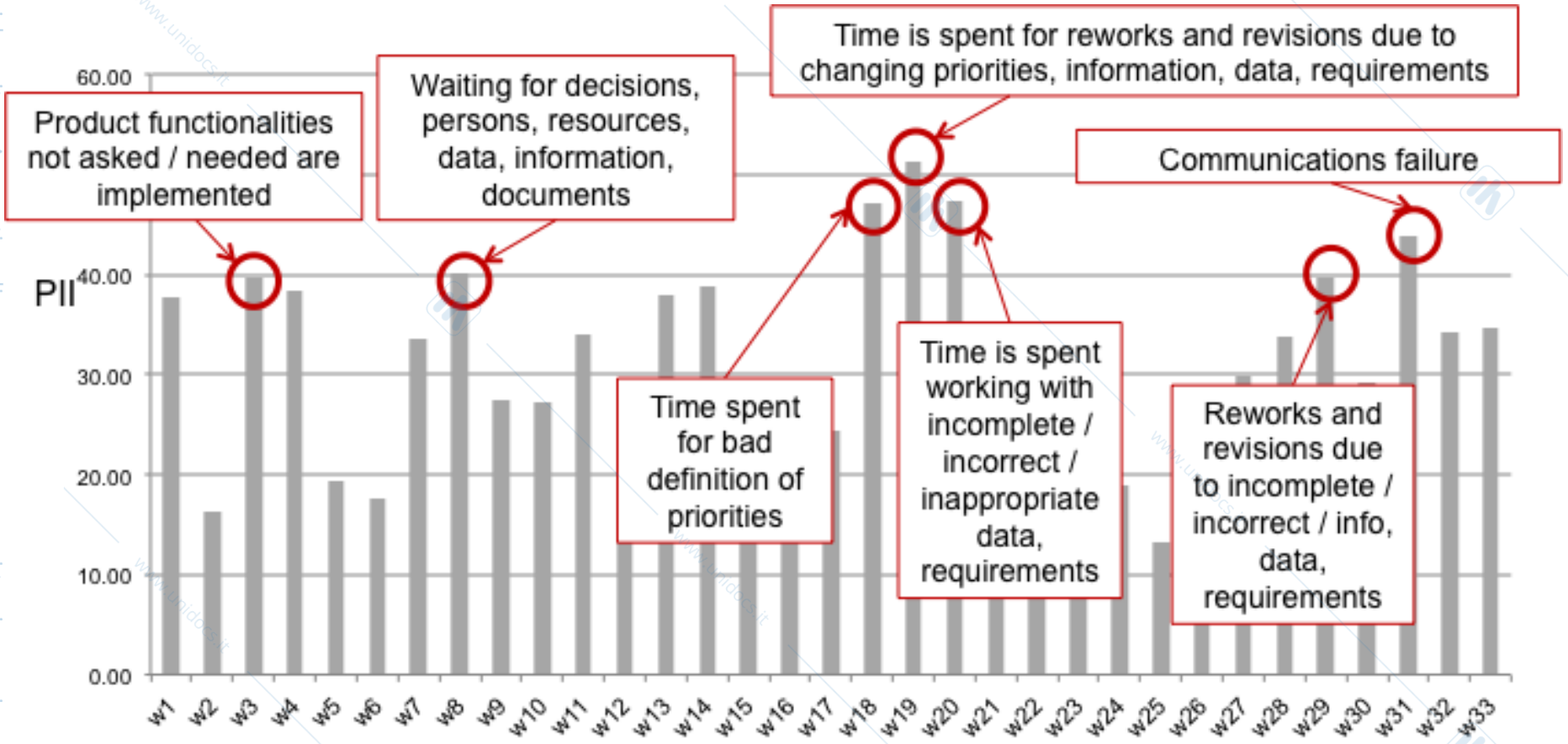
4.
Is it possible to avoid this waste?

□ *Avoidable*
□ *Quite Easy to Avoid*
□ *Difficult to Avoid*
□ *Not Avoidable*

(i) Creating Value: How to Eliminate Waste? MyWaste Example

Waste	Probability (P)	Severity (S)	Detection (D)	Avoidability (A)	Priority Index of Intervention (PII)
#19	Does the waste occur in your enterprise?	How serious is the waste for your enterprise?	How easy is to detect the waste?	Is it possible to avoid the waste?	
Time is spent for reworks and revisions due to changing priorities, information, data, requirements	☐ Never_**0** ☐ Rarely_**1** ☐ Sometimes_**2** ☐ Often_**3** ☐ Always_**4**	☐ Unimportant _**1** ☐ A Little bit Serious _**2** ☐ Sufficiently Serious_**3** ☐ Highly Serious_**4**	☐ Very Easy_**1** ☐ Easy Enough_**2** ☐ Hard Enough_**3** ☐ Impossible_**4**	☐ Avoidable_**4** ☐ Quite Easy to Avoid_**3** ☐ Difficult to Avoid_**2** ☐ Not Avoidable_**1**	***P*S*D*A***

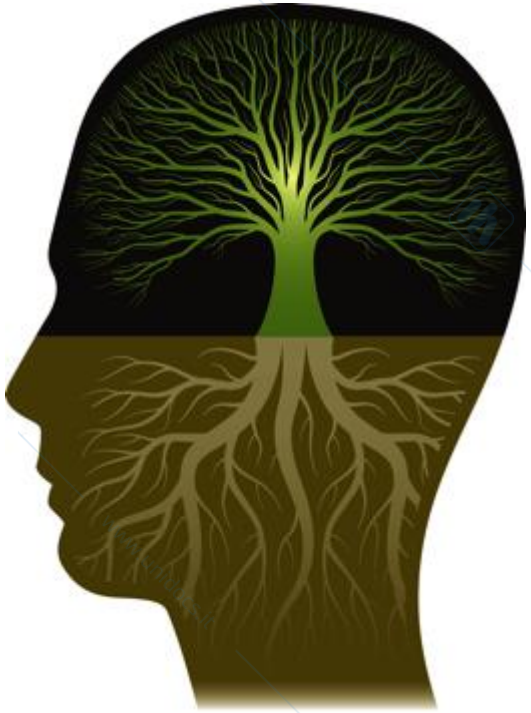
(i) Creating Value: How to Eliminate Waste? MyWaste Example from an Italian Company



(i) Creating Value: Causes and Effects of Wastes

(i) Creating Value: The object of the wastes.

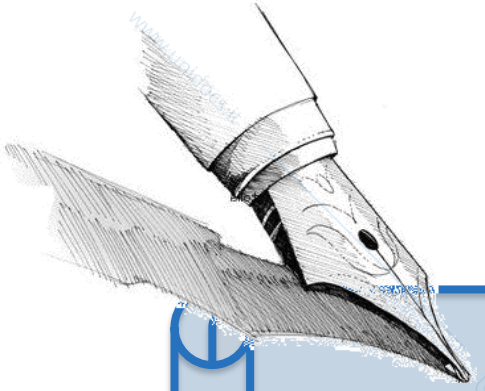
Waste of knowledge



Waste of resources

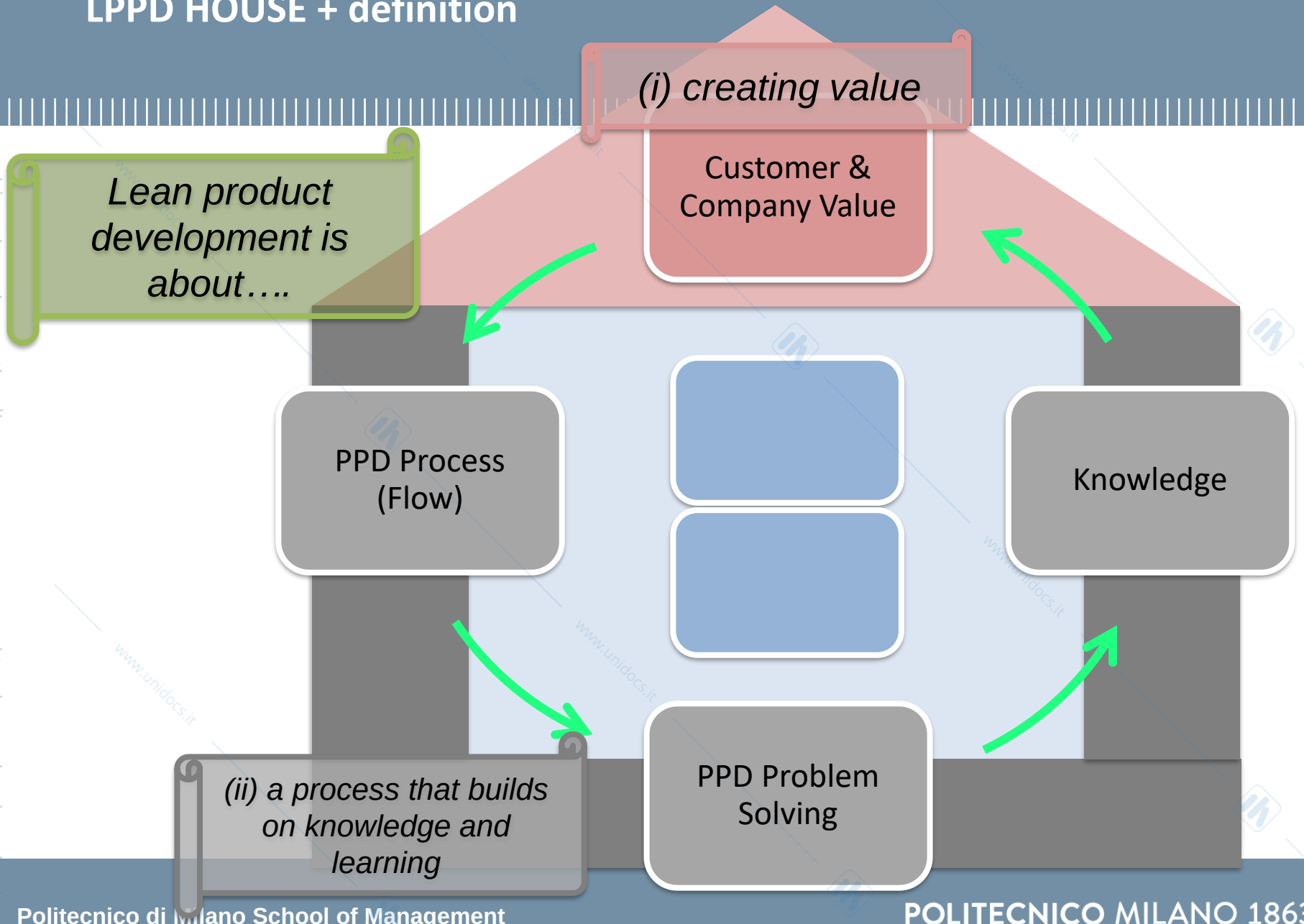
Waste of time

How Lean Thinking Applies in Product Development

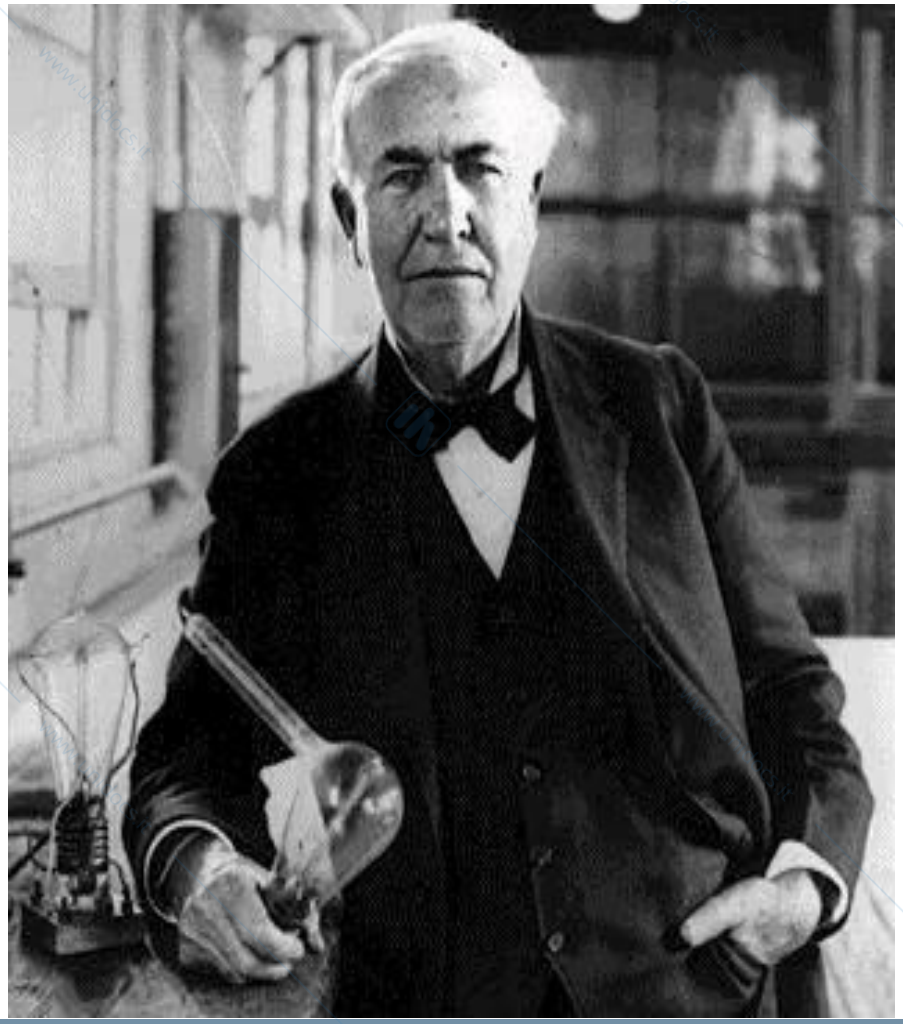


*Lean product development is about (i) creating value through **(ii) a process that builds on knowledge and learning** enabled by (iii) an integrated system (made of people, processes, and technology).*

LPPD HOUSE + definition



(ii) Build on Knowledge and Learning: Learn from Mistakes.

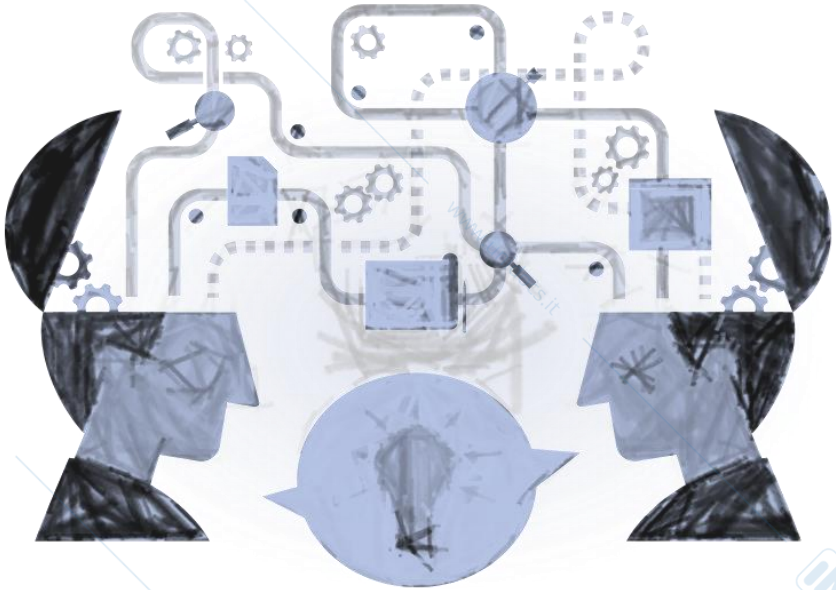


"I **have** not failed. I've just **found** 10,000 **ways** that won't **work**."
Edison was famous for never giving up in his search for the construction of the electric light bulb.

(ii) Value as Knowledge and Learning

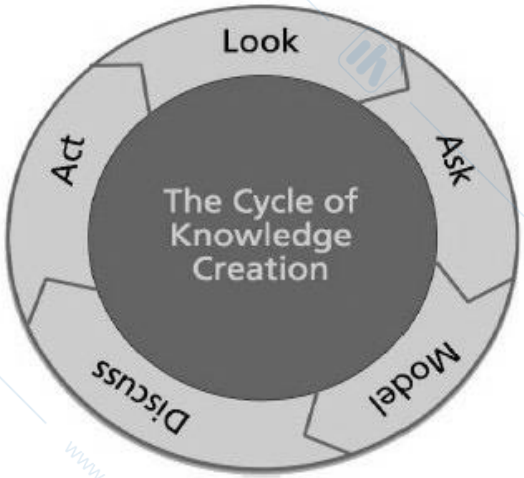
Lean Product Development promotes the dynamic **creation**, **sharing**, **use** and **re-use** of **knowledge**!

Value is creating
reusable knowledge!

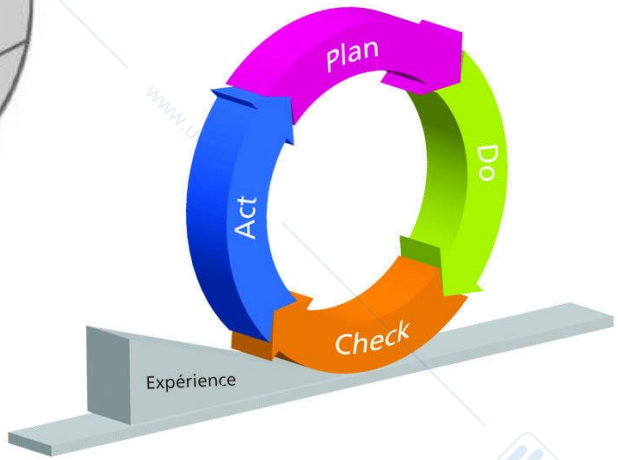


(ii) Value as Knowledge and Learning

There are many ways to create and formalize knowledge!

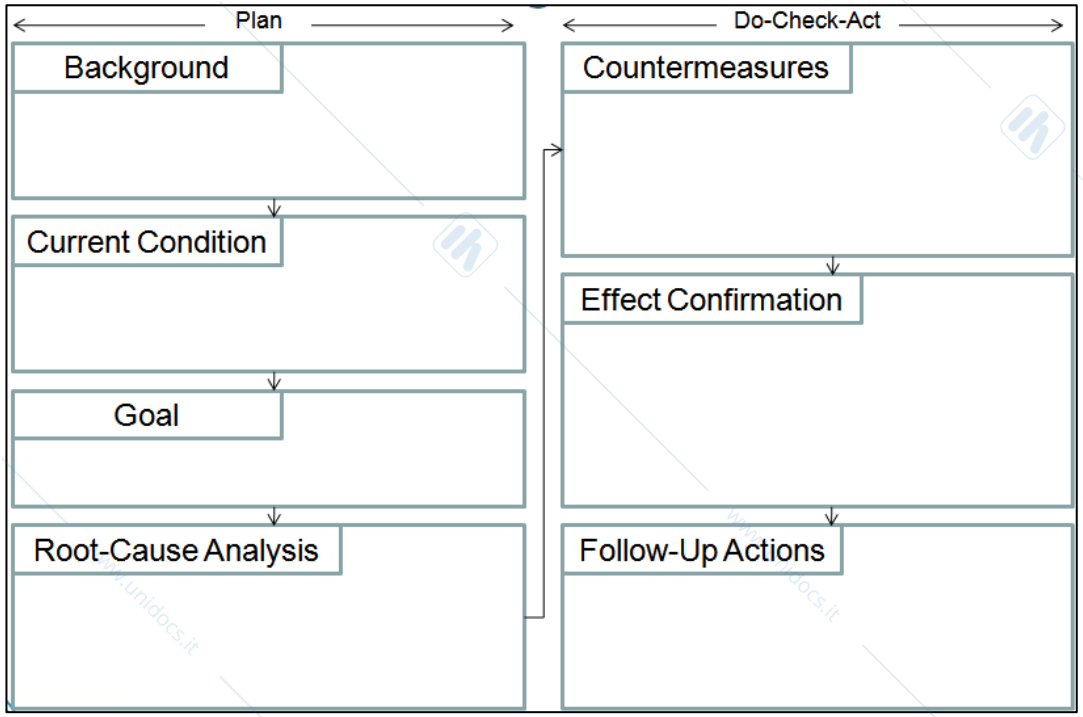


LAMDA

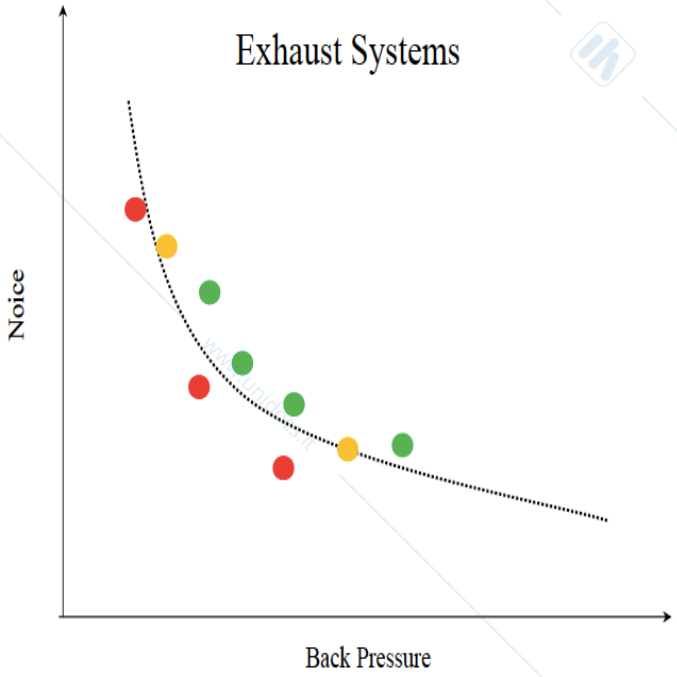


(ii) Value as Knowledge and Learning

There are many ways to **visualize** knowledge!



A3 SHEET



TRADE-OFF and LIMIT CURVES

Problem solving + Knowledge creation and formalization

(ii) Build on Knowledge and Learning: Learn from Mistakes.

The Challenge: **manned, controlled, and powered heavier-than-air flying machine**

When: 1899 -1903

Why were the Wright brothers successful, and What can we learn from them?

What they observed…?

That most other investigators were spending 5000 hours designing and building their aircraft and about 5 seconds testing it (before it crashed and usually killed them).

They did not believe this was a sensible approach.

So they focused their efforts on methods of experimentation:
"We thought that if some method could be found by which it would be possible to practice by the hour instead of by the second there would be hope of advancing the solution of a very difficult problem…and without any serious danger." **Wilbur Wright**

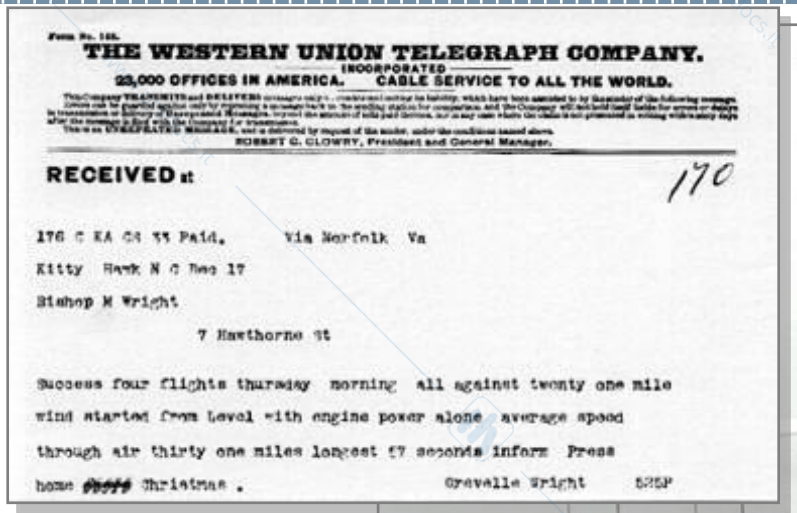
And they began experimenting!

Others tried and failed…

- many previous attempts had ended catastrophically
- many concurrent efforts
  - Langley (USA)
  - Chanute (USA)
  - Pearse (New Zealand)
  - Jatho (German)
  - Whitehead (USA)
  - Kress (Austrian)
  - Others
- most were:
  - better educated
  - better funded

Story by Kent Harmon from Targeted Convergence

History records they were successful…



THE WESTERN UNION TELEGRAPH COMPANY.
INCORPORATED
23,000 OFFICES IN AMERICA. CABLE SERVICE TO ALL THE WORLD.

ROBERT C. CLOWRY, President and General Manager.

RECEIVED at 170

176 C KA CS 55 Paid. Via Norfolk Va

Kitty Hawk N C Dec 17

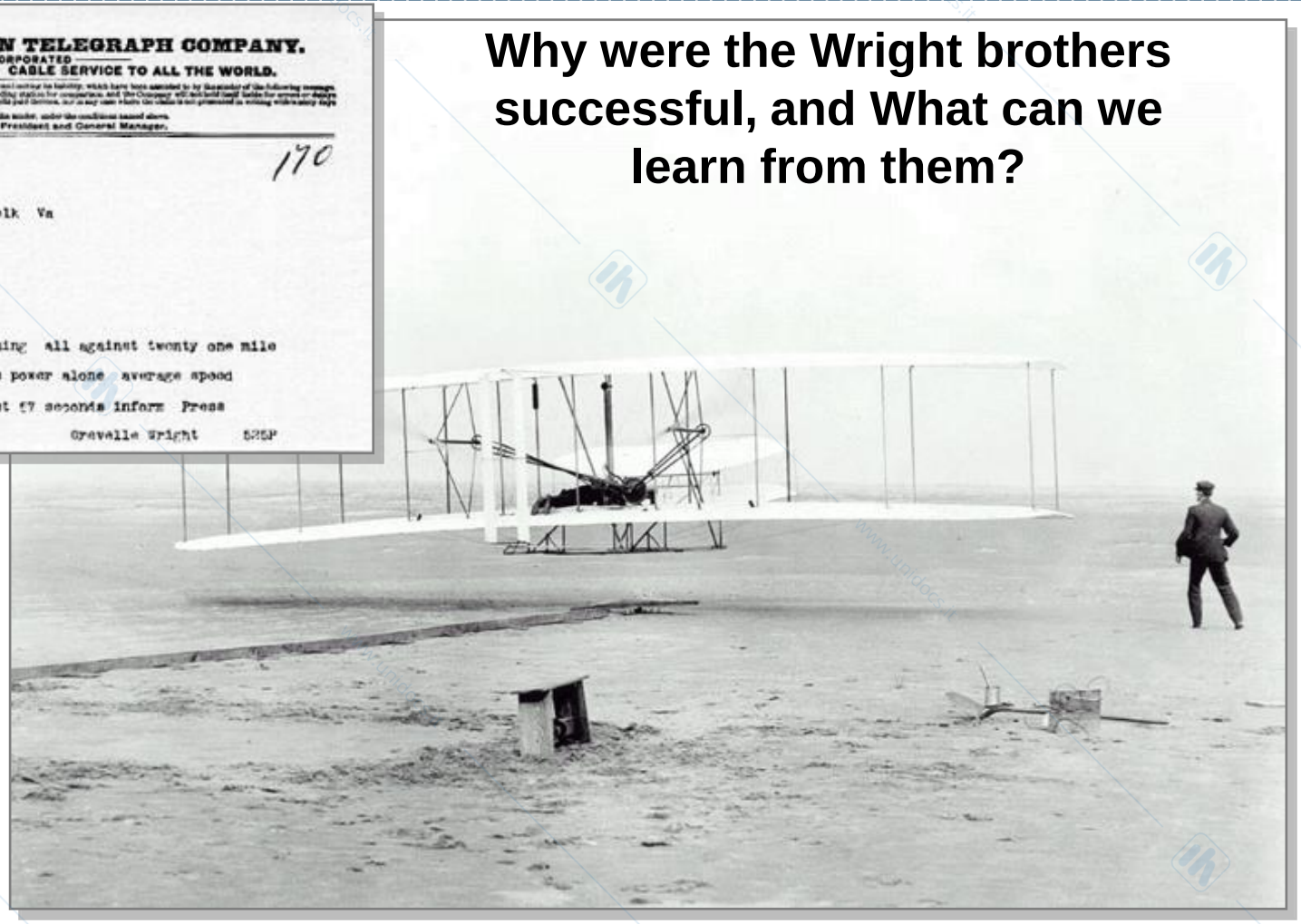
Bishop M Wright

7 Hawthorne St

Success four flights thursday morning all against twenty one mile wind started from Level with engine power alone average speed through air thirty one miles longest 57 seconds inform Press home [redacted] Christmas .

Orevalle Wright 525P

Why were the Wright brothers successful, and What can we learn from them?



They began by Observing

- Most other investigators were spending **thousands of hours designing** their aircraft and **5 seconds testing** it…

  (*before it crashed and usually killed them*).

- They did not believe this was a sensible approach, so they focused their efforts on methods of **experimentation**:

"We thought that if some method could be found by which it would be possible to practice by the hour instead of by the second there would be hope of advancing the solution of a very difficult problem…and without any serious danger."

Wilbur Wright

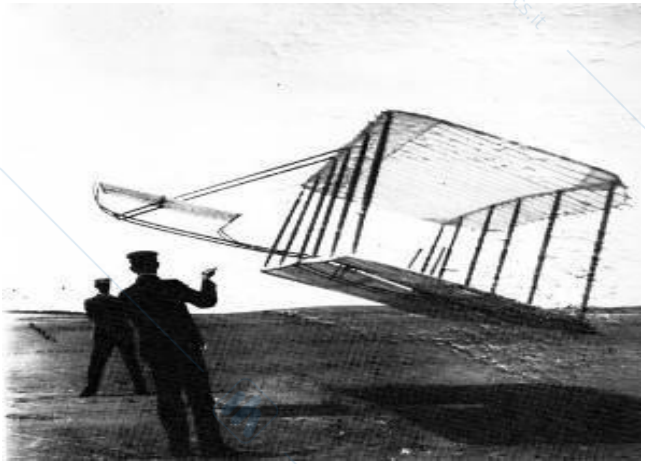
…and began experimenting.

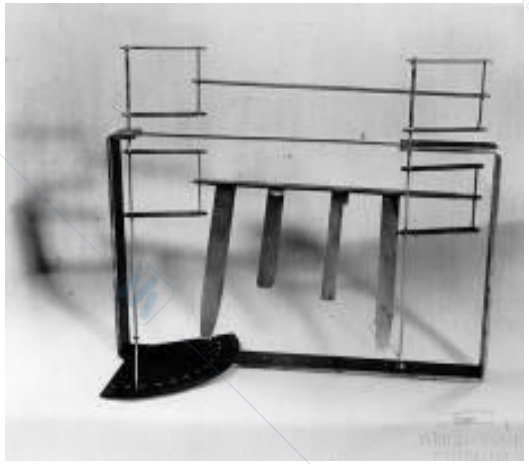
They focused their experiments

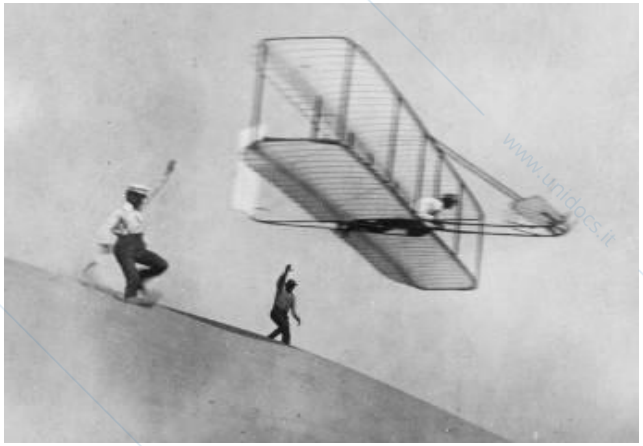
- They identified three critical knowledge gaps that need to be closed for successful flight:
  - Lift
  - Control
  - Propulsion

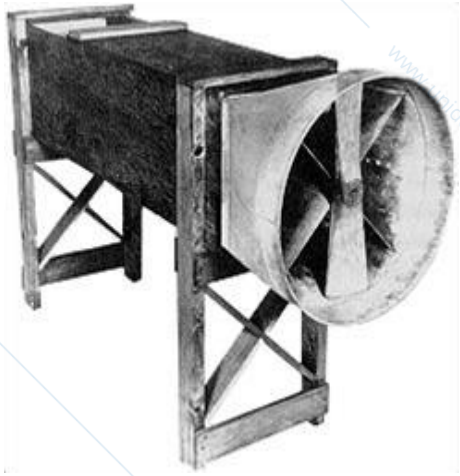
- They focused on each independently – and nothing else until all were closed.

(ii) Build on Knowledge and Learning: Learn from tests and experiments.

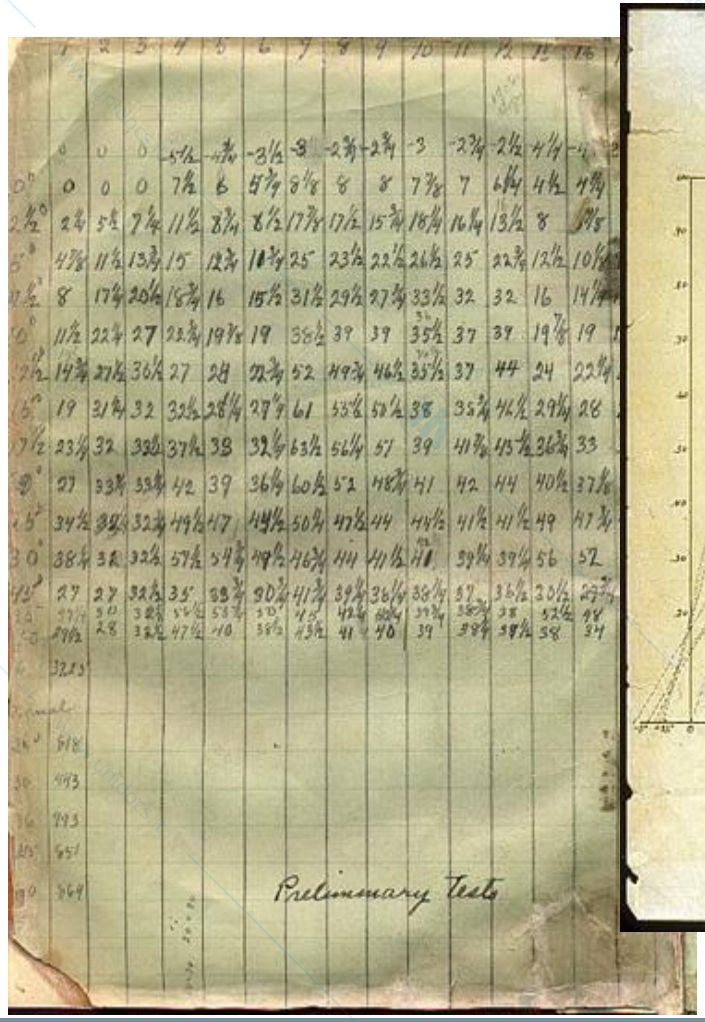


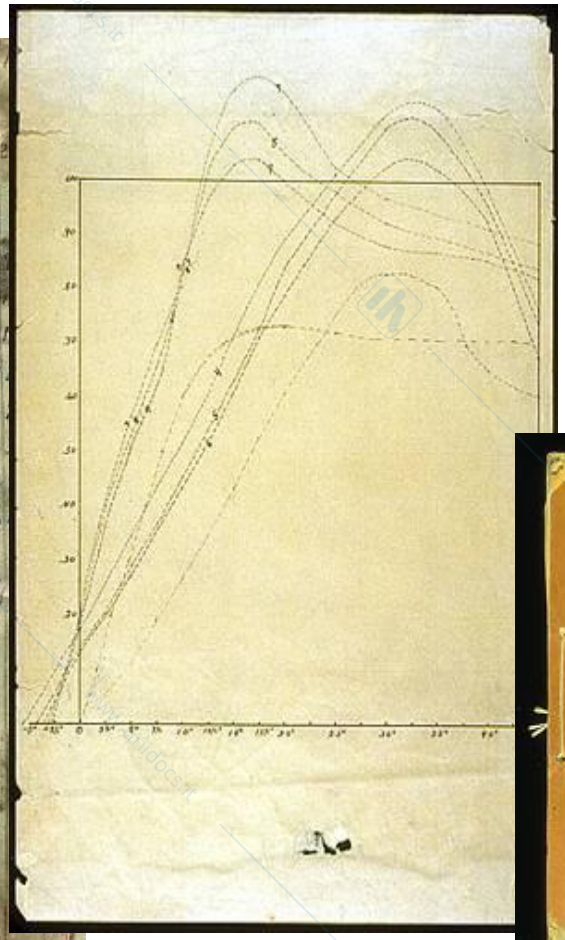


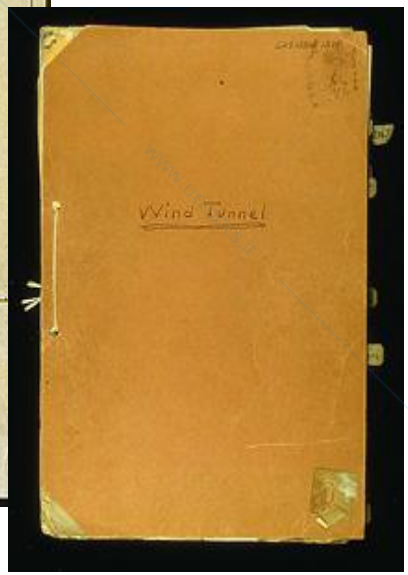




(ii) Build on Knowledge and Learning: Learn from tests and experiments.







Meticulously recorded results.

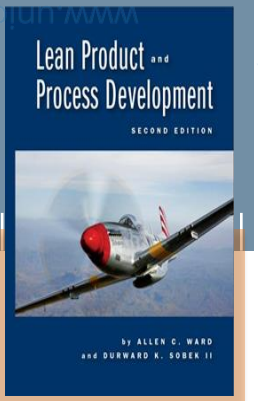
Generalizing and visualizing the Knowledge.

Lessons from the Wright Brothers

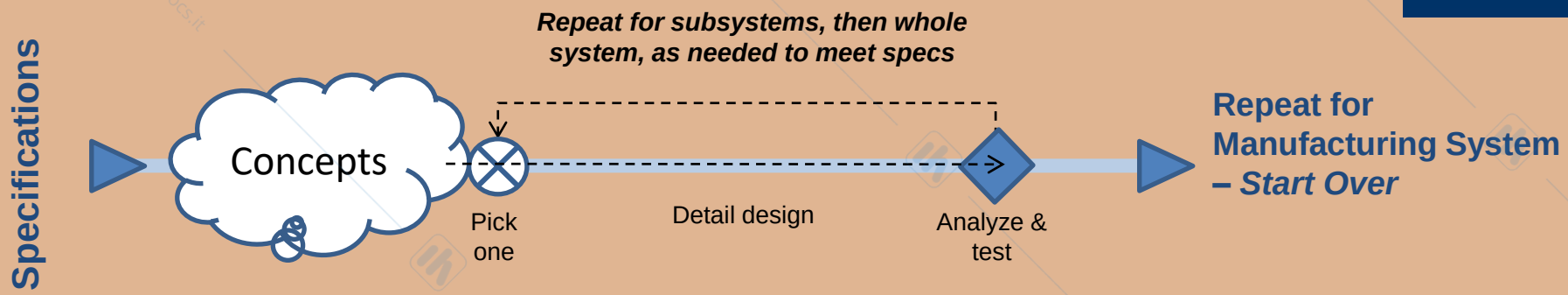
- Began with deep, thorough, extensive **observation**.
- Identified the key **knowledge gaps** and turned their focus to just those.
- Set an **objective**, but **not the solution**.
- **Tested** extensively using **rapid prototyping** of **alternative components and subsystems** (not the whole plane) to discover **limits** and **trade-offs**.
- The **plane design came last –** an integration of the knowledge gained from observation and testing.

Set-Based *Thinking*

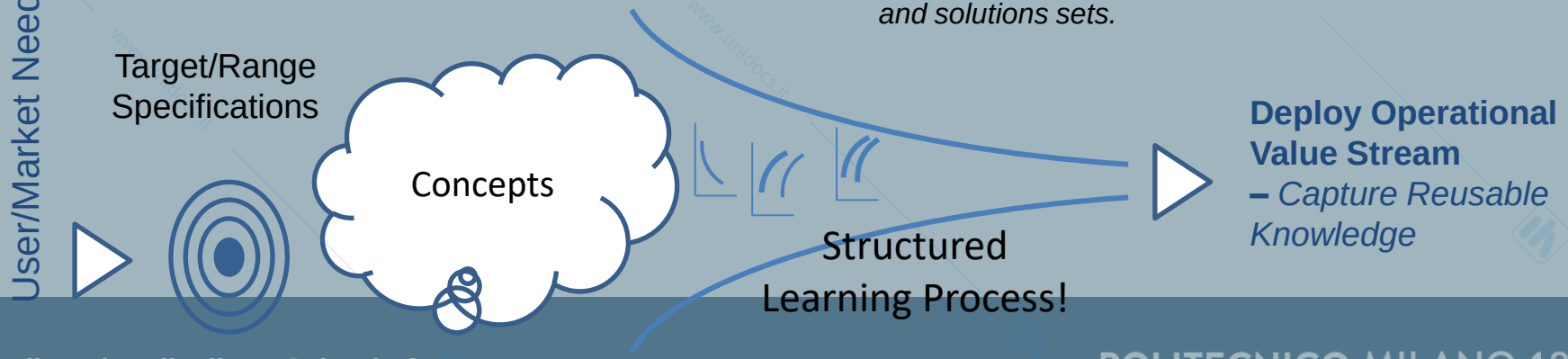
From Ward and Sobek
Lean Product and Process Development, 2014



Conventional Development - Point-Based

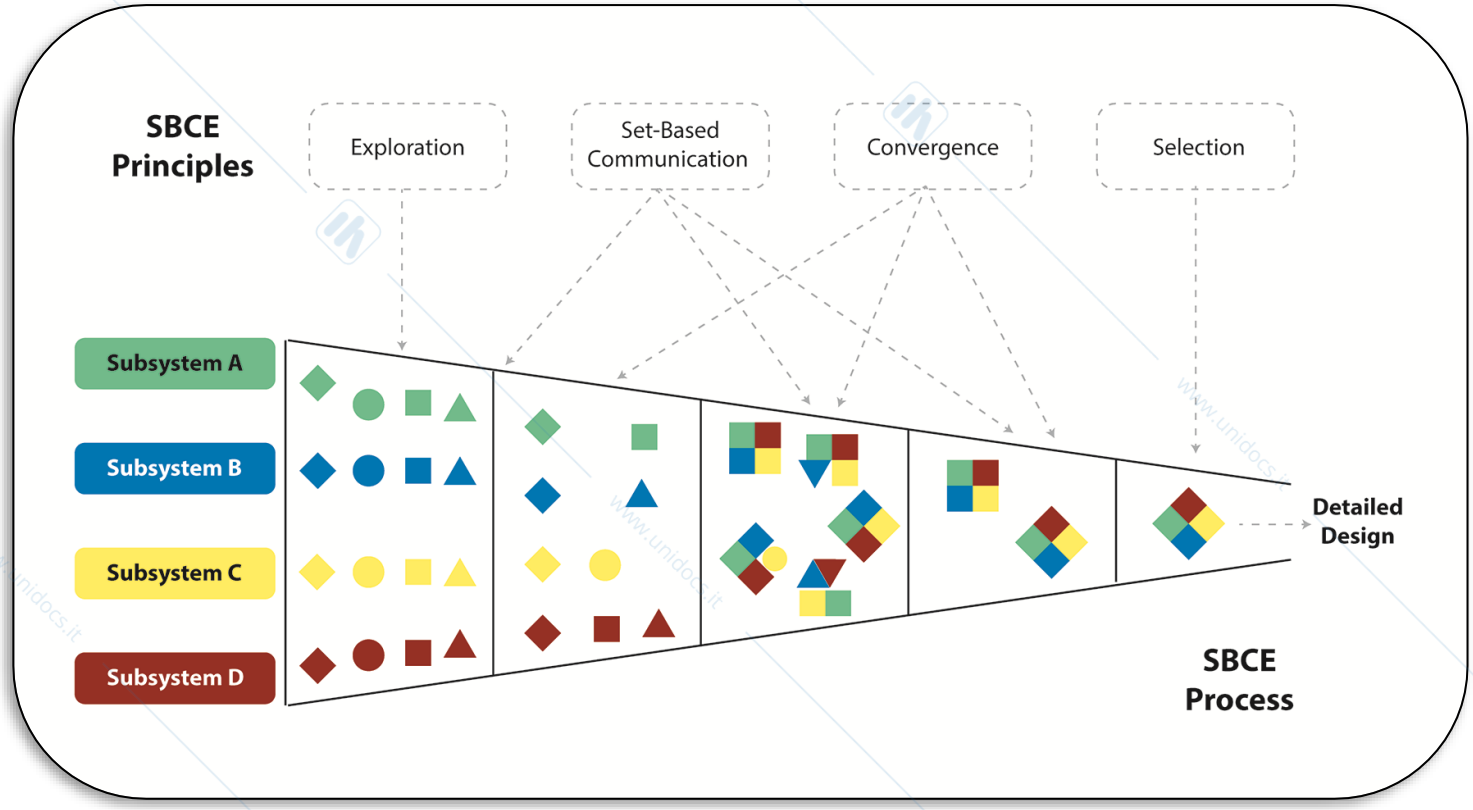


Set-Based *Innovation*



(ii) Value as Knowledge and Learning: Set-Based Concurrent Engineering (SBCE)

*SBCE is a "PD paradigm in which alternative **sets** are explored and **progressively converged** through extensive **integration** and re-using product and process **knowledge**"*



(ii) Value as Knowledge and Learning: SBCE Principles

Principle One – **Map the Design Space**

i. Define Feasible Regions
ii. Explore Trade-Offs by Designing Multiple Alternatives
iii. Communicate Sets of Possibilities

Principle Two – **Integrate by Intersection**

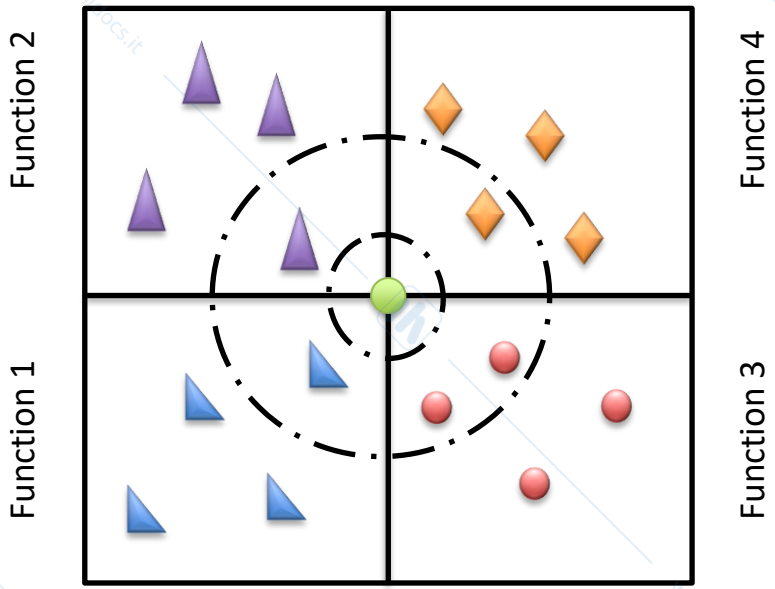
i. Look for Intersections of Feasible Sets
ii. Impose Minimum Constraint
iii. Seek Conceptual Robustness

Principle Three – **Establish Feasibility before Commitment**

i. Narrow Sets Gradually while Increasing Detail
ii. Stay within Sets Once Committed
iii. Control by Managing Uncertainty at Process Gates

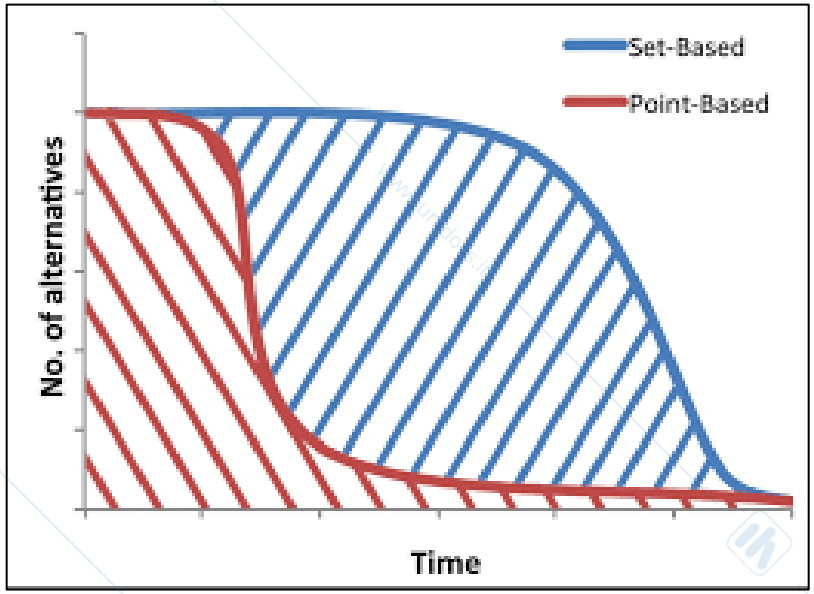
(Sobek, Ward, & Liker, 1999)

(ii) Value as Knowledge and Learning: SBCE Principle 1



Map the Design Space

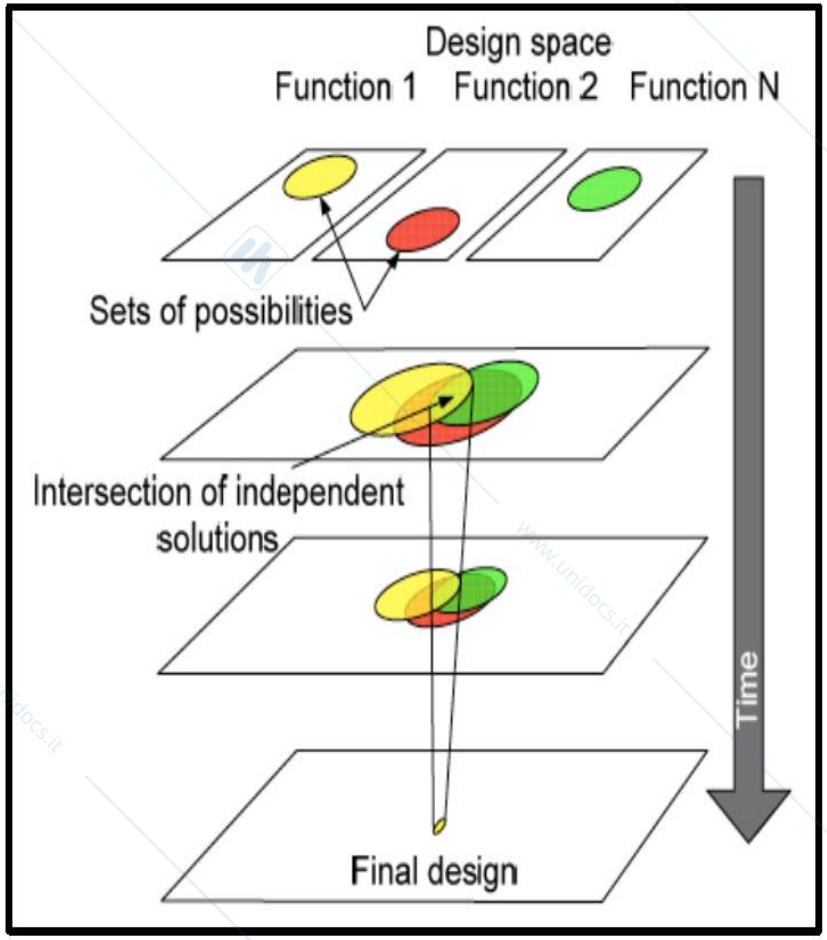
- Increasing the flexibility of system
- Reaching to a optimum solution which works with the whole system
- Decreasing the number of iterations



(ii) Value as Knowledge and Learning: SBCE Principle 2

Integrate by Intersections

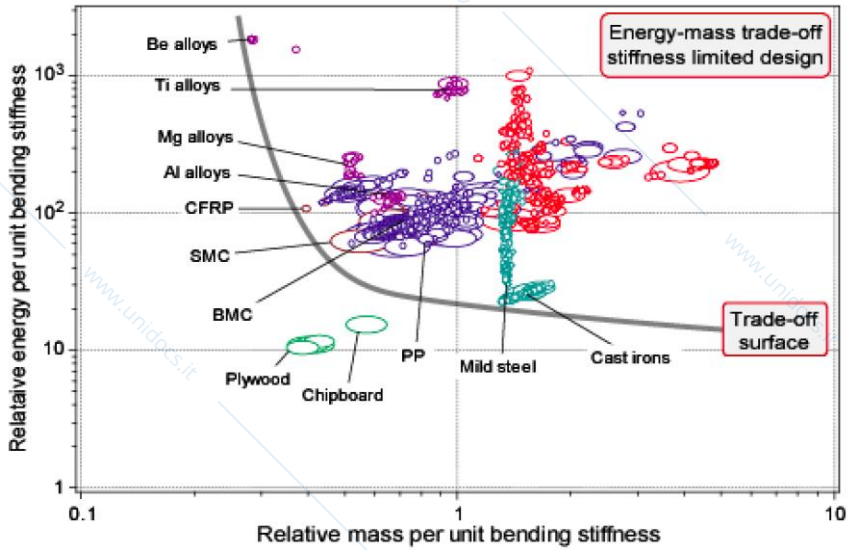
- Delaying decisions
- Knowldge sharing among stages

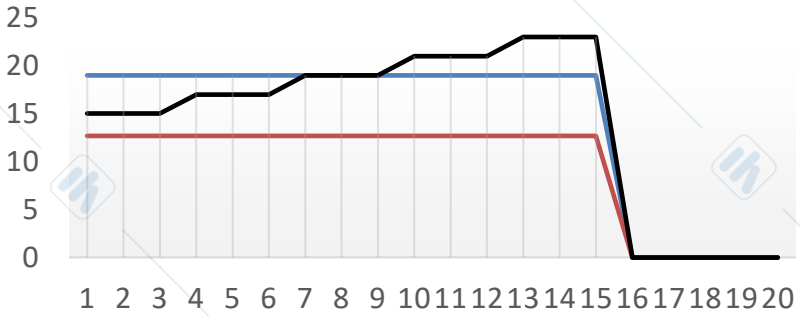


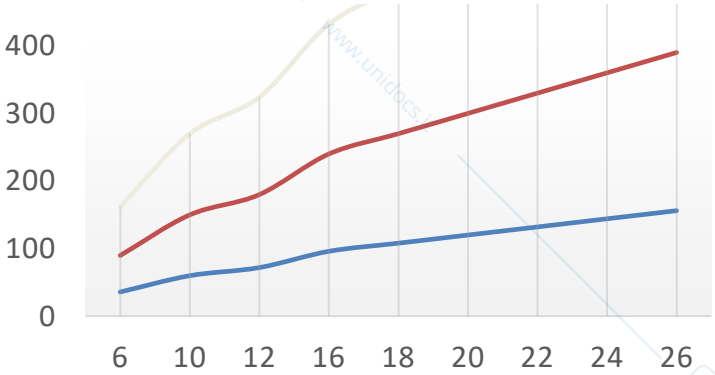
(ii) Value as Knowledge and Learning: SBCE Principle 3

Establish Feasibility before Commitment

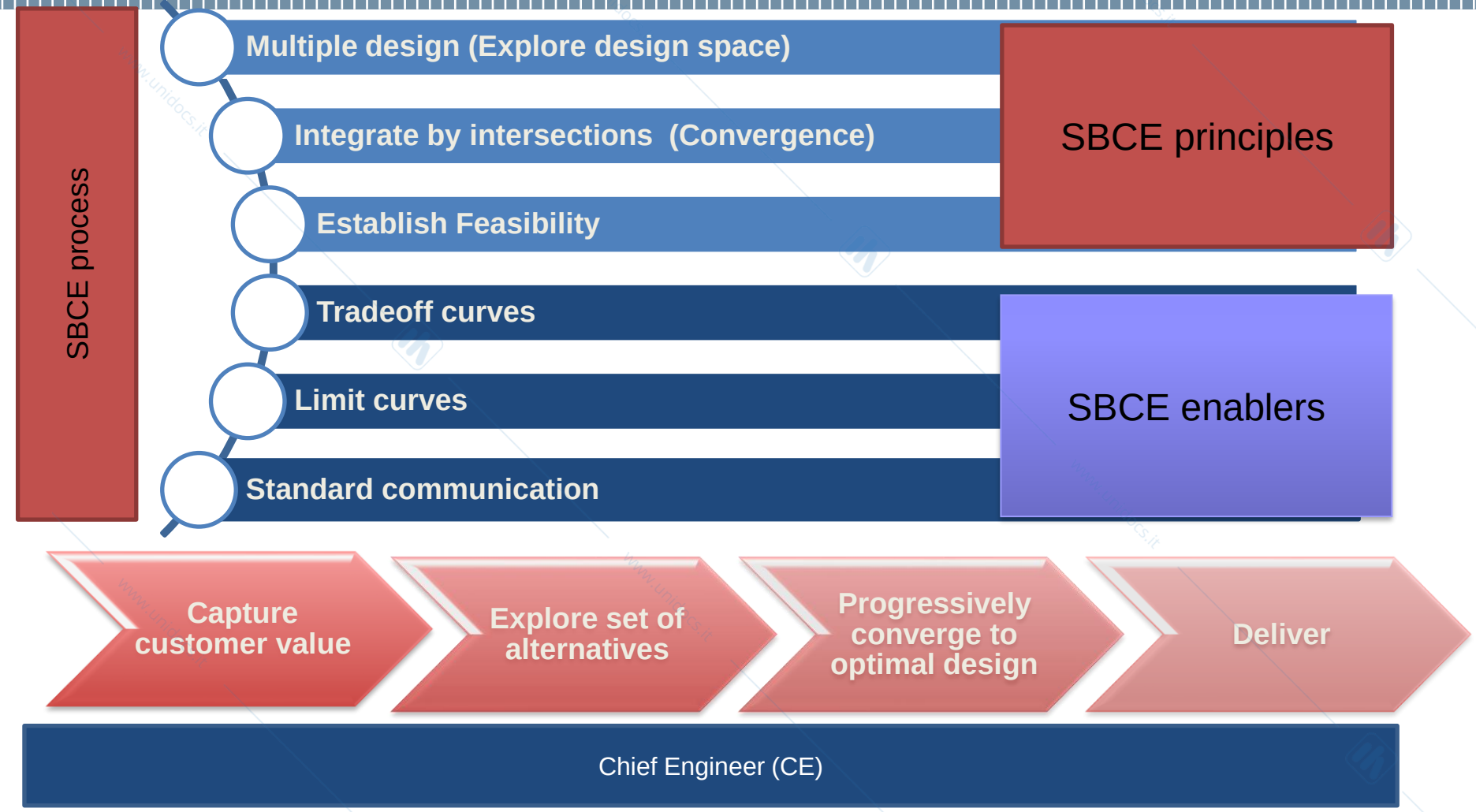
- Narrowing solutions which are not feasible
- Allowing the process to convergence toward the optimal solution
- Use of quick knowledge tools (e.g. trade-off and limit curves)





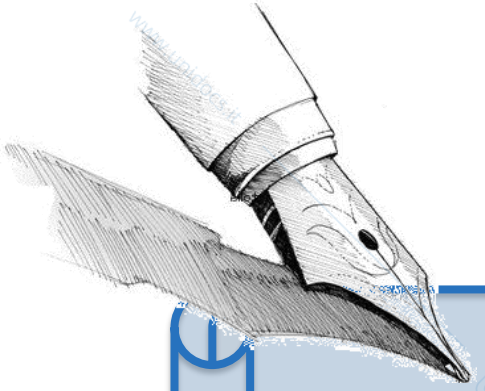


(ii) Value as Knowledge and Learning: SBCE Principles and Enablers



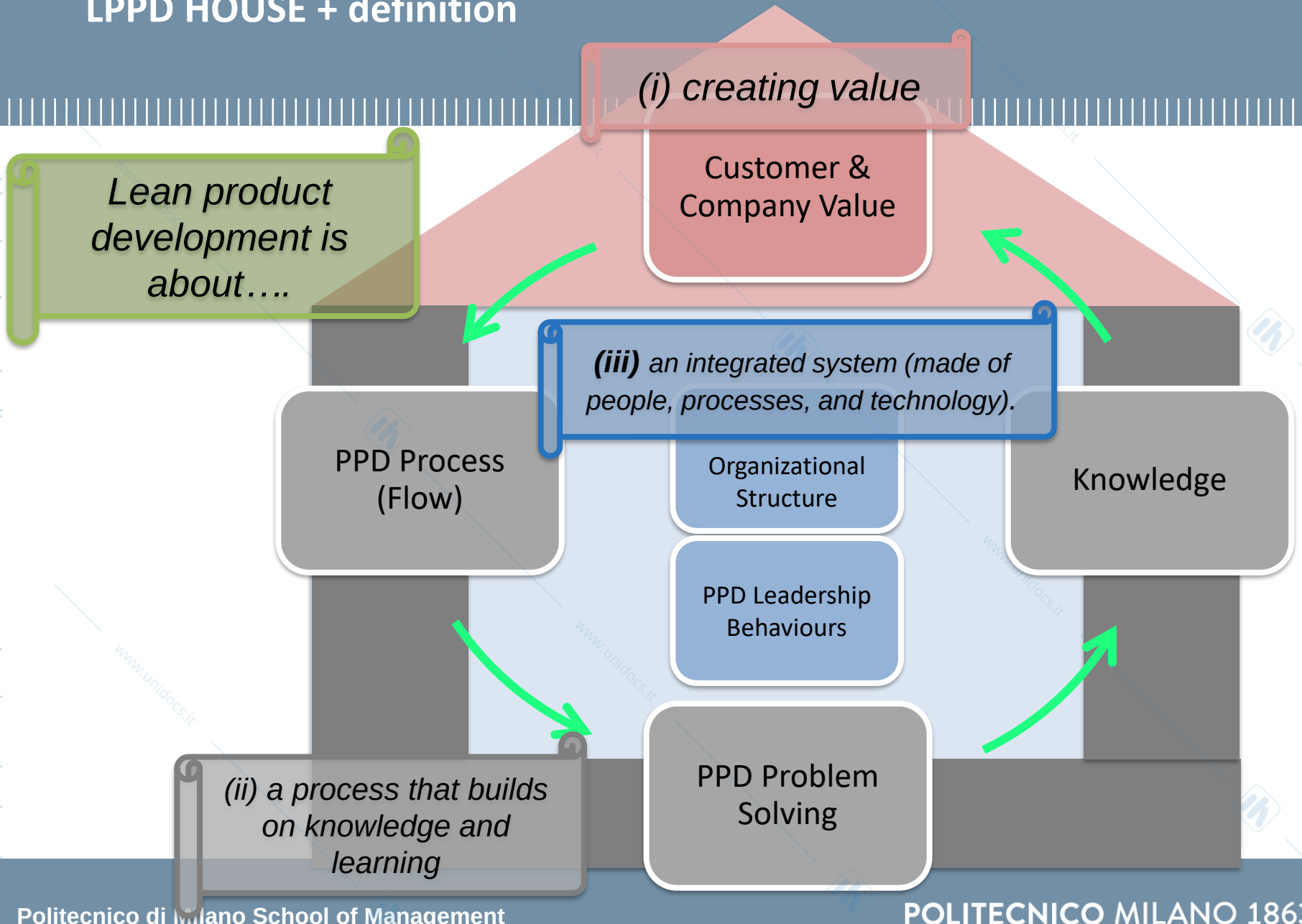
Adapted from Ward (2007), Morgan and Liker (2006)

How Lean Thinking Applies in Product Development



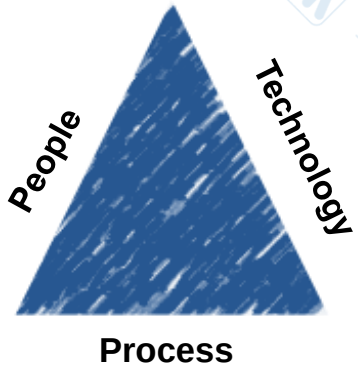
Lean product development is about (i) creating value through (ii) a process that builds on knowledge and learning enabled by ***(iii) an integrated system*** *(made of people, processes, and technology).*

LPPD HOUSE + definition



(iii) System Integration (People, Process, Technology)

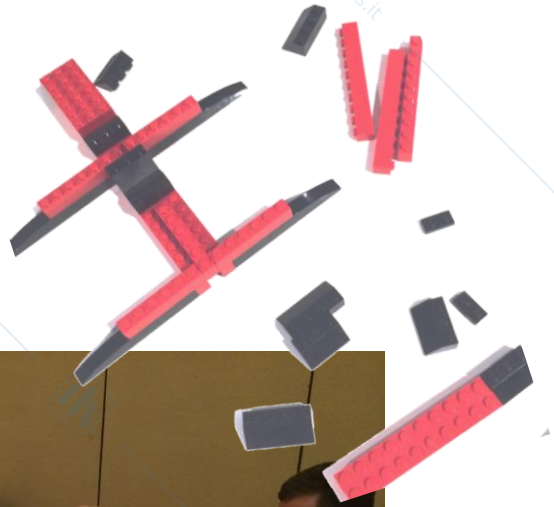
Morgan & Liker's 13 principles for lean product development

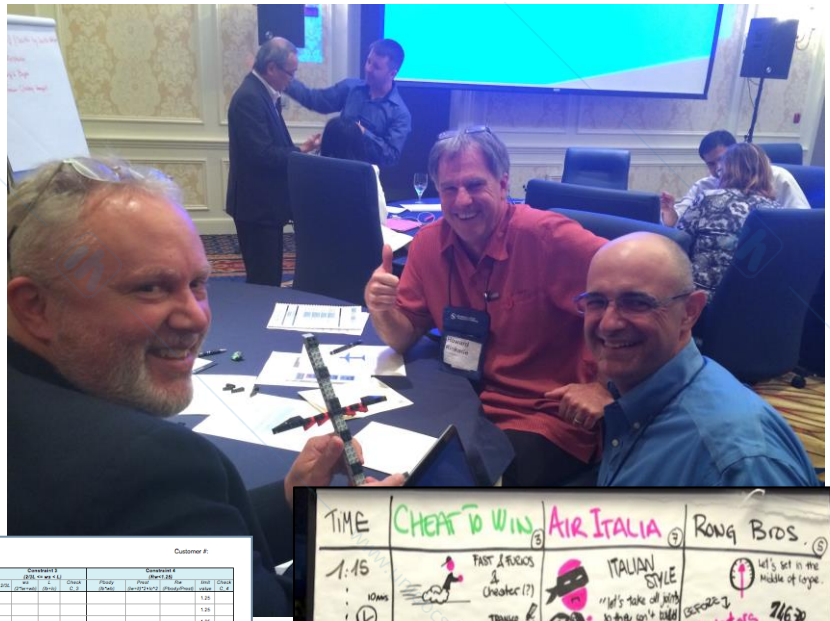


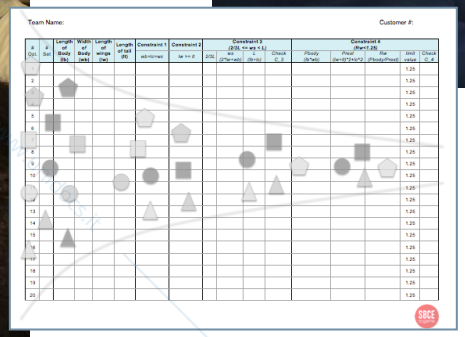
1. **Customer-Defined Value separated from Waste.**
2. **Front-Load the PD Process to Explore Alternative Solutions**
3. **Leveled Product Development Process Flow**
4. **Utilize Standardization**

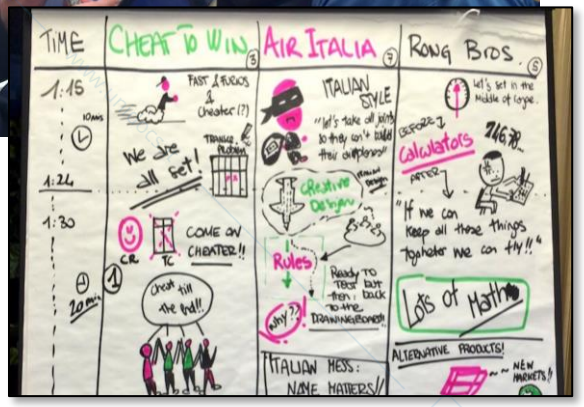
(iii) System Integration (People, Process, Technology)

SBCE game







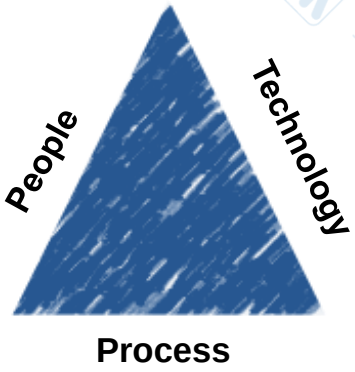


http://www.sbcegame.polimi.it

(iii) System Integration (People, Process, Technology)

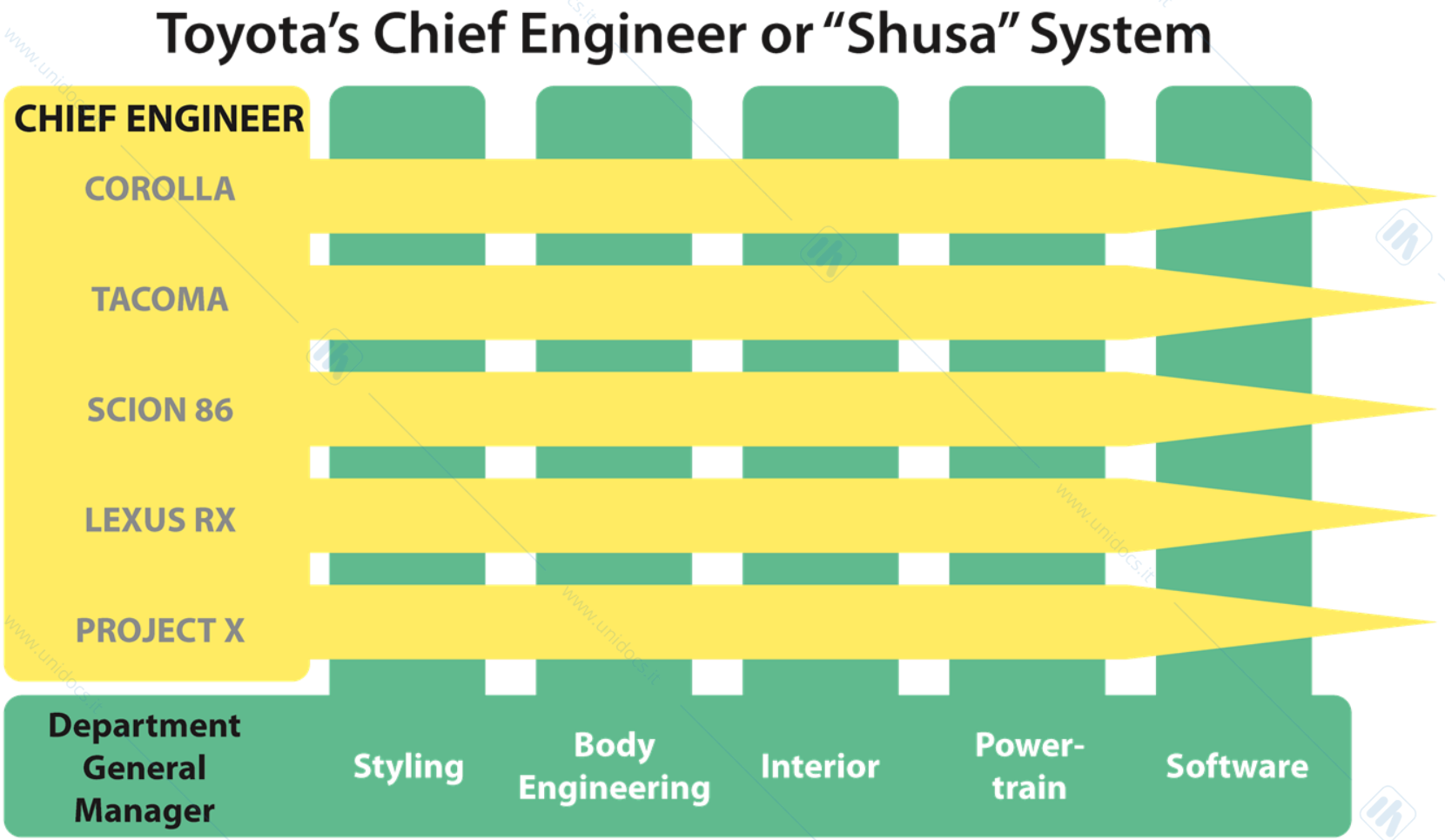
Morgan & Liker's 13 principles for lean product development

5. **Chief Engineer System**
6. **Cross-functional Integration**
7. **Technical Competence in all Engineers**
8. **Fully Suppliers integration**
9. **Learning and Continuous Improvement**
10. **Culture to Support Relentless Improvement**



1. **Customer-Defined Value separated from Waste.**
2. **Front-Load the PD Process to Explore Alternative Solutions**
3. **Leveled Product Development Process Flow**
4. **Utilize Standardization**

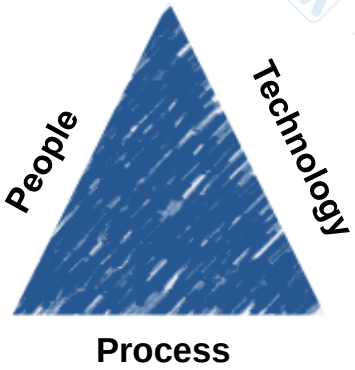
(iii) System Integration (People, Process, Technology)



(iii) System Integration (People, Process, Technology)

Morgan & Liker's 13 principles for lean product development

5. **Chief Engineer System**
6. **Cross-functional Integration**
7. **Technical Competence in all Engineers**
8. **Fully Suppliers integration**
9. **Learning and Continuous Improvement**
10. **Culture to Support Relentless Improvement**



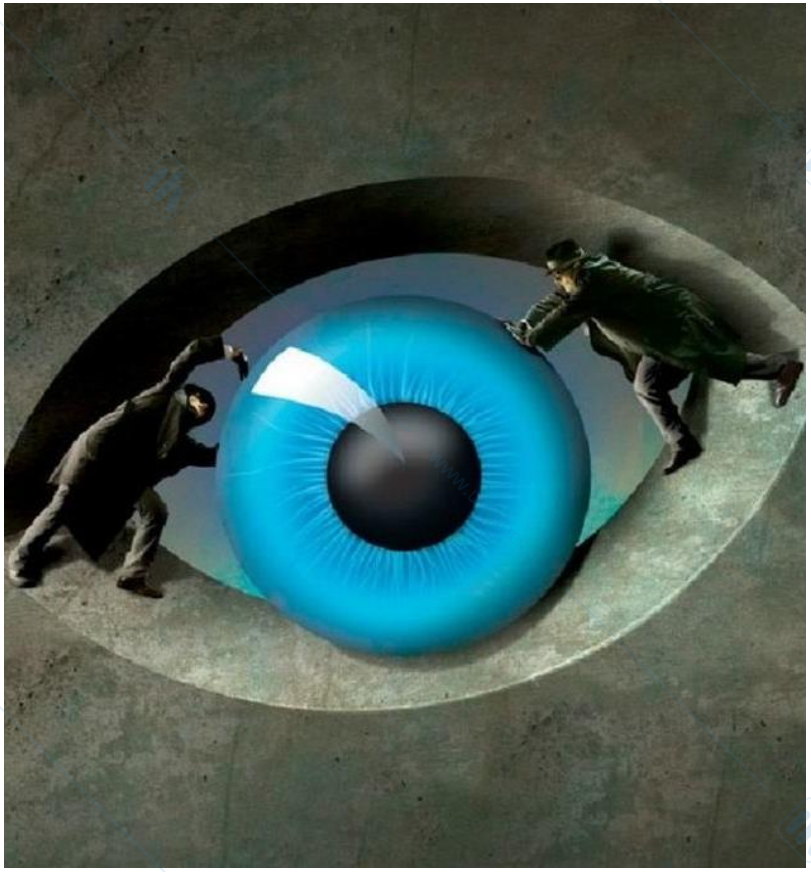
11. **Adapt Technology to Fit your People and Process.**
12. **Simple, Visual Communication.**
13. **Standardization and Organizational Learning.**

1. **Customer-Defined Value separated from Waste.**
2. **Front-Load the PD Process to Explore Alternative Solutions**
3. **Leveled Product Development Process Flow**
4. **Utilize Standardization**

(iii) System Integration (People, Process, Technology) – Visual Management

Visual representation of symbols and data of a project that fosters monitoring and management

Extensive use of images



(iii) System Integration (People, Process, Technology) – Visual Management

Effective

Easy

Direct

Simple

CATCHY

Clear

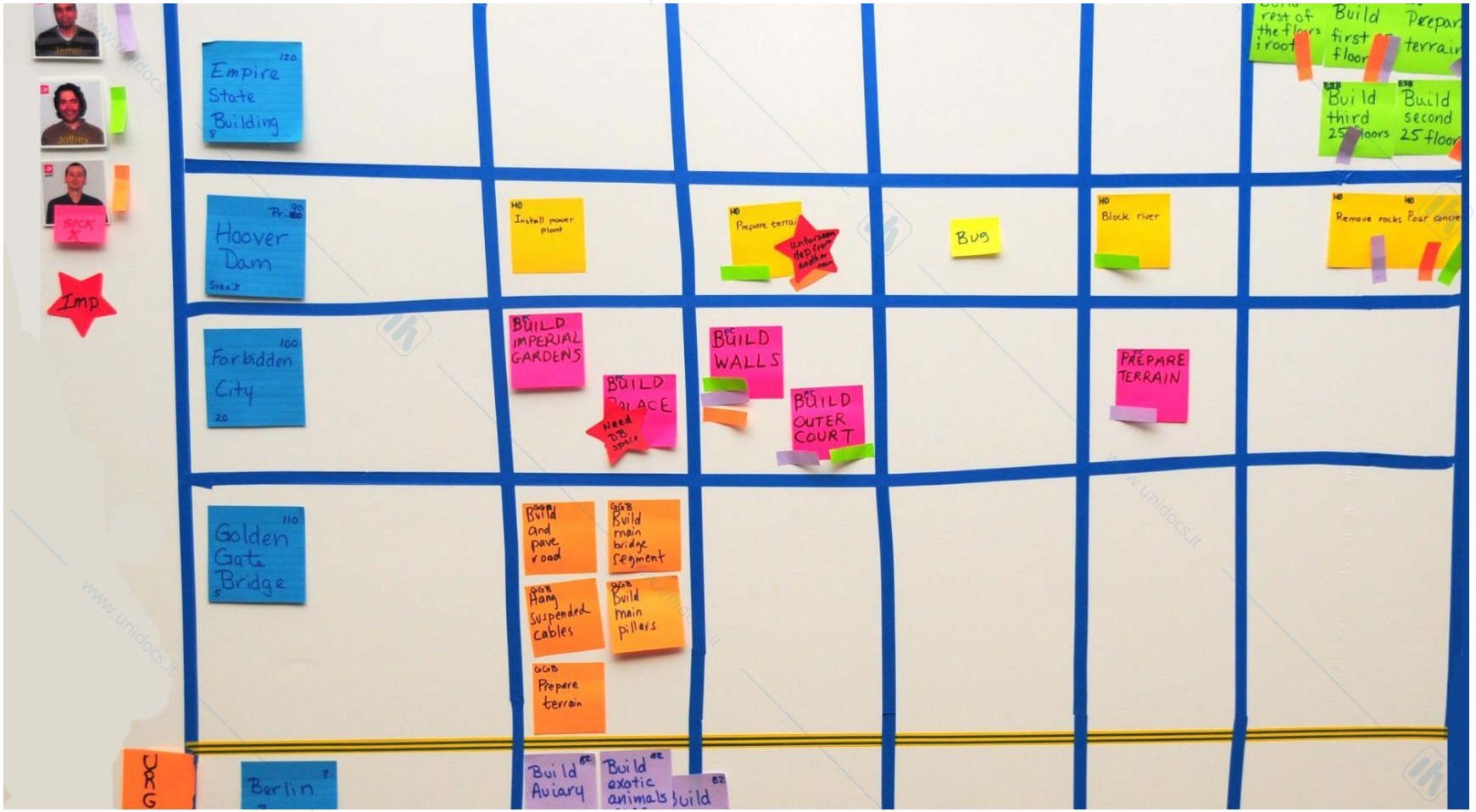
Last in memory

(iii) System Integration (People, Process, Technology) – Visual Management

Contents:

- Business Goals
- Graphs
- Project monitoring
- Task planning and specific objectives
- Roles
- Team workflow documents
- ….

(iii) System Integration (People, Process, Technology) – Visual Planning



(iii) System Integration (People, Process, Technology) – Issue Board

(iii) System Integration (People, Process, Technology) – A3 Sheet

1. Background

-The machine – XHM 100 is a machine for bearing (6209, 6308, 6309) assembly.

- Current losses from the non-effective resetting activities : 900 pieces /hour.

2. Current Condition

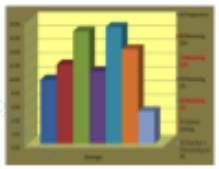
-Currently non-effective method / tools are used to reset the machine . This is because during the resetting, the technician is doing external set up as an internal set up.

-External set up which are done while the machine is still operating and do not require or involve the machine that is going to be set up while internal set up is the processes which are done when the machine completely stopped.

3. Future Goals

- The maximum time per resetting is 65 minutes. Based on current performance, the improvement on resetting time taken must be 50%.

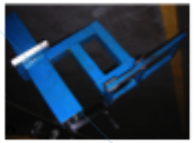
4. Root Cause Analysis



5. Countermeasures and Implementation

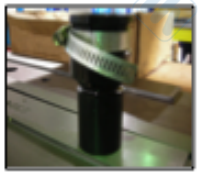
-The improvements will be followed by the Six Sigma and SMED principles.

Designer 1, Technician



Supporter

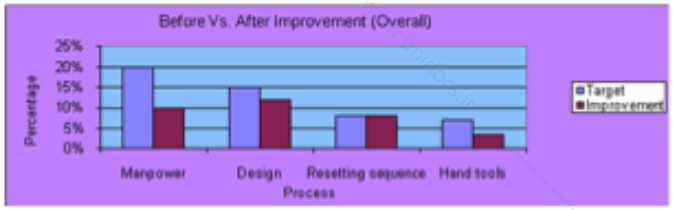
Designer 2, Technician



Bushing

Improvements	Target	In charge	Duration
Man Power	20%	Technician and Eng. Manuf.	2 months
Design (Supporter and Bushing)	15%	Designers (2) and Engineer, Procurements	4 months
Resetting Sequence	8%	Designers and Technician	2 months
Hand tools	7%	Technician	1 month
TOTAL	**50%**		**< 5 months**

6. Results

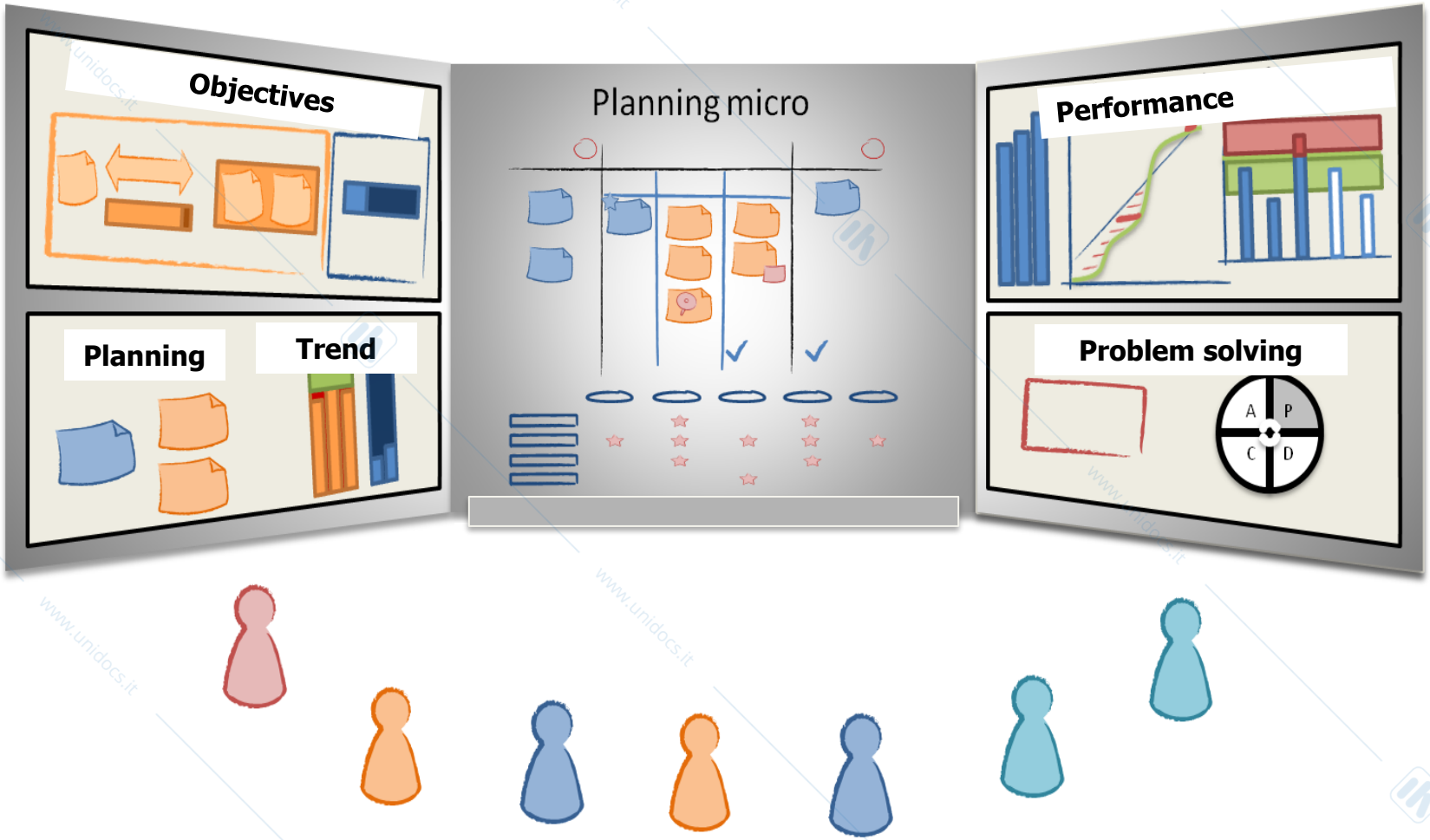


7. Follow-up Action

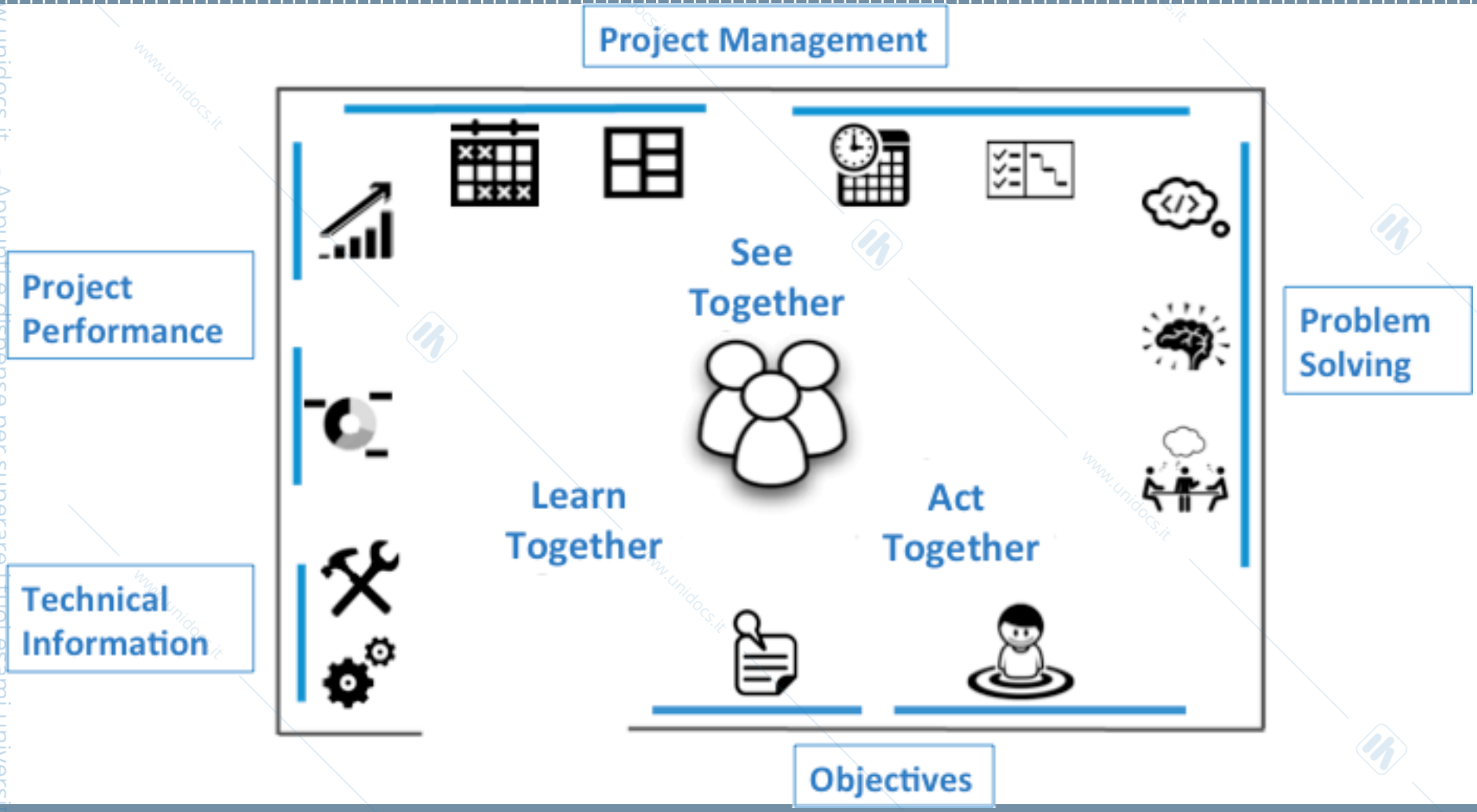
- Top management should provide training for technicians to improve their working skills and attitude.

- Company should apply Six Sigma and SMED to every processes, not only to the process that contribute higher losses in order to meet customer requirements.

(iii) System Integration (People, Process, Technology) – Obeya Room



(iii) System Integration (People, Process, Technology) – Obeya Room



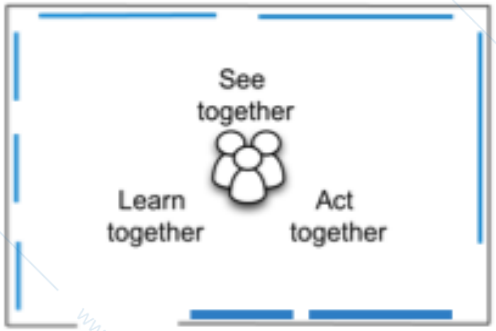
(iii) System Integration (People, Process, Technology) – Obeya Room

Project Management

- Macro plan
- Work plan matrix
- Task work
- Team plans

Project Performance

- KPIs (Cost, Quality, …)
- Measurements



Problem Solving

- A3
- Issue Board
- PDCA

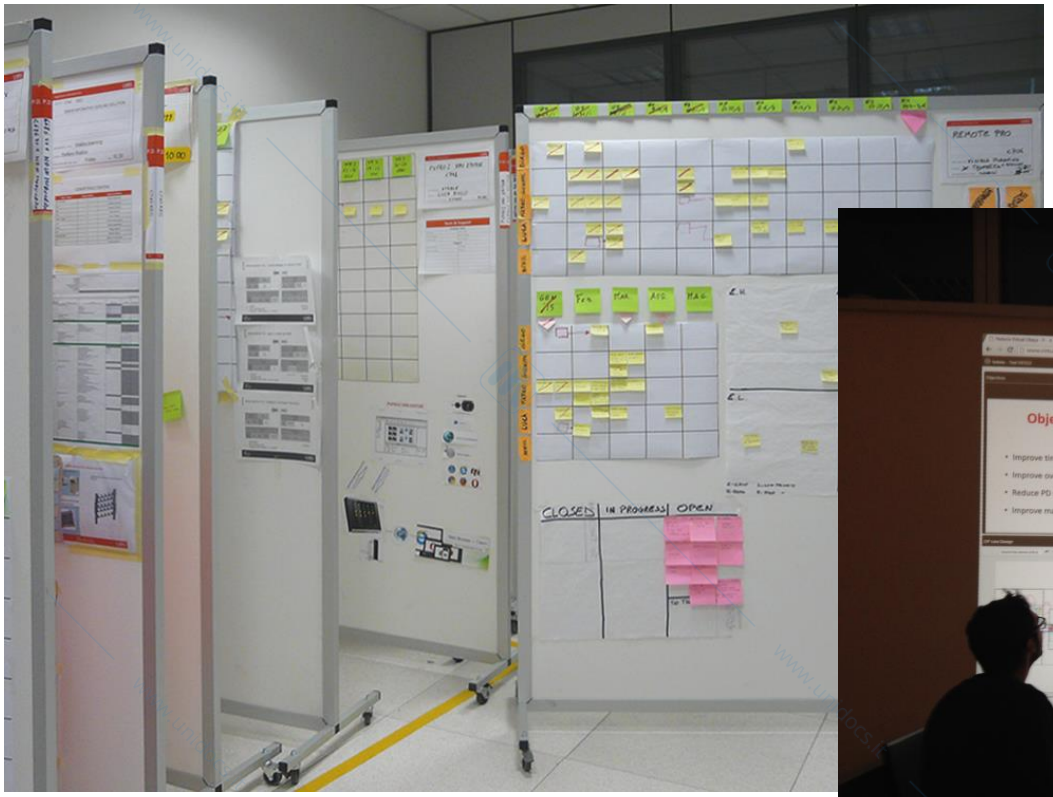
Technical Information

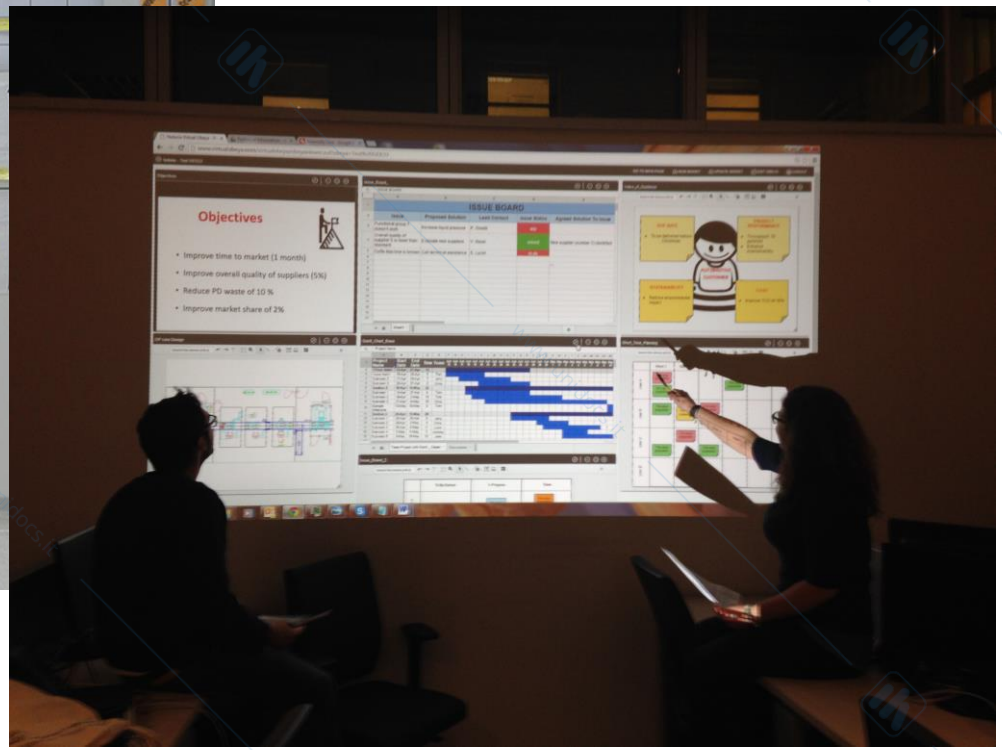
- Target Products
- Drawings
- Specifications

- Project Objectives
- Customer Value
- Voice of customer

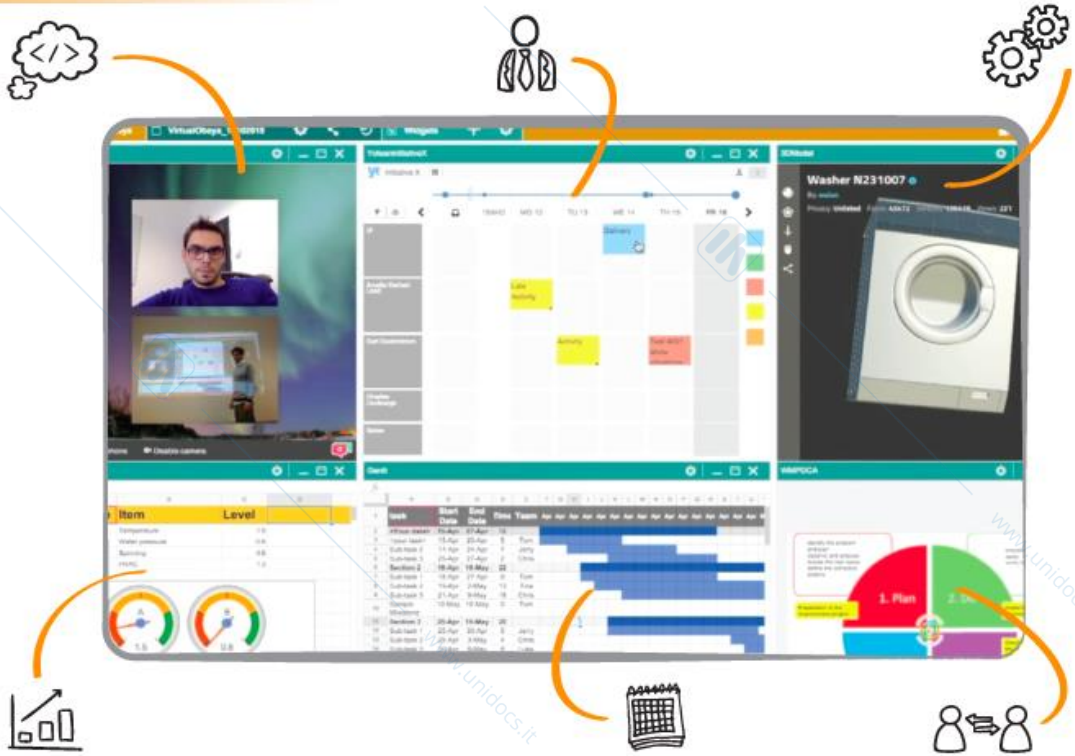
Objectives

(iii) System Integration (People, Process, Technology) – (Virtual) Obeya Room





(iii) System Integration (People, Process, Technology) – Virtual Obeya Room



VIEW VIDEO

https://www.youtube.com/watch?v=Z6814WqigNA&feature=youtu.be

Questions???

Thank You

Prof. Monica Rossi

monica.rossi@polimi.it

POLITECNICO
MILANO 1863

SCHOOL OF MANAGEMENT