



اجرا و مدیریت پروژه به روش اصول ناب (Lean Project Management)

فصل اول: مفاهیم، اصول و ابزارهای روش ناب (Lean)
بخش پنجم: چرخه بهبود مداوم (PDCA)

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What we will learn?

- ❑ Continuous improvement cycle
 - ❖ Concept
 - ❖ 12-Step PDCA Cycle
 - ✓ Plan
 1. Identify your problem
 2. Explain your problem
 3. Set goals and expectations
 4. Prepare an action plan
 - ✓ Do
 5. Collect data
 6. Analyze the facts
 7. Develop a solution
 8. Test the solution

What we will learn?

☐ Continuous improvement cycle

❖ Concept

❖ 12-Step PDCA Cycle

✓ Check

9. Ensure goals and expectations have been met

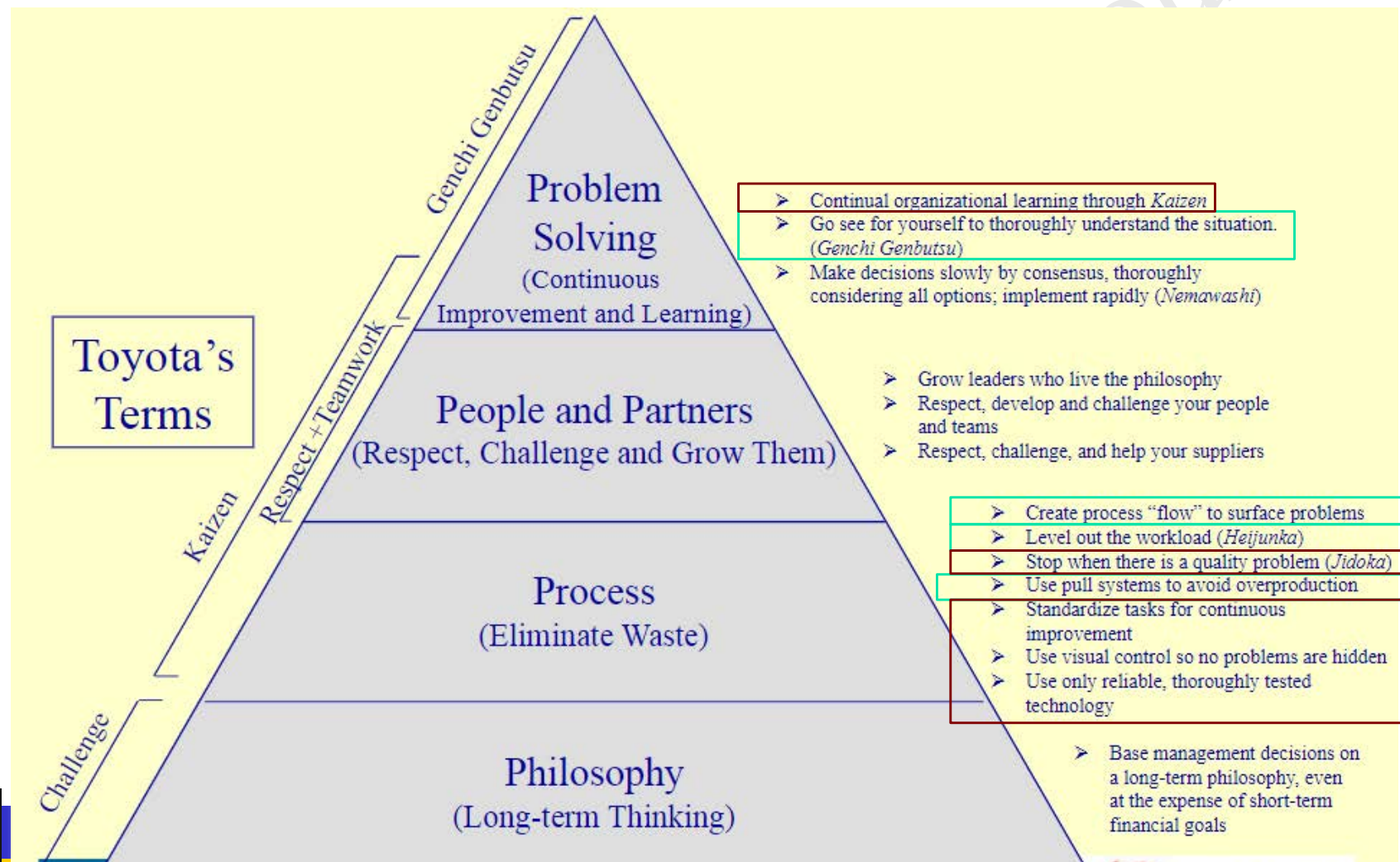
✓ Act

10. Continuously improve

11. Monitor solution

12. If goals are met implement fully

Lean – Principles (4P Model of the Toyota way)

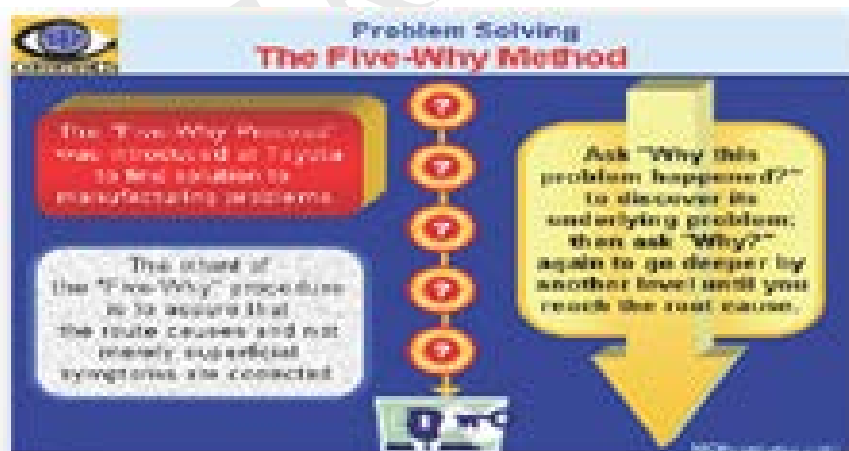


Principle 5

❑ Term: Solve quality problems immediately (Stop-the-line)

- ❖ Finds quality for customers as a driver for value
- ❖ Builds a culture of fixing problems

❑ Tool: 5 Whys Process and Mistake-Proofing Devices, *Jidoka*

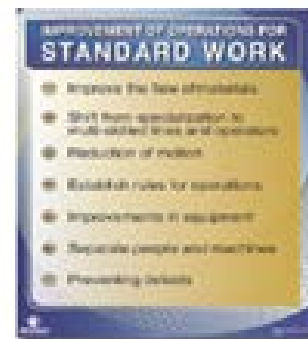


Principle 6

❑ **Term: Standardize work tasks and processes**

- ❖ Uses stable, repeatable methods whenever possible to increase predictability
- ❖ Captures the learning about a process by standardizing best practices
- ❖ Allows creative and individual expression to improve on the standard, then incorporate it into a new standard
- ❖ Uses checklists and procedural descriptions to show in pictures and tell in text how to complete a task

❑ **Tool: Standard Operating Procedures / Work Instructions**

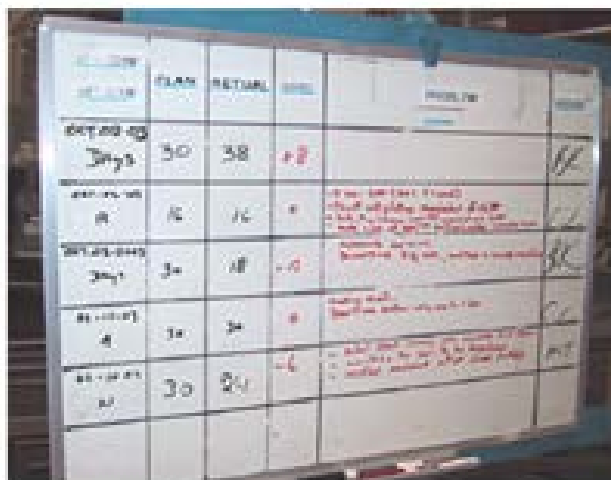


Principle 7

❑ Term: Implement visual control

- ❖ Use simple visual indicators to help people determine whether they are in standard conditions or not
- ❖ Designs simple visuals (keep your site organized)

❑ Tool: Visual Management



ITEM	PLAN	ACTUAL	DIFFERENCE
30x30	30	32	+2
30x40	10	11	+1
30x50	30	29	-1
30x60	30	29	-1
30x70	30	29	-1

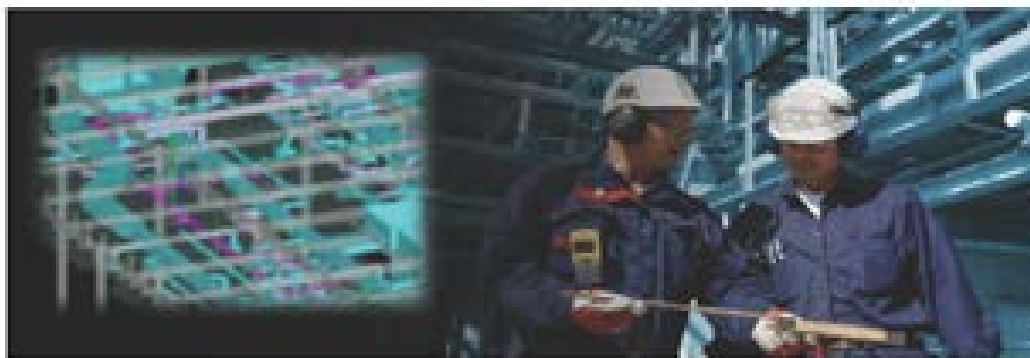


Principle 8

❑ **Term: Use only reliable technology, processes, practices and people**

- ❖ Uses technology to support activities (not to replace people)
- ❖ Encourages innovation

❑ **Tool: Building Information Modeling (BIM)**

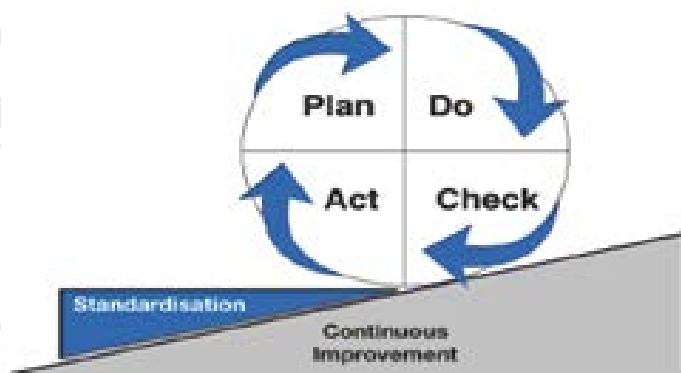


Principle 14

❑ **Term:** Develop and excellent organization through continuous improvement and reflection

- ❖ Looks for the root cause of inefficiencies and apply countermeasures
- ❖ Exposes failures and design a process of improvement

❑ **Tool:** PDCA and Kaizen Events



Continuous Improvement Cycle

(Concept)

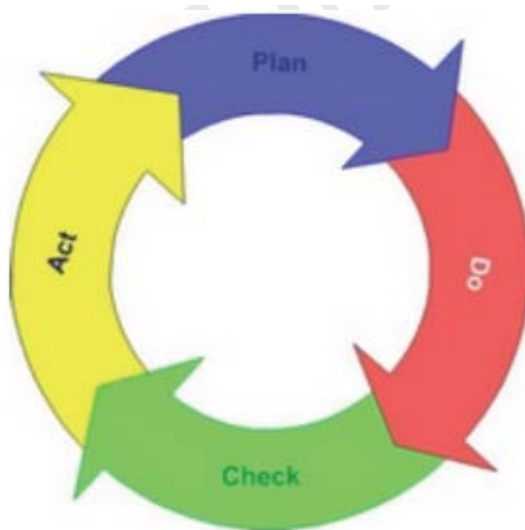
Introduction

1. 12-Step cycle of Plan-Do-Check-Act (**PDCA**)
2. Way of thinking (long-term philosophy (**next section**))

Introduction

Plan-Do-Check-Act (PDCA)

Plan Do Check Act (PDCA) is a framework that provides a methodical approach to problem solving and continuous improvement.



When should we use PDCA?

Introduction

When should we use PDCA?

❑ It should be used **before and after** conducting

1. **Pull planning** adopted
2. **Gemba Walk** performed

What PDCA consists of?

Plan-Do-Check-Act (PDCA) definition

❑ The **PDCA cycle** is an **improvement cycle** based on scientific method of

1. **Proposing** a change in a process,
2. **Implementing** the change, then
3. **Measuring** the results and
4. **Taking** appropriate action.

❑ Continual improvement **seeks** to

1. Eliminate **waste** in all forms,
2. Improve **quality** of products and services and
3. Responsiveness to **customers** while reducing costs

Difference between problem solving and improvement?

Plan-Do-Check-Act (PDCA) definition

Note – problem solving is not necessarily improvement; it is maintenance. For example, if a process has quality levels of 95% and they are elevated to 99%, that represents improvement. If on the other hand quality levels fall to 50% and a team effort restores them to 95% then that would be maintenance.

Plan-Do-Check-Act (PDCA) cycle

1. Plan:

- i. Identify problem
- ii. Analyze the problem

Establish your goals and expectations

2. Do:

- i. Develop a potential solution
- ii. Test a potential solution

Run your process and test whether it works as expected

Plan-Do-Check-Act (PDCA) cycle

3. Check/Study:

- i. Measure how effective the test solution was
- ii. Analyze whether it could be improved in any way

Compare your expectations to your actual results

4. Adjust/Act:

- i. Implement the improved solution fully

Take action on what you learned; improve the process

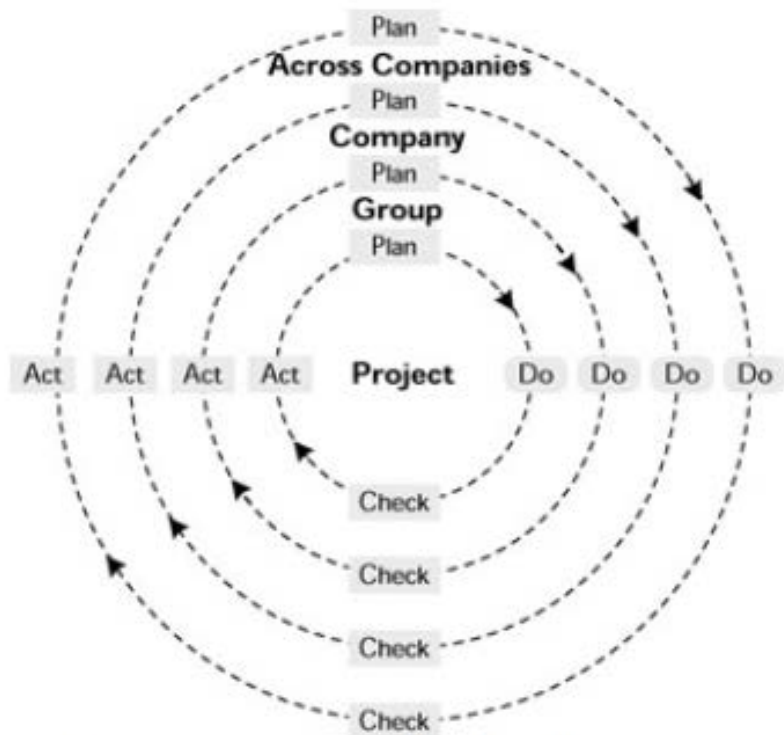
See Video #12

Plan-Do-Check-Act (PDCA) cycle – Example

- ☐ You are the electrical project manager on a job that seems chaotic
- ☐ Your foreman and workers are not meeting your estimated productivity rate
- ☐ You are currently losing money because of poor productivity

What should you do?

Plan-Do-Check-Act (PDCA) cycle at all levels of the enterprise



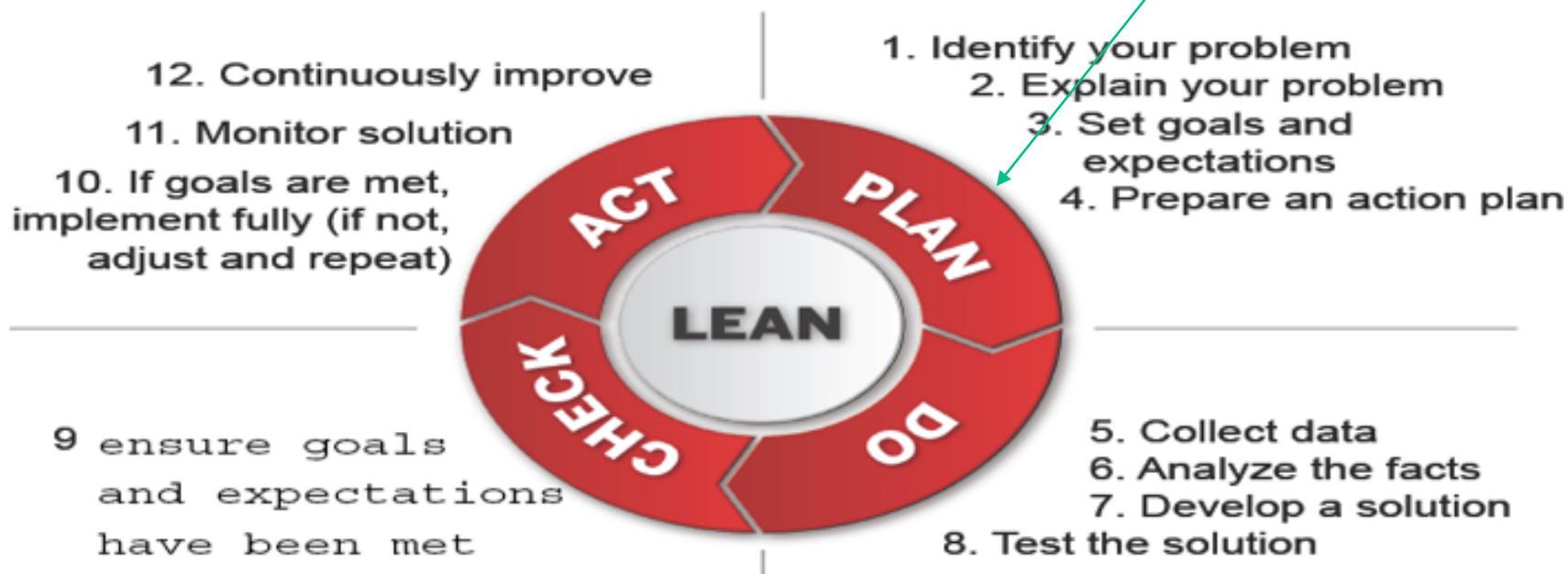
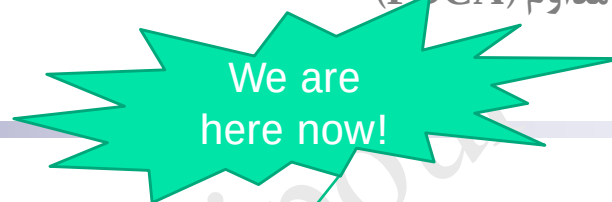
The Deming cycle at all levels of the enterprise

How?

Use 12-Step PDCA Cycle

Continuous Improvement Cycle

(12-Step PDCA Cycle)



Best practice – Plan

Step 1: Identify the project or problem

When identifying a problem,
think about **how you can identify a process that requires improvement**

What inputs help you *recognize whether a process is not conforming to the required standard?*



Best practice – Plan

Step 2: Explain the reason for selecting your problem and explain your problem

Produce a clear problem statement
that **uses facts** and does **not mention any countermeasures**

EXAMPLE:

PROBLEM: The electricians are complaining about not being able to complete their tasks because at least twice a day they encounter materials that are in their way. They must move the materials or work somewhere else. Records kept on tasks scheduled versus tasks completed support their complaints.

Best practice – Plan

Step 3: Set goals and expectations

EXAMPLE:

- 1. Goal 1:** Develop material storage plan with the workers, where materials are place within reach but out of the way
- 2. Goal 2:** Work with the vendor to establish a just-in-time delivery system so that materials do not have to be stored on site

Best practice – Plan

Step 4: Develop an Action Plan

Identify specific time-dependent actions needed to **solve the problem**

Who is responsible for each task?

What do we need to do? What data is needed?

Where can we find the facts or the data?

When must each task or action be completed?

Why are we undertaking this project?

Best practice – Plan

Step 4: Develop an Action Plan

Identify specific time-dependent actions needed to **solve the problem**

You are likely to apply one or many lean tools to support your plan:

1. **Standard work**
2. **Visual management (like 5S, Kanban card, BIM, etc.)**
3. **Pull planning (discussed)**
4. **Value Stream Mapping (next section)**
5. **Swim lane diagrams (next section)**

Best practice – Plan

Step 4: Develop an Action Plan

1. Standard work

- ❖ **Bureaucracies** can be very efficient if the environment is very **stable** and if technology changes very little.
- ❖ **Organic** organizations are more effective when the environment and technology are **changing rapidly**.

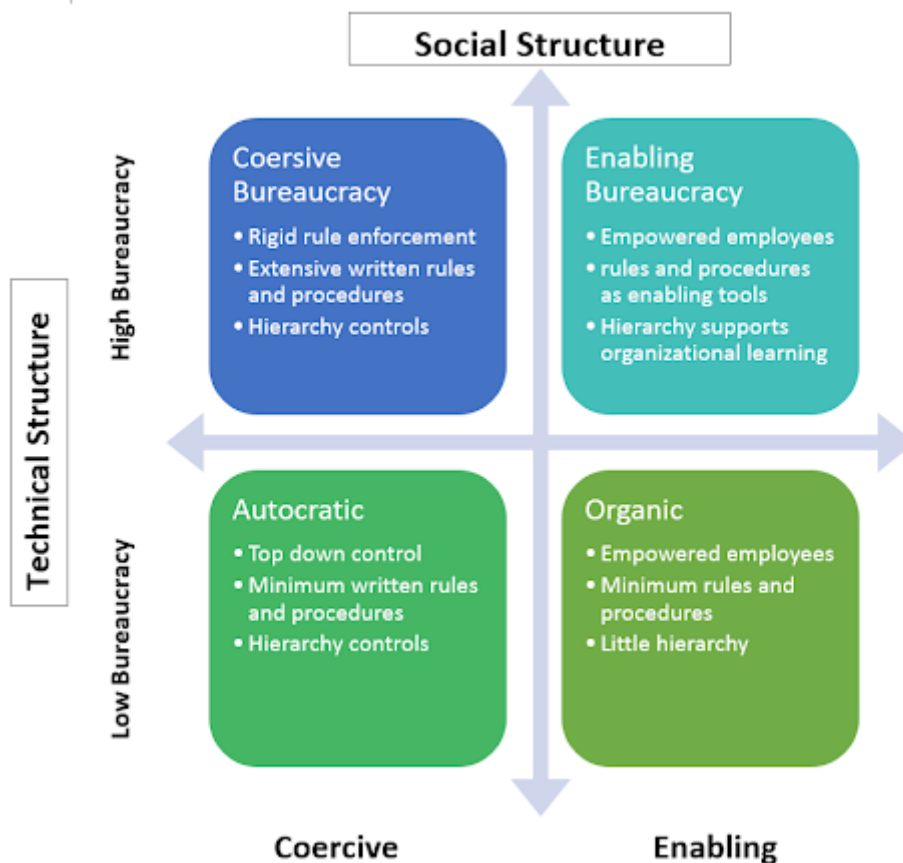
Let's see more about it!

Best practice – Plan

Step 4: Develop an Action Plan

1. Standard work

Source: Adapted from P. S. Adler, Building Better Bureaucracies, *Academy of Management Executive*, 13:4, November, 1999, 36-47.



Best practice – Plan

Step 4: Develop an Action Plan

1. Standard work

Which one is better?

Best practice – Plan

Step 4: Develop an Action Plan

1. Standard work

THE TOYOTA WAY FOLLOWS NEITHER APPROACH AND ADOPTED APPROACH
BETWEEN THEM.

- ❑ Toyota's bureaucratic, **top-down system** becomes the basis for flexibility and innovation.

❖ It is called “**Democratic Taylorism.**”

- ❑ The **critical task** when implementing standardization is to find that balance between
 1. Providing employees with **rigid procedures to follow** and
 2. Providing the **freedom to innovate and be creative** to meet challenging targets consistently for cost, quality, and delivery.

Let's see some important notes of how to perform this idea!

Best practice – Plan

Step 4: Develop an Action Plan

1. Standard work

❑ First, the **standards** have to be **specific enough** to be **useful guides**,
yet **general enough** to allow for **some flexibility**.

1. In **repetitive manual work**, standards are pretty **specific**.
2. In **engineering**, since there are **no fixed quantities**, the standards need to be **more variable**.

Best practice – Plan

Step 4: Develop an Action Plan

1. Standard work

- ❑ Second, the people doing the work have to **improve the standards**.
 - ❖ There is simply **not enough time** in a workweek for engineers to be everywhere **writing and rewriting standards**.
 - ❖ Nobody likes following **someone's detailed rules and procedures** when they are **imposed** on them.
 - ❖ Imposed rules that are **strictly policed become coercive** and a **source of friction** and resistance between management and workers.

Using standardization should be the foundation for continuous improvement, innovation, and employee growth.

Best practice – Plan

Step 4: Develop an Action Plan

1. Standard work

*In fact, at Toyota the standard work is **posted outward**, away from the **operator**.*

*The operator is trained using the standardized work,
but then must do the job and not look up at the standardized work sheet.*

*The standard work sheet is posted outward for the **team leaders and group leaders**
to **audit** to see if it is being followed by the operator.*

Best practice – Plan

Step 4: Develop an Action Plan

2. Visual management

- ❖ Visual controls provide transparency

Let's see some tools!

Best practice – Plan

Step 4: Develop an Action Plan

2. Visual management

Mechanisms for increased visualization

Examples of mechanisms for increased visualization

<i>Requirements for Increased Visualization</i>	<i>Criteria / Change</i>
Commitment charts	Visualization
Safety Signs	Team effort
Mobile signs	Knowledge
Project milestones	Communication
PPC charts	Relation with other tools

Source: Adapted from Salem, O., Solomon, J., Genaidy, A., and Minkarah, I., *Journal of Management in Engineering*, ASCE, October, 2006. With permission.

Let's look at them in a brief!

Best practice – Plan

Step 4: Develop an Action Plan

2. Visual management

Requirements for Increased Visualization

Criteria / Change

Commitment charts

Visualization

- ❖ Commitment charts are typically used to **secure everyone's agreement** to actions that **support lean endeavors**.
- ❖ They have been used to **identify best practices** for job site **safety**.

Best practice – Plan

Step 4: Develop an Action Plan

2. Visual management

<i>Requirements for Increased Visualization</i>	<i>Criteria/Change</i>
Safety Signs	Team effort

- ❖ Having a **document signed** by all responsible parties in plain sight provides **high visualization**;
 - ✓ This improves **safety compliance**.
- ❖ **Safety signs** that are **designed/selected** through a team effort also seem to obtain **higher compliance**.

Best practice – Plan

Step 4: Develop an Action Plan

2. Visual management

Requirements for Increased Visualization

Criteria / Change

Mobile signs

Knowledge

❖ Visual controls provide transparency

as construction has **mobile workstations**,

placement in plain **view of all indicators** and activities

allows everyone to **understand the status** of the system at a glance.

The work flow and the respective action plans can be seen on the job site

Best practice – Plan

Step 4: Develop an Action Plan

2. Visual management

Requirements for Increased Visualization

Criteria / Change

Project milestones

Communication

- ❖ **Project milestones** are typically maintained in a **trailer** under the **watchful eyes** of project staff.
- ❖ A visualization approach involves **posting milestones** in the **work area** for **everyone to see**.
 - ✓ It leads to **higher levels of involvement** among crews.

Best practice – Plan

Step 4: Develop an Action Plan

2. Visual management

Requirements for Increased Visualization

Criteria / Change

PPC charts

Relation with other tools

❖ Similarly, Percent Planned Complete (**PPC charts**) in plain view make **everyone accountable**.

✓ One nationally known **contractor maintains** an **electronic display board** in the **main site trailer**,

near an entrance way that everyone uses.

○ It is approximately **4 × 3 and displays an automated countdown** of the **number of days remaining** on the project.

It is very effective in keeping people aware of time frames and the overall commitments of the project.

Best practice – Plan

Step 4: Develop an Action Plan

2. Visual management (The 5 Step plan – 5S)

- ❖ The Five-Step plan is a Japanese approach to **improve operations**.
- ❖ It helps to create an organized environment in a facility that **promotes** the application of **lean thinking**.
- ❖ It involves a sequential process based on the **five Ss**.

The Toyota Way is not about using 5S to neatly organize and label materials, tools, and waste to maintain a clean and shiny environment. Visual control of a well-planned lean system is different from making a mass-production operation neat and shiny. Lean systems use 5S to support a smooth flow to takt time. 5S is also a tool to help make problems visible and, if used in a sophisticated way, can be part of the process of visual control of a well-planned lean system (Hirano, 1995).

Let's see the steps!

Best practice – Plan

Step 4: Develop an Action Plan

2. Visual management (The 5 Step plan – 5S)

i. **Seiri** (Sort)

❖ **Segregate** and **Discard**.

❖ This involves **getting rid of unnecessary items** in order to be more organized.

❖ This step is **applied to such areas** as tools, work in process, products, documents, and so on.

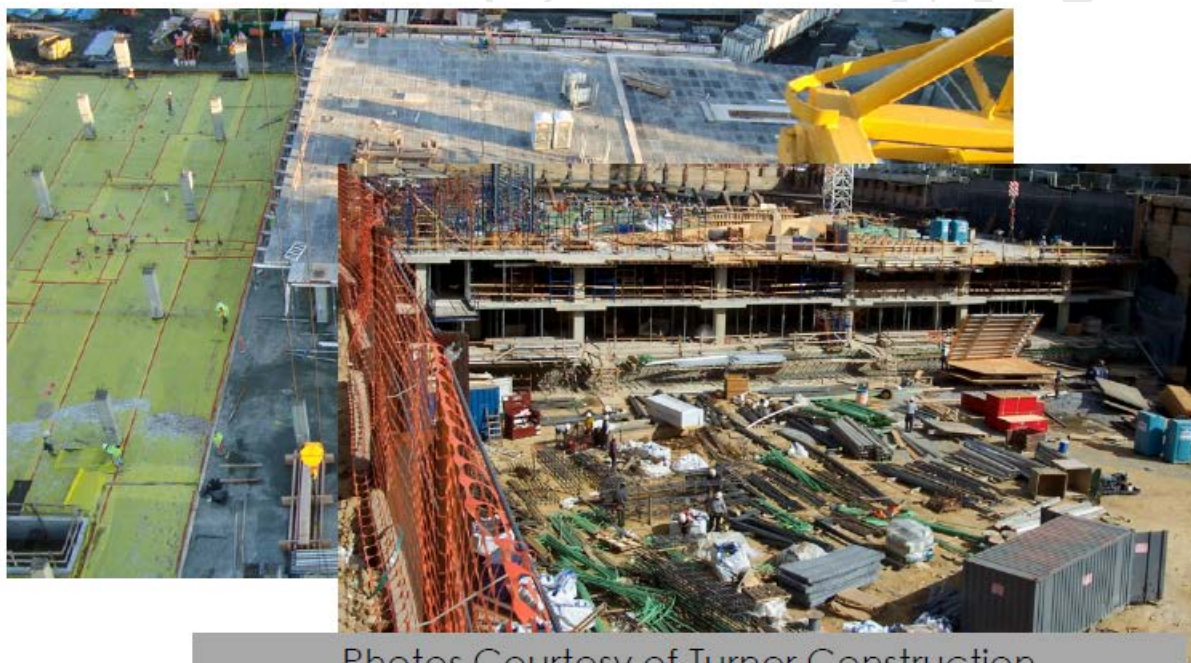
1. Hourly, daily, weekly (necessary and keep them **in the area**)
2. Monthly (necessary to some extent and **near the area**)
3. Yearly (not necessary, keep them **out of the area**)
4. Not used (**get rid of them**)

Best practice – Plan

Step 4: Develop an Action Plan

2. Visual management (The 5 Step plan – 5S)

i. *Seiri* (Sort)



Photos Courtesy of Turner Construction



16th LCI Congress | San Francisco, CA | October 7-10, 2014

Best practice – Plan

Step 4: Develop an Action Plan

2. Visual management (The 5 Step plan – 5S)

ii. *Seiton* (Straighten or Put things in order)

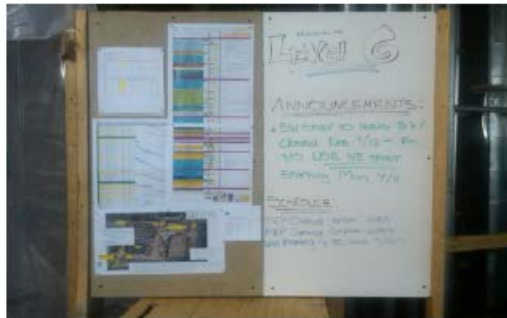
- ❖ **Neatness** is obtained by proper rearrangement of the work area and identification of proper locations.
- ❖ The **object** of the exercise is **not just** to maintain a **neat appearance**.
 - ✓ **Workers** can reliably **find what they need** to do a job **without wasting time** by looking.
 - ✓ They should **place tools and equipment** in a manner that will **improve the flow of work**.
 - ✓ **Everything** should be kept in their **designated locations**
 - ✓ **Equipment** should be **returned** to its proper place at the **end**.

Best practice – Plan

Step 4: Develop an Action Plan

2. Visual management (The 5 Step plan – 5S)

ii. *Seiton* (Straighten or Put things in order)



- Communicate the plan
- Everyone working with a coordinated plan
- All materials on carts
- Reduce clutter, safer
- Workers proud of their workplace and product

Photos Courtesy of Turner Construction



16th LCI Congress | San Francisco, CA | October 7-10, 2014

Best practice – Plan

Step 4: Develop an Action Plan

2. Visual management (The 5 Step plan – 5S)

iii. *Seiso* (Shine or Clean up)

- ❖ **Cleaning and daily inspection** to avoid the confusion of an **untidy work area**.
- ❖ **Unnecessary items** should be disposed of properly in order not to create **clutter** that inhibits the **effective execution** of work tasks.
- ❖ After each job, tools and equipment should be **cleaned and restored** to their **proper locations**.
- ❖ The **root causes of waste** and uncleanliness are investigated to **ensure** that they **do not reemerge**.

Best practice – Plan

Step 4: Develop an Action Plan

2. Visual management (The 5 Step plan – 5S)

iv. *Seiketsu* (Standardize or Personal neatness)

- ❖ This refers to **standardizing locations** for tools, files, equipment, materials, and so on.
- ❖ **Color coding** and **labeling** can help to standardize locations.
- ❖ **Employees' creativity** is actively involved in the development of standardized systems.

Best practice – Plan

Step 4: Develop an Action Plan

2. Visual management (The 5 Step plan – 5S)

iv. *Seiketsu* (Standardize or Personal neatness)



Photos Courtesy of Turner Construction



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Best practice – Plan

Step 4: Develop an Action Plan

2. Visual management (The 5 Step plan – 5S)

v. **Shitsuke** (Sustain or Discipline)

- ❖ It provides **motivation** for employees to **sustain** the **other four Ss**.
- ❖ Management can use **recognition programs** to provide **motivation**.

Best practice – Plan

Step 4: Develop an Action Plan

2. Visual management (The 5 Step plan – 5S)



See Video #13

Best practice – Plan

Step 4: Develop an Action Plan

2. Visual management (Technology)

- ❖ Use only reliable, thoroughly tested technology that serves your people and processes

Society has reached the point where one can push a button and be immediately deluged with technical and managerial information. This is all very convenient, of course, but if one is not careful there is a danger of losing the ability to think. We must remember that in the end it is the individual human being who must solve the problems.

Eiji Toyoda, Creativity, Challenge and Courage

Toyota Motor Corporation, 1983

Best practice – Plan

Step 4: Develop an Action Plan

2. Visual management (Others)

- Checklists
- Skills Matrix
- Color coding
- Colored Lines
- Address Grids
- Kanban Cards
- Pictures / Graphics
- Signage—Directions / Instructions
- Labeling
- Scoreboards
- Signals (lights, horns)
- Defect Boards / Tables
- Sample Boards / Tables
- Area Information Boards
- Production Control Boards
- Suggestion Program

Best practice



We are here now!

Best practice – Do

Step 5: Collect data

Gathering data enables us to
understand the current situation to
discover the extent of a problem

Ways to gather data:

- ❖ **Data** provides the information required to **analyze a problem**



Best practice – Do

Step 6: Analyze the Facts

Use analytical tools

(statistics, charts, fishbone diagram, etc.)

To fully define the problem

For example, to understand the cause of debris and materials scattered around the jobsite, you can use histograms and cause and effect analysis



Best practice – Do

Step 7: Develop Potential Solutions

1. Brainstorm all potential root causes of the problem
2. Prioritize them
3. Develop potential solutions

Ways to perform Step 7:

1. Gemba Walk
2. Pareto analysis
3. The 5 Whys
4. The Ishikawa diagram

Best practice – Do

Step 7: Develop Potential Solutions

2. Pareto analysis

- ❖ The **Pareto chart** is named for an **Italian economist**, Vilfredo Pareto (1848–1923), who studied the distribution of **wealth in Europe**.
- ❖ He proposed an **economic theory**, **20% of the people in Italy held 80% of the wealth**, hence the “80–20” rule.
 - ✓ Dr. Joseph Juran applied this concept to the **field of quality**.

Best practice – Do

Step 7: Develop Potential Solutions

2. Pareto analysis

- ❖ The data provided, list the **number of problems** relating to window installation and their unit cost.

For example, when a window is installed in a manner that violates the code, it costs \$1,100. Four occurrences are priced at \$4,400.

- ✓ In performing Pareto analysis, one must decide whether to use

1. Number of occurrences or
2. Costs of these occurrences

- ❖ In this case, the analysis was based on **total costs**.

Let's see some example!

Best practice – Do

Step 7: Develop Potential Solutions

2. Pareto analysis

Item	Category	Quantity	Cost per Occurrence	Total Cost	%	Cumulative %
c	Not finished on time	25	785.00	19,625.00	44%	44%
g	Wrong window installed	2	3500.00	7000.00	16%	59%
f	Job not done properly	4	1250.00	5000.00	11%	71%
a	Code infraction	4	1100.00	4400.00	10%	80%
h	Damage during window installation	1	3500.00	3500.00	8%	88%
e	Not starting on time	15	150.00	2250.00	5%	93%
b	Leave job site dirty	18	124.95	2249.10	5%	98%
d	Crew very rude	8	100.00	800.00	2%	100%
		77		44,824.10	100%	

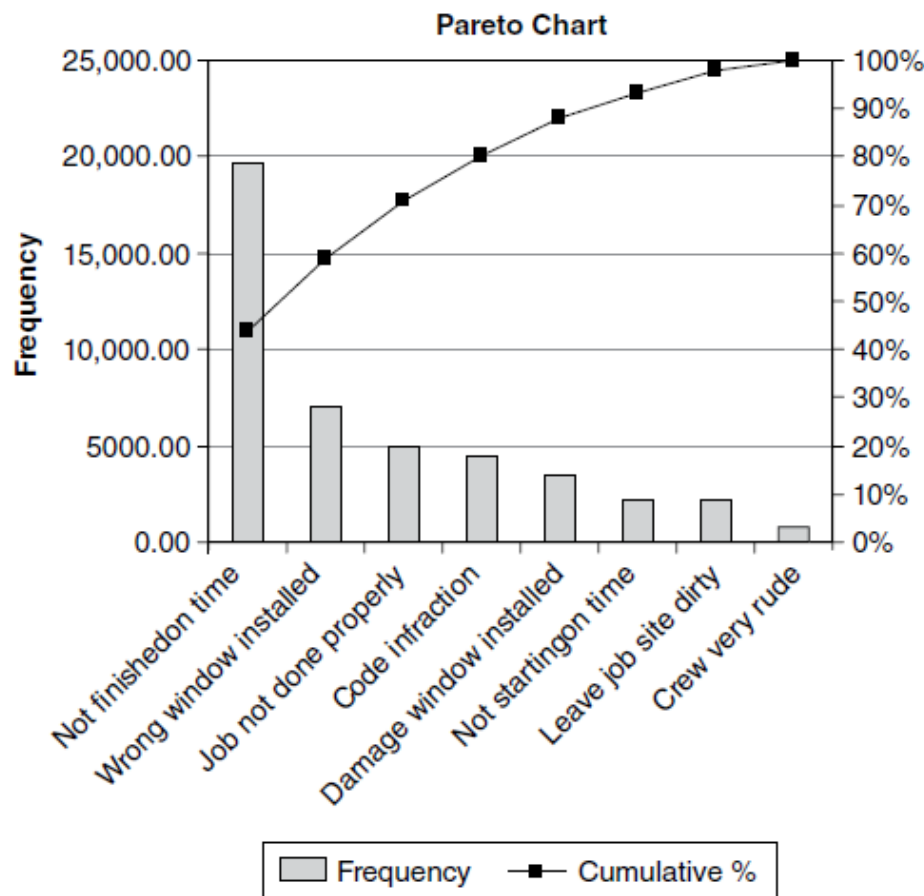
Analysis of Customer Complaints

Best practice – Do

Step 7: Develop Potential Solutions

2. Pareto analysis

Let's see everything in a procedure



Best practice – Do

Step 7: Develop Potential Solutions

2. Pareto analysis

1. **Set up a table** like the one you saw, with the respective headings as shown.
2. **List the values** of the attributes in **descending order** of magnitude (i.e., the largest cost first and the smallest last). The category “Not finished on time” costs \$19,625. By contrast, the category “crew very rude” costs \$800 and is listed last.
3. The cost column is totaled to **\$44,824.10**.
4. For each category, **divide its cost by this total** to obtain a **percentage**.
5. Use the right-hand column to create a **cumulative total**.
6. Draw the chart with **two “y” axes**.
 - ✓ The **left-hand vertical** scale is used for the cost of the transactions.
 - ✓ The **right-hand vertical** axis is used for the cumulative value.
7. **Draw the cumulative curve**, using the right-hand scale and terminating at a value of 100%.

Best practice – Do

Step 7: Develop Potential Solutions

3. The 5 Whys

- ❖ The **five-Why analysis** procedure is a **simple**, yet effective procedure for finding the **root cause of a problem**.
- ❖ It is a part of the **Toyota problem-solving process** and focuses on **involved processes** rather than on people.

What is the procedure for 5 whys?

Best practice – Do

Step 7: Develop Potential Solutions

3. The 5 Whys

- ❖ The steps in the process are:
 - ✓ Ask **why a process deviates** from expectations.
 - ✓ Ask **why the answer** is as stated.
 - ✓ **Repeat the questions:** asking why until a root cause is found. (If needed, this may extend beyond five questions.)
 - ✓ **Other quality tools** such as a Pareto analysis and Fishbone diagrams may be used instead.



Let's see an example!

Best practice – Do

Step 7: Develop Potential Solutions

3. The 5 Whys

1. Why **wasn't the drywall installed** in room 302 last week **as scheduled**?

❖ Answer: The **conduit work** for electrical and communications was **not complete**.

2. Why wasn't the **conduit** work completed?

❖ Answer: The **electrical subcontractor** did not have the **material** to complete the work.

3. Why wasn't the **material** available?

❖ Answer: The materials were **ordered late**.

Best practice – Do

Step 7: Develop Potential Solutions

3. The 5 Whys

4. Why was the **material** ordered late?

- ❖ Answer: There was a **discrepancy** between the **plans and specs** regarding the configuration. There was an open request for information (**RFI**).

5. Why did this **RFI** remain open?

- ❖ Answer: The **communications specialist** did **not spot** the discrepancy until the middle of the week.

The root cause of this problem should prompt the electrical foreman and general foreman to improve the constraints analysis process. Shop drawings should be prepared on a timely basis and approved through the project manager and designer to avoid last minute surprises. Reliable, sound commitments can only be made when all constraints have been removed.

Best practice – Do

Step 7: Develop Potential Solutions

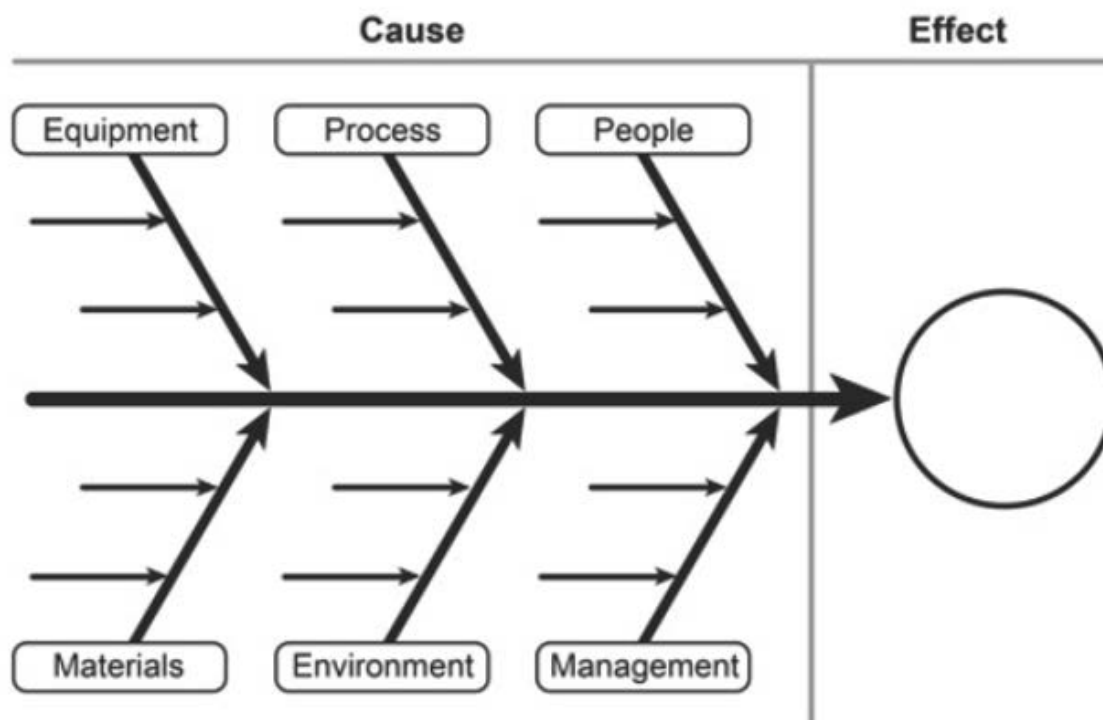
4. The Ishikawa Diagram (cause and effect or fishbone diagram)

- ❖ The **Fishbone Diagram** or **cause and effect diagram** was developed by **Dr. Kaoru Ishikawa**.
- ❖ It serves as a tool to **find the sources of quality problems**, or in fact, almost any **type of problem**;
it focuses attention on **causes, not just symptoms**.
- ❖ The diagram looks like the **skeleton of a fish**, with the problem represented by the **head of the fish**.
- ❖ The **ribs** represent **possible causes**, and **smaller bones** are **sub-causes**.

Best practice – Do

Step 7: Develop Potential Solutions

4. The Ishikawa Diagram (cause and effect or fishbone diagram)



How to create fishbone diagram?

Best practice – Do

Step 7: Develop Potential Solutions

4. The Ishikawa Diagram (cause and effect or fishbone diagram)

1. Establish problem (effect)
 - ❖ State in clear terms
 - ❖ Agreed upon by entire group
2. Problem becomes the “head” of the fish
 - ❖ Draw line to head (“backbone”)
3. Decide major causes of the problem
 - ❖ By brainstorming
 - ❖ If the effect or problem is part of a process the major steps in the process can be used
4. Connect major causes to backbone of the fish with slanting arrows

Best practice – Do

Step 7: Develop Potential Solutions

4. The Ishikawa Diagram (cause and effect or fishbone diagram)

5. Brainstorm secondary causes for each of the major causes
6. Connect these secondary causes to their respective major causes
7. Repeat Steps 5 & 6 for sub-causes and sub-causes dividing with increased specificity usually four or five levels
8. Analyze and evaluate causes and sub-causes
 - ❖ May require the use of statistical, analytical, and graphical tools
9. Decide and take action

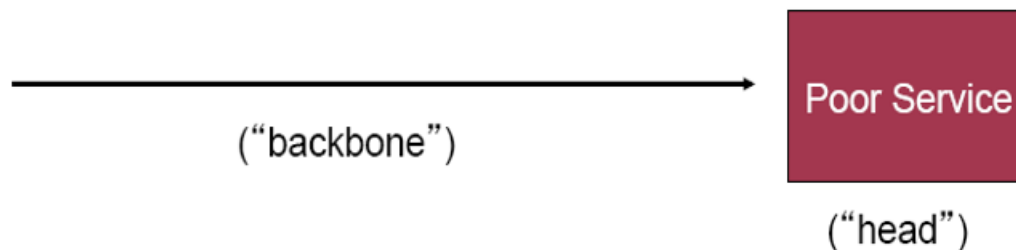
Best practice – Do

Step 7: Develop Potential Solutions

4. The Ishikawa Diagram (cause and effect or fishbone diagram)

❖ Example

■ Step 1 & 2:



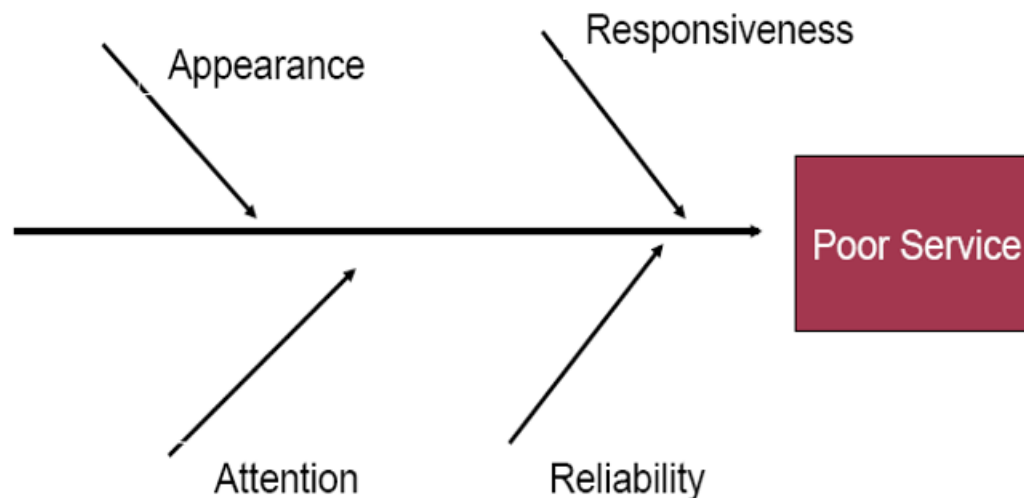
Best practice – Do

Step 7: Develop Potential Solutions

4. The Ishikawa Diagram (cause and effect or fishbone diagram)

❖ Example

■ Step 3 & 4:



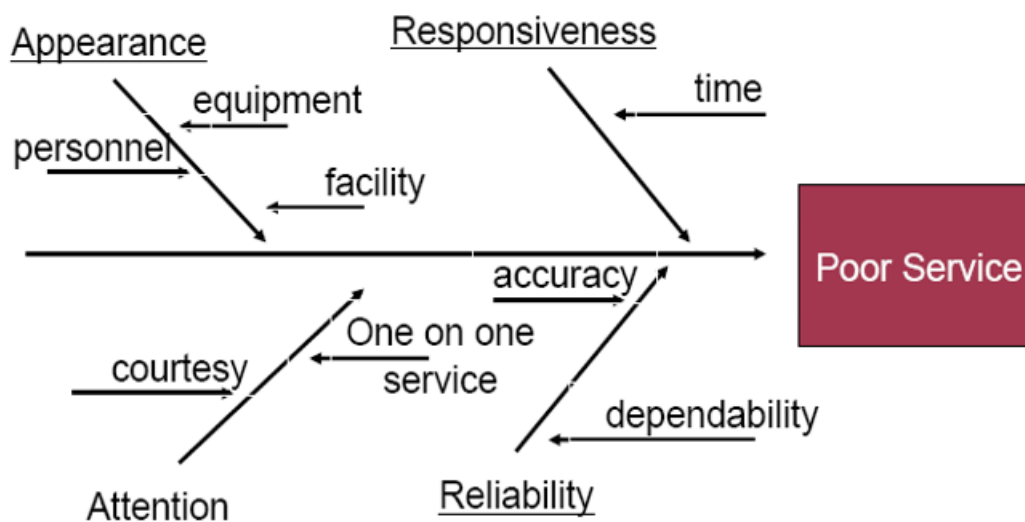
Best practice – Do

Step 7: Develop Potential Solutions

4. The Ishikawa Diagram (cause and effect or fishbone diagram)

❖ Example

■ Step 5, 6, & 7:

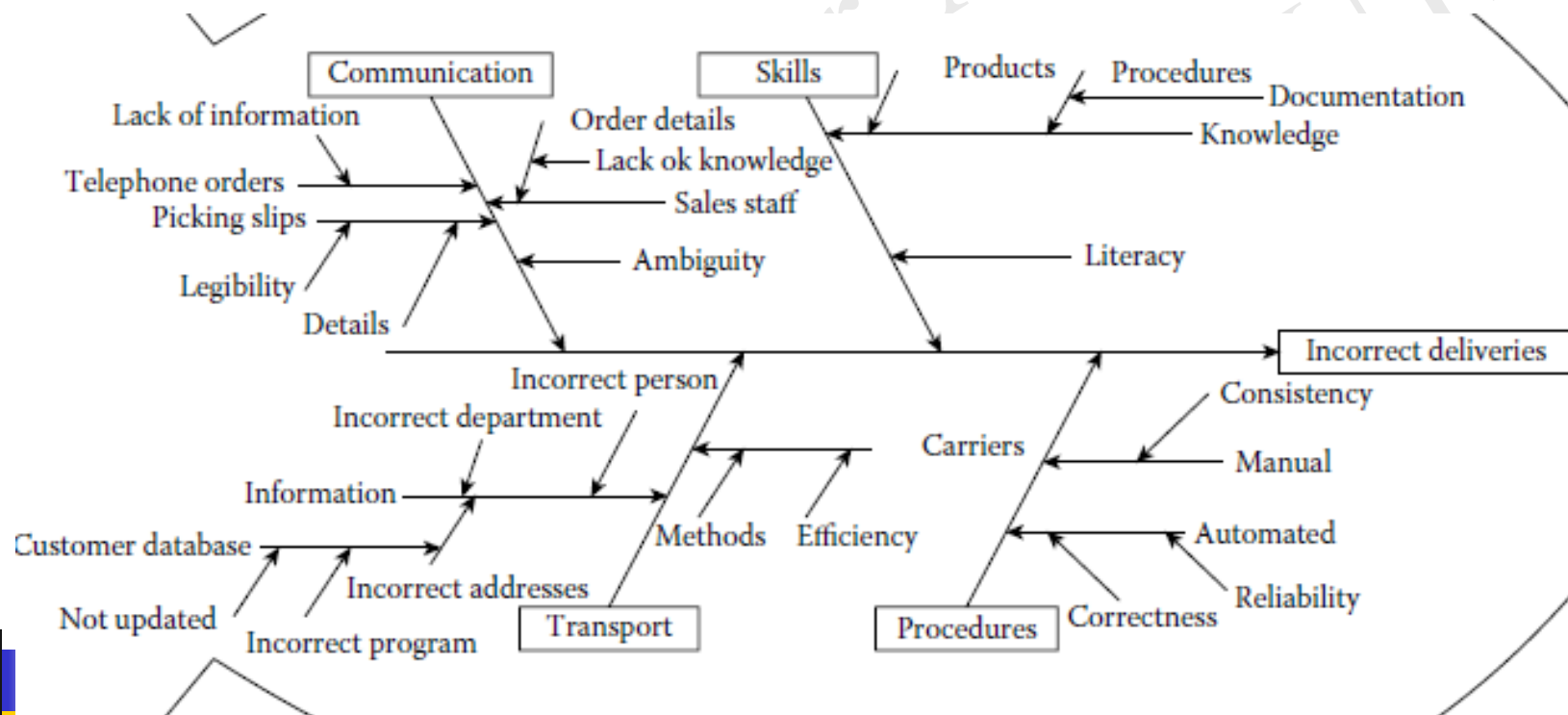


Best practice – Do

Step 7: Develop Potential Solutions

4. The Ishikawa Diagram (cause and effect or fishbone diagram)

❖ Example



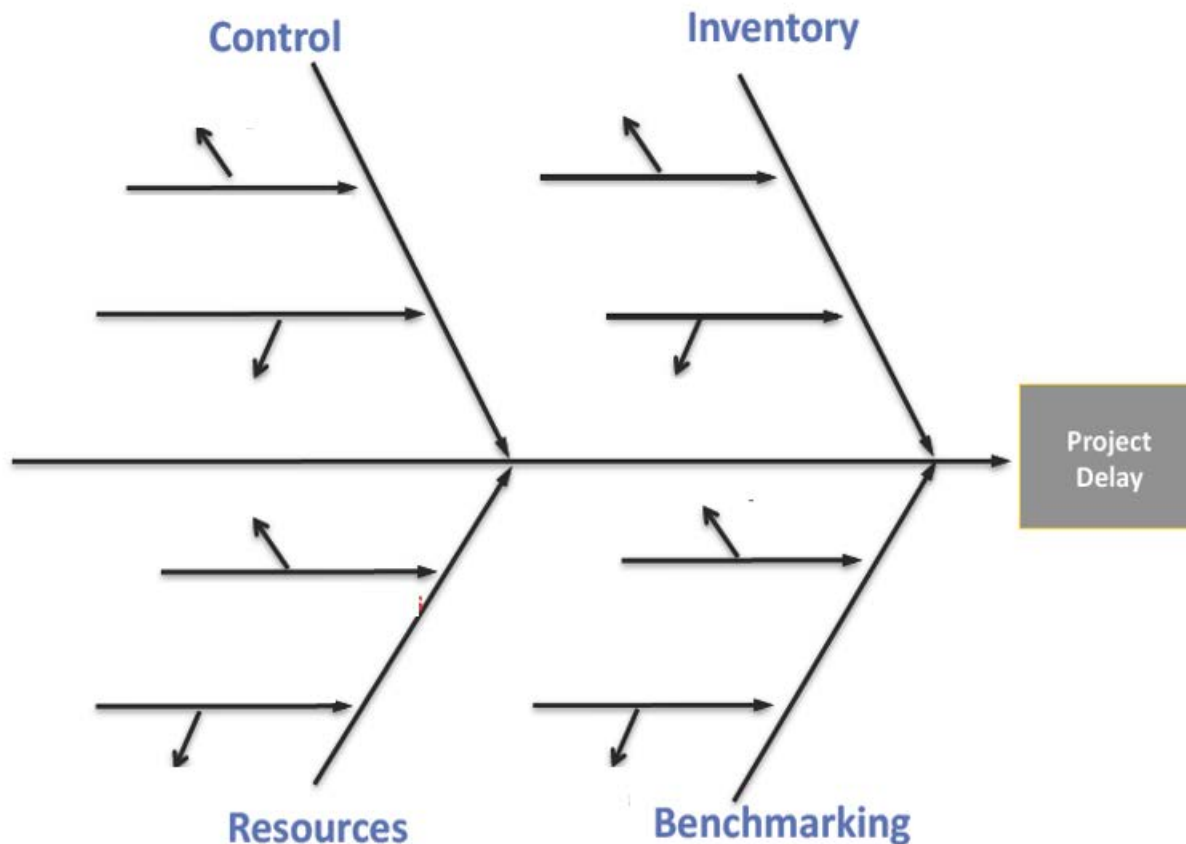
Fishbone – Assignment

ASSIGNMENT 1-5-1:

1. Meet your team members online and work on the fishbone presented in the next slide to complete all causes and sub-causes based on your thought.
2. Complete a fishbone
3. Send your work (in PDF format) to ralavipour@gmail.com

Due on the next week (next week with similar day)

Fishbone – Assignment



Best practice – Do

Step 8: Test the potential solutions

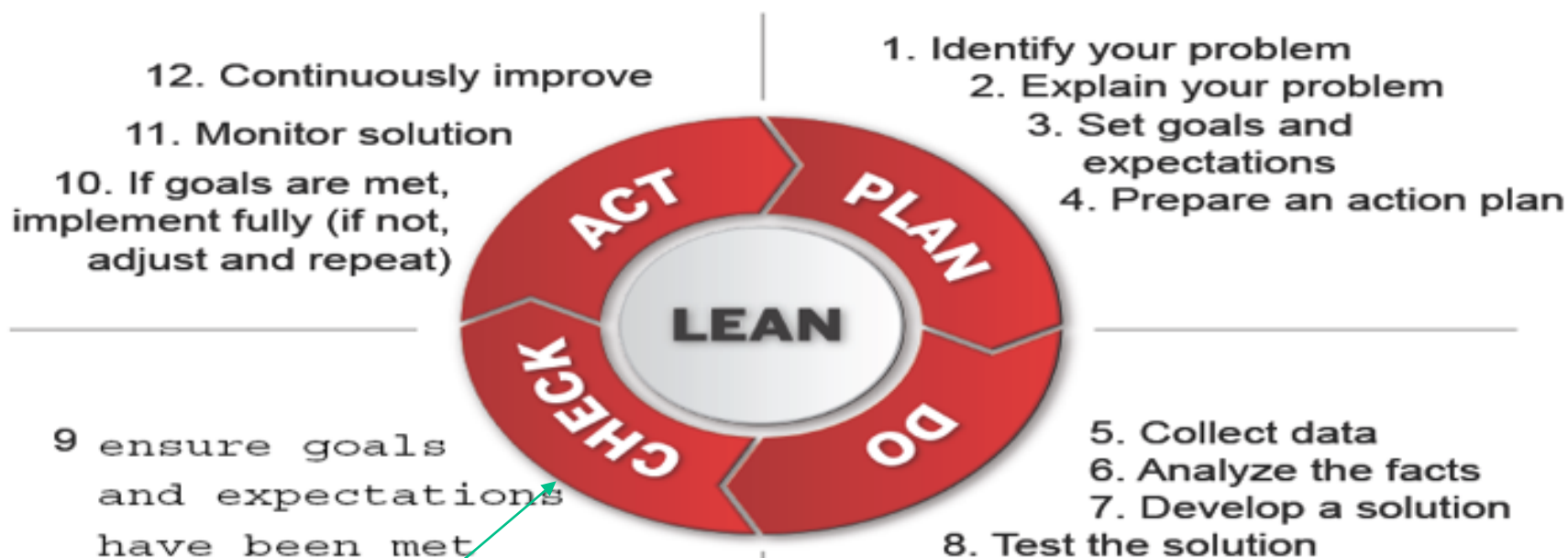
**Test how well the solution resolves the problem
by pilot testing the most plausible solution(s)**

For example, develop a material storage plan, then reorganize all materials according to the plan to see if it facilitates greater productivity and a safer work site

Experiment with different plans to see which plan is most effective



Best practice



We are here now!

Best practice – Check

Step 9: Ensure goals have been met

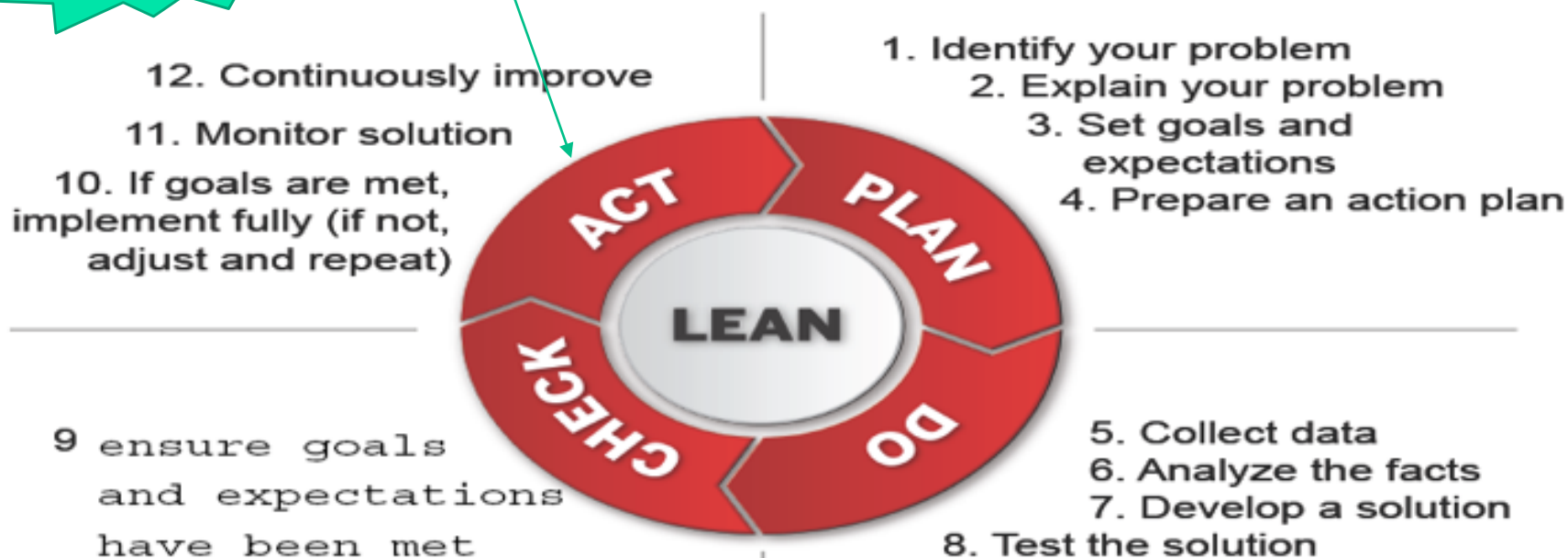
Compare the solution to the goals identified in Step 2
To assess the success of the solution

- If the goals have been met, the solution can be fully implemented
- If not, you will need to develop and test additional solutions



Best practice

We are here now!



Best practice – Act

Step 10: If goals are met, fully implement the solution (if not, adjust and repeat)

Make the new solution the standard way of working

- ☐ Train people
- ☐ Update documentation
- ☐ Develop standard operating procedures (SOPs)



Best practice – Act

Step 11: Monitor the solutions

Continuously gather the data and analyze the facts

To monitor the effectiveness of implemented countermeasures



- ☐ Repeat **Steps 5 & 6** of the PDCA cycle to establish the before and after situation.
- ☐ Individuals involved need **constructive feedback** after implementing countermeasures to help maintain continuous improvement

Best practice – Do

Step 12: Continuously improve the process

Ongoing process control can be used to ensure the performance of the countermeasures consistently meet the objectives set

The Kaizen process

- ☐ Kaizen is the Japanese concept of continual incremental improvement.
- ☐ Kai means change
- ☐ Zen means good;



hence, Kaizen stands for ongoing changes for beneficial reasons on a never-ending basis.

- ☐ It involves all members of an organization **actively participating** in making improvements on an **ongoing basis**.

Best practice – Do

Step 12: Continuously improve the process

☐ The Kaizen process

- ☐ Kaizen methodology is more **appropriate** for a specialty contractor or supplier.

See Video #14

Best practice – Do

Step 12: Continuously improve the process

The Kaizen process

What is the roles in the Kaizen process?

- ❑ **Senior executives/managers:** They must first **embrace Kaizen** as an organizational strategy and **communicate this policy** to **all stakeholders**.
- ❑ **Middle managers:** They **deploy the policies** established by **senior executives**.
 - ❖ They **ensure** that **staff members** have the appropriate **training and preparation**.
 - ❖ They **establish implementation milestones** for **supervisory staff**.

Best practice – Do

Step 12: Continuously improve the process

The Kaizen process

What is the roles in the Kaizen process?

- ❑ **Supervisors:** They **work** closely with **line workers** to **implement Kaizen** at the functional level.
 - ❖ They are **actively involved** in **collecting Kaizen suggestions** for improvement from employees and **coach the respective teams** to promote success.
- ❑ **Employees:** They are expected to **actively pursue self-development** through **education and training** in order to support Kaizen team activities.

Best practice – Do

Step 12: Continuously improve the process

The Kaizen process

What approaches do we have for Kaizen?

Best practice – Do

Step 12: Continuously improve the process

The Kaizen process

□ There are **two primary approaches** to Kaizen improvement activities:

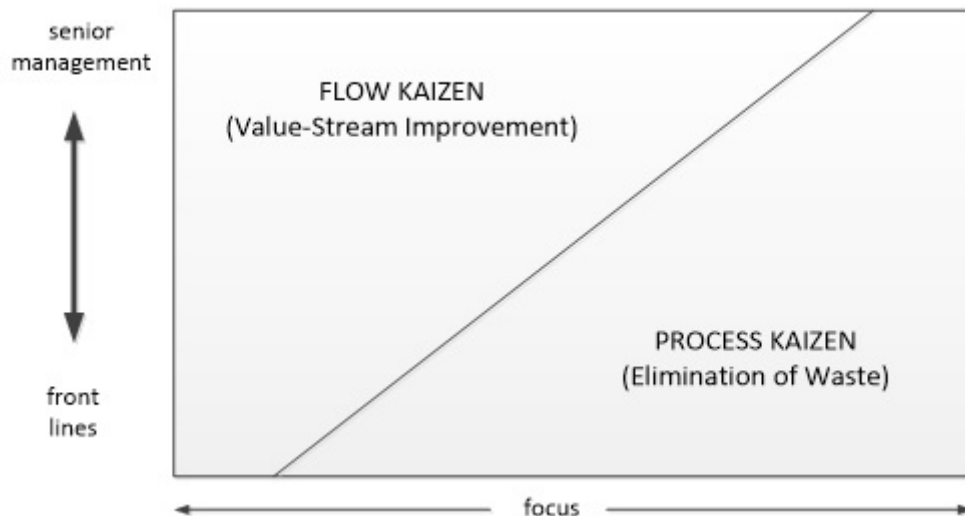
1. **Flow Kaizen**

❖ Flow Kaizen emphasizes **value stream improvement**

2. **Process Kaizen**

❖ Process Kaizen focuses on the **elimination of waste**.

How to implement Kaizen?



Best practice – Do

Step 12: Continuously improve the process

The Kaizen process

- While Kaizen involves **ongoing, long-term dedication** to improvement of the organization and its people,

process periodically conducts **short-term activities** as

“Kaizen events” or **“Kaizen breakthrough”** methodology.

- ✓ *These events are a cross-functional, team-based process for rapid improvement, and are often a week long in duration.*

What is Kaizen Events?

Best practice – Do

Step 12: Continuously improve the process

The Kaizen process

- Kaizen Event

Kaizen drives the improvements which lead to a
leaner business operating system



What is Kaizen Cycle?

Best practice – Do

Step 12: Continuously improve the process

The Kaizen process

☐ Kaizen Cycle



How to **implement** Kaizen Event?

Best practice – Do

Step 12: Continuously improve the process

The Kaizen process

☐ Kaizen Event implementation

1. PDCA (This section)
2. 5-S (This section)
3. 5-Whys (This section)
4. Value Stream Mapping (Next section)



What areas are related to Kaizen?

Best practice – Do

Step 12: Continuously improve the process

The Kaizen process

☐ Kaizen Umbrella

- Quality Improvement
- Customer Orientation
- Total Quality Control
- Discipline in Work Place
- Productivity Improvement
- Total Productive Maintenance
- New Product Development
- Co-operative Labour Management Relations
- Kanban
- Robotics
- Zero Defect
- Q.C. Circle
- Automation
- Just-in-Time
- Suggestion System
- Small Group Activity

What is the **typical structure** for Kaizen?

Best practice – Do

Step 12: Continuously improve the process

The Kaizen process

Preliminary activities:

Select area/work unit for Kaizen

- Based on business requirements

- Based on potential for improvement

Establish project objectives

- Document baseline data

- Set metrics for improvement – numerical goals

Appoint Kaizen team members

- Team leader and subteam leader

Publicize the event – meet with the involved work unit team

- Explain roles and expectations

- Engage hearts and minds for the event

Best practice – Do

Step 12: Continuously improve the process

The Kaizen process

Day 1:

*Teams meet for conceptual training and problem identification.
Training topics include:*

- Lean theory and lean production systems
- Kaizen breakthrough methodology
- Team dynamics – multipurpose
- The lean transformation

Best practice – Do

Step 12: Continuously improve the process

The Kaizen process

Day 2:

Evaluate/analyze current processes:

- Document existing processes
- Identify value-added versus non-value-added activities
- Measure cycle times
- Discuss improvement options
- Formulate process improvement – rearrangement of layouts
- Initiate process improvement

Best practice – Do

Step 12: Continuously improve the process

The Kaizen process

Day 3:

- Continue process improvement
- Apply lean tools
- Focus on delivering value to the customer
- Recheck cycle times

Best practice – Do

Step 12: Continuously improve the process

The Kaizen process

Day 4:

- Refine process/system improvements
- Establish new work/process standards
- Document new standard operating procedures
- Recalibrate new cycle times

Best practice – Do

Step 12: Continuously improve the process

The Kaizen process

Day 5:

- Present recommendations and results to management
- Celebrate Kaizen event accomplishments

Kaizen events are short-term in duration but have proven to be very effective. They focus everyone's effort for a few days, but the benefits in improved performance far outweigh the cost of lost production.

What are Checklist / Forms for Kaizen?

Best practice – Do

Step 12: Continuously improve the process The Kaizen process

❖ Kaizen Event Profile

Event Profile

Team # : _____

Event Description:

Describe scope and scale of project

Event Dates:

Preliminary Objectives:

Be specific and state measurable objectives.

Do not say "significantly reduce costs by eliminating waste"

Do say "reduce cost of operation by \$500k".

Team:

Name	Role
Sue	Team Leader
Pete	Co-Leader
Jane	Outside eyes

Production Requirements (Takt Time):

Takt = $\frac{\text{Available time}}{\text{Customer demand}}$ Calculate in seconds

Consultant:

Sensei's Facilitator:

Process Information:

A picture of the process flow - show the Current state in a picture, not words

Current Situation and Problems

Be specific

For example:

Service desk hold times at 92 seconds
10% of all callers hang up before talking to an agent
3% Rework due to tolerance failure

Best practice – Do

Step 12: Continuously improve the process The Kaizen process

❖ Kaizen Workshop Target Sheet

Building Number:

Team #:

Division Name:

Team Name:

Department Name:

Date:

	(A) Start	(B) Target	(C) 1st Day	(D) 2nd Day	(E) 3rd Day	(F) 4th Day	(G) Final	(H) Difference	(I) % Increase / Decrease
Space (Sq. Ft.)									
Inventory									
Walking Distance (ft)									
Parts Transport Distance (ft)									
Throughput Time									
Process Cycle Time									
Volume Per Day									
Full-time Equivalent Crew									
Productivity									
Changeover (Total time)									
Changeover (Total #)									
Schedule Attainment									
Quality Improvements									
Safety Improvements									
# Poka-yoke Implemented									

Baseline Data:

Current Output Required

Hours per Shift

of Shifts

Remarks:

Use Red Dot ● to indicate a change

Use Asterisk * to indicate an estimate

Best practice – Do

Step 12: Continuously improve the process The Kaizen process

❖ Task / Process Time Observation

Date / Time: ____/____/____ : ____

Line / Process: _____

Observed by: _____

#	Step	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Best Time	Observations (changeover time)
1		0																
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		
Complete Cycle Time																		

Best practice – Do

Step 12: Continuously improve the process The Kaizen process

❖ Kaizen Waste Identification

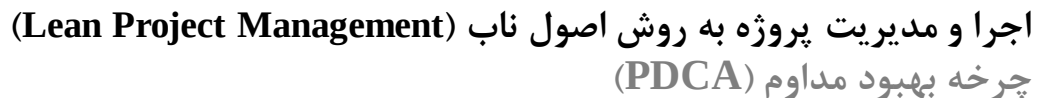
<i>Identify one example of each type of waste below</i>	Possible cause	Proposed Action	Method of measurement
Overproduction			
Delays			
Transportation			
Process			
Inventories			
Motions			
Defective products			
Untapped resources			
Misused resources			

Best practice – Do

Step 12: Continuously improve the process The Kaizen process

❖ Kaizen Proposal Sheet

Location		Objective		Date		Operator	
Before				After			
Problem				Effects (cycle time / inventory / changeover time reduction, poka yoke etc.)			



Best practice – Do

Step 12: Continuously improve the process

❖ **Kaizen Newspaper**

TEAM: _____

DATE: ____/____/____

No.	PROBLEM	WHO	BY WHEN	CHECK

Best practice – Do

Step 12: Continuously improve the process The Kaizen process

❖ Kaizen Standard Work Instruction Sheet

Element		Work Sequence		Operation Name	Operation Number	Revision Date	Signature
1						Critical Safety Char. Critical Quality Check 	
2							
3							
4							
5							
6							
7							
Notes 				Critical Quality Check			
				Job Assists			

Tools Required	Parts Required	Job Assists

Best practice – Do

Step 12: Continuously improve the process The Kaizen process

❖ Forms – Stakeholders & Change

Things to consider!
What are the "key" measurements we will track?
What data is needed for those measurements?
How will the data be acquired?
How often will we acquire the data?
Who's help is needed for acquiring the data?
Who will be responsible for accurate data collection?
Who will be responsible for providing the reports from the collected data?
How will the reports look?
How often will the results be reported?
Who will the results be reported to?
What method will be used to communicate results?
How long will we continue to measure and report?

Best practice – Do

Step 12: Continuously improve the process The Kaizen process

❖ Inventory / Facility Audit

Things to consider!	What is needed?	When is it needed?	Who is responsible for providing it?	Date Complete
Area Layouts - Drawings - Flowcharts?				
All Assets in Use				
Special Carts / Cabinets / Stools / Benches?				
Logbook - Follow Ticket - Inventory Sheet?				
Work Instructions - Procedures?				
Kanban Cards - Boards - Racks?				
Safety Equipment?				
Visual Signage / Markings?				
Communication board?				

Best practice – Do

Step 12: Continuously improve the process The Kaizen process

❖ Outside Support Required

Review	What is the need?	Who can supply it?	When is it needed?	Who will arrange it?	Date Complete
Access to accurate Current / Historical Data?					
Procurement of new Machine - Tool - Equipment.?					
Changes to Machine / Tool / Fixture / Etc.?					
Physical or Floor Layout changes are needed?					
Changes to Production Schedule or Inventory?					
Movement of Machinery / Tables / Etc.?					
Electrical wiring needs / changes?					
Construction of any kind?					
Management support?					
Drawing / Design / Procedure updates?					
Painting / Floor or Wall changes?					

Best practice – Do

Step 12: Continuously improve the process The Kaizen process

❖ Communication Plan

Who must we communicate with before, during and/or after the Kaizen Blitz? (Line workers? Management? Blitz Team? Support personnel?)	When must the communication happen? (Before/during/after the implementation? How often? Beginning of/during or end of the day/week/month?)	What content must be included in the Communication? (Implementation update? Current challenges? Positive/negative results? Operator input/ideas? Performance reminders? Recognition? etc.)	How will the content be communicated? (Special meeting? One on one? Visual boards? Newsletter? Included in the Training?, etc.)	Who is responsible for planning & implementing the communication plan? Blitz Team member? Supervisor or other Management?)



اجرا و مدیریت پروژه به روش اصول ناب (Lean Project Management)

فصل اول: مفاهیم، اصول و ابزارهای روش ناب (Lean)
بخش ششم: نقشه برداری جریان ارزش (VSM)

ارائه دهندگان:

سید محمدرضا علوی پور

(PhD, PMP, CMIT)

کامبیز کردانی

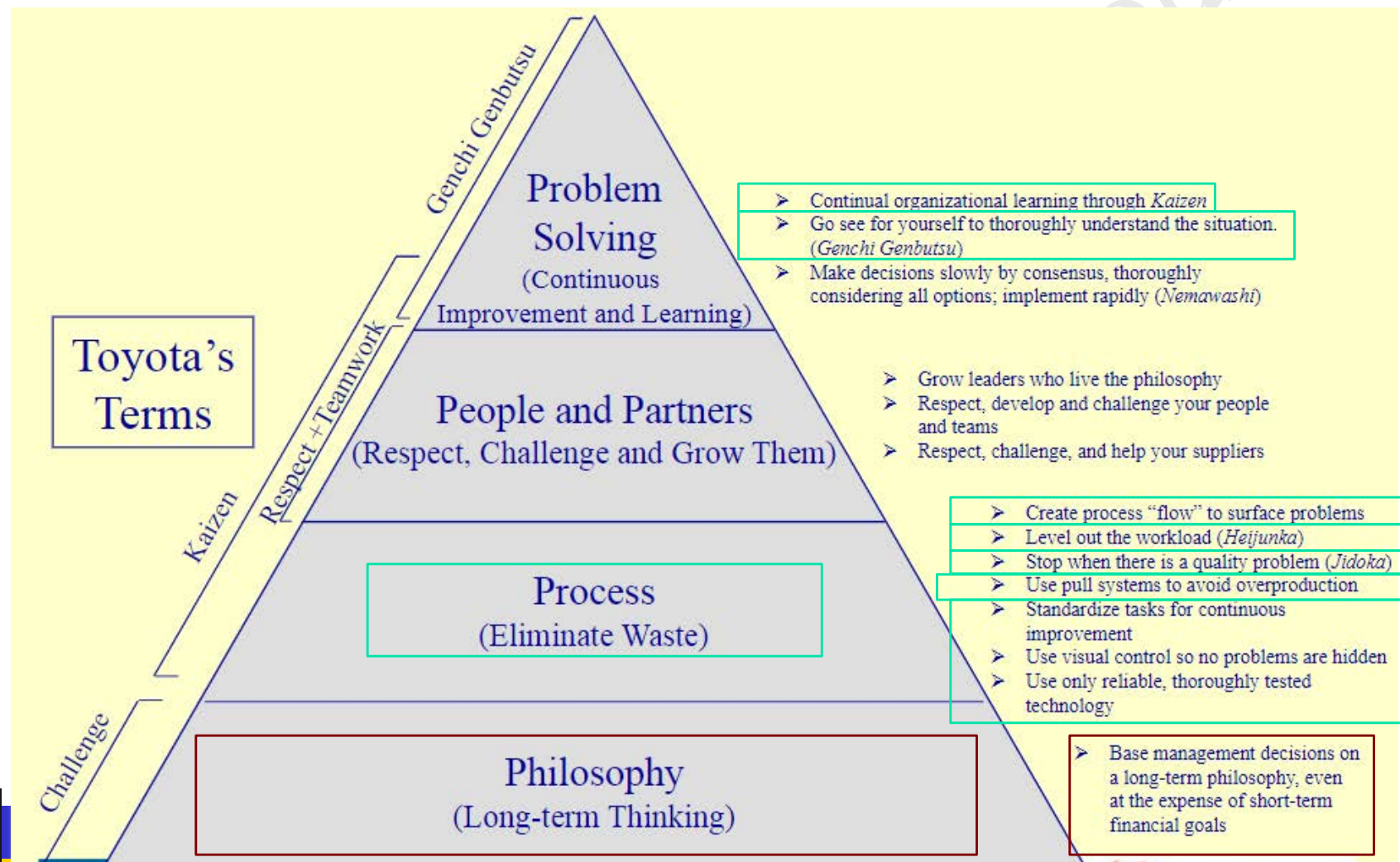
(M.Sc., PMP)

What we will learn?

☐ Long-term management

- ❖ Overview
- ❖ Value management
- ❖ Swim lane diagrams
- ❖ Case study

Lean – Principles (4P Model of the Toyota way)



Continuous improvement

1. 12-Step cycle of Plan-Do-Check-Act (PDCA)
2. Way of thinking (long-term philosophy (this section))

Step 4: Develop an Action Plan

Identify specific time-dependent actions needed to **solve the problem**

You are likely to apply one or many lean tools to support your plan:

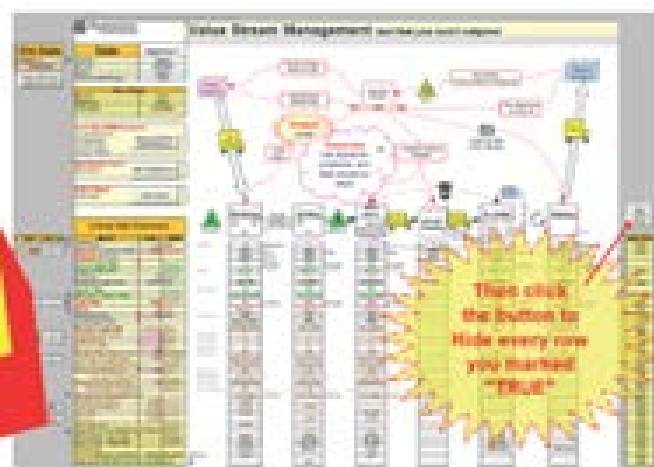
1. Standard work (discussed)
2. Visual management (like 5S, Kanban card, BIM, etc.) (discussed)
3. Pull planning (discussed)
4. Value Stream Mapping (This section)
5. Swim lane diagrams (This section)

Way of thinking – Principle 1

❑ Term: Long term philosophy

- ❖ Base management decisions on a long-term philosophy, even at the expense of short-term financial goals.

❑ Tool: Value Stream Mapping



Long-Term Management

(Overview)

Philosophy (Long-term thinking)

*Toyota's starting point in business is to **generate value** for the customer, society, and the economy.*

- ☐ A **mission greater** than earning a paycheck
- ☐ Doing the **right thing** for the customer
- ☐ Building **trust** with employees
- ☐ **Don't let** business decisions **undermine** trust and mutual respect
- ☐ Create a **consistency** of **purpose** and place in history
 - o *You will see a **slow and steady movement** forward year in and year out. This is constancy of purpose.*

Philosophy (Long-term thinking)

*Toyota's starting point in business is to **generate value** for the customer, society, and the economy.*

- Use **self reliance** and **responsibility** to do your own fate
 - One of the key differences is that Toyota **always chose a path of self reliance** and lets **do it ourselves**,
rather than relying on outside business partners.

For example, when Toyota wanted to get into the luxury car business, it didn't buy BMW. Instead it created its own luxury division, Lexus, from scratch, in order to learn and understand for itself the essence of a luxury car.

The philosophy of "do it yourself"

Philosophy (Long-term thinking)

*Toyota`s starting point in business is to **generate value** for the customer, society, and the economy.*

- The **true mission**, has **three parts**:
 1. Contribute to the economic growth of the country in **which it is located** (external stakeholders)
 2. Contribute to the stability and well being of team members (internal stakeholders)
 3. Contribute to the overall growth of Toyota

Philosophy (Long-term thinking)

- Mission statement:
 1. **Honor** the language and spirit of the law of **every nation** undertake open and fair corporate activities to be a good corporate citizen of the world.
 2. **Respect** the culture and customs of **every nation** and **contribute** to economic and social development through corporate activities in the communities.
 3. **Dedicate** ourselves to providing clean and safe products and to enhancing the quality of life everywhere through all our activities.
 4. **Create** and **develop** advanced technologies and **provide outstanding products** and **services** that fulfill the needs of customers worldwide.

Philosophy (Long-term thinking)

- Mission statement:
- 5. Foster a corporate culture that enhances **individual creativity and teamwork value**, while honoring mutual trust and respect between labor and management.
- 6. Pursue growth in harmony with the **global community** through innovative management.
- 7. Work with business partners in research and creation to achieve **stable, long-term growth and mutual benefits**, while keeping ourselves open to new partnerships.

Long-Term Management

(Value Management)

What is value?

☐ A measurement of the worth of

1. Product
2. Service

by a **customer** based on it's usefulness in satisfying a **customer need**.

☐ An activity, process or operation that

changes the product from one form to another

in order to **get it closer** to the customer's specifications

☐ It is **something** that customer is willing to pay that

What is value stream?

What is value stream?

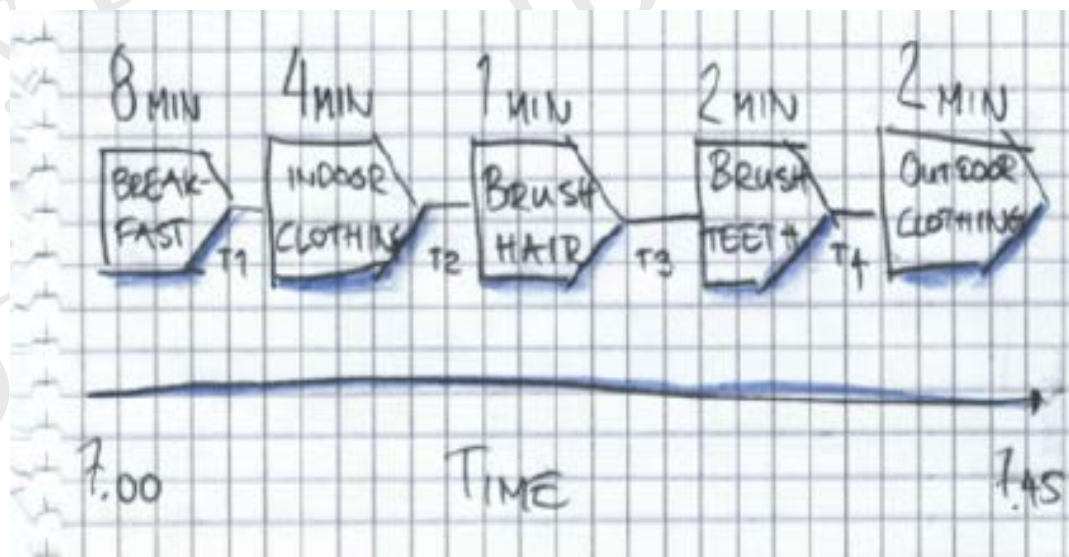
❑ A value stream is

1. Sequence of activities required to

- ❖ Design
- ❖ Construct
- ❖ Provide a specific good or service

2. Path a long with

- ❖ Information
- ❖ Materials
- ❖ Resources flow



What is value stream mapping?

What is value stream mapping?

❑ A value stream mapping is

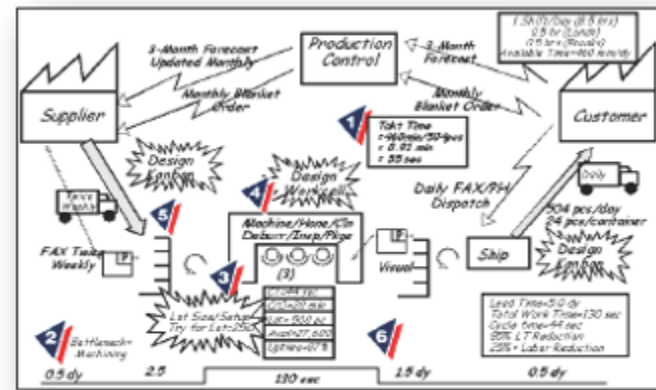
❖ Lean technique used to **analyze and design** the flow of

- ✓ People
- ✓ Materials
- ✓ Information

required to produce a product of service for a customer.

It is also known as “**material and information flow mapping**”

Follow the process from start to finish and draw a visual representation of the actual physical and information flows ...and then draw how it should flow



What is value stream mapping?

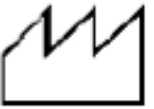
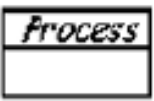
❑ Benefits:

- ❖ Gain agreement on best process
- ❖ Establish “standards”
- ❖ Eliminate wastes

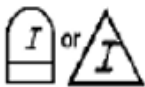
What are the **steps** to construct your VSM?

Let's see the symbols first!

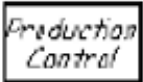
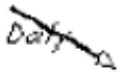
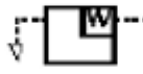
VSM process symbols (for reference)

	Customer/Supplier Icon: represents the Supplier when in the upper left, customer when in the upper right, the usual end point for material
	Dedicated Process flow Icon: a process, operation, machine or department, through which material flows. It represents one department with a continuous, internal fixed flow.
	Shared Process Icon: a process, operation, department or workcenter that other value stream families share.
	Data Box Icon: it goes under other icons that have significant information/data required for analyzing and observing the system.
	Workcell Icon: Indicates that multiple processes are integrated in a manufacturing workcell.

VSM material symbols (for reference)

	Inventory Icons: show inventory between two processes	
	Shipments Icon: represents movement of raw materials from suppliers to the Receiving dock/s of the factory. Or, the movement of finished goods from the Shipping dock/s of the factory to the customers	
	Push Arrow Icon: represents the "pushing" of material from one process to the next process.	
	Supermarket Icon: an inventory "supermarket" (kanban stockpoint).	Resource 1 Resource 2 Resource 3
	Material Pull Icon: supermarkets connect to downstream processes with this "Pull" icon that indicates physical removal. This pull symbol represents physical removal of stored inventory from supermarkets.	
	FIFO Lane Icon: First-In-First-Out inventory. Use this icon when processes are connected with a FIFO system that limits input. Maximum inventory capacity can be written top the lane.	FIFO →
	Safety Stock Icon: represents an inventory "hedge" (or safety stock) against problems such as downtime, to protect the system against sudden fluctuations in customer orders or system failures. Used as a temporary safety stock, not permanent!	Stock Stock Stock
	External Shipment Icon: shipments from suppliers or to customers using external transport	

VSM information symbols (for reference)

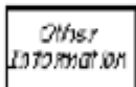
	Production Control Icon: This box represents a central production scheduling or control department, person or operation.
	Manual Info Icon : A straight, thin arrow shows general flow of information from memos, reports, or conversation. Frequency and other notes may be relevant. Indicate the type of information if needed.
	Electronic Info Icon : This wobble arrow represents electronic flow such as electronic data interchange (EDI), the Internet, Intranets, LANs (local area network), WANs (wide area network). You may indicate the frequency of information/data interchange, the type of media used ex. fax, phone, etc. and the type of data exchanged.
	Production Kanban Icon : This icon triggers production of a pre-defined number of parts. It signals a supplying process to provide parts to a downstream process. Indicates the production needed to supply parts to a downstream process.
	Withdrawal Kanban Icon : This icon represents a card or device that instructs a material handler to transfer parts from a supermarket to the receiving process. The material handler (or operator) goes to the supermarket and withdraws the necessary items.

VSM information symbols (for reference)

	Signal Kanban Icon : used whenever the on-hand inventory levels in the supermarket between two processes drops to a trigger or minimum point. It is also referred as "one-per-batch" kanban.
	Kanban Post Icon : a location where kanban signals reside for pickup. Often used with two-card systems to exchange withdrawal and production kanban. Typically located near a supermarket.
	Sequenced Pull Icon: represents a pull system that gives instruction to subassembly processes to produce a predetermined type and quantity of product, typically one unit, without using a supermarket.
	Load Leveling Icon : a tool to batch kanbans in order to level the production volume and mix over a period of time.
	MRP/ERP Icon : scheduling using MRP/ERP or other centralized systems. Material requirements planning (MRP) Enterprise resource planning (ERP)
	Go See Icon : gathering of information through visual means.
	Verbal Information Icon: represents verbal or personal information flow.

VSM general symbols (for reference)

inour

	Kaizen Burst Icon: used to highlight improvement needs and plan kaizen workshops at specific processes that are critical to achieving the Future State Map of the value stream.
	Operator Icon : represents an operator. It shows the number of operators required to process the VSM family at a particular workstation.
	Other Icon : other useful or potentially useful information.
	Timeline Icon : shows value added times (Cycle Times) and non-value added (wait) times. Use this to calculate Lead Time and Total Cycle Time.

VSM symbols (for reference)

Another useful website:

- ❖ <https://www.lucidchart.com/pages/value-stream-mapping/value-stream-mapping-symbols>

Contents

Value stream mapping symbols

VSM process symbols

VSM material symbols

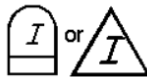
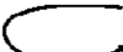
VSM information symbols

VSM general symbols

VSM symbols (for reference)

Another useful website:

❖ http://www.strategosinc.com/vsm_symbols.htm

Process Symbols	 Customer/Supplier	 Dedicated Process	 Shared Process	 Data Box	 Workcell	Value Stream Mapping symbols are <i>not</i> standardized and there are many variations. Here are the most common symbols. You may also create your own symbols for specialized applications. Next Page			
Material Symbols	 Customer/Supplier	 Shipments	 Push Arrow	 Supermarket	 Material Pull	 FIFO Lane	 Safety Stock	 External Shipment	
Information Symbols	 Production Control	 Manual Information	 Electronic Info	 Production Kanban	 Withdrawal Kanban	 Signal Kanban	 Kanban Post	 Sequenced Pull	 Load Leveling
	 MRP/ERP	 Go See	 Verbal Information						
General Symbols	 Kaizen Burst	 Operator	 Other Stuff	 Timeline					
									

Time metrics

What are the **steps** to construct your VSM?

Let's see the time metrics now!

Time metrics

1. Process time (PT) / Value-Adding (VA) time:

- ❖ The time it takes to **actually perform** the work **if** one is able to **work uninterrupted**
 - ✓ It is also called cycle time (C/T)

2. Non-value adding (NVA) time:

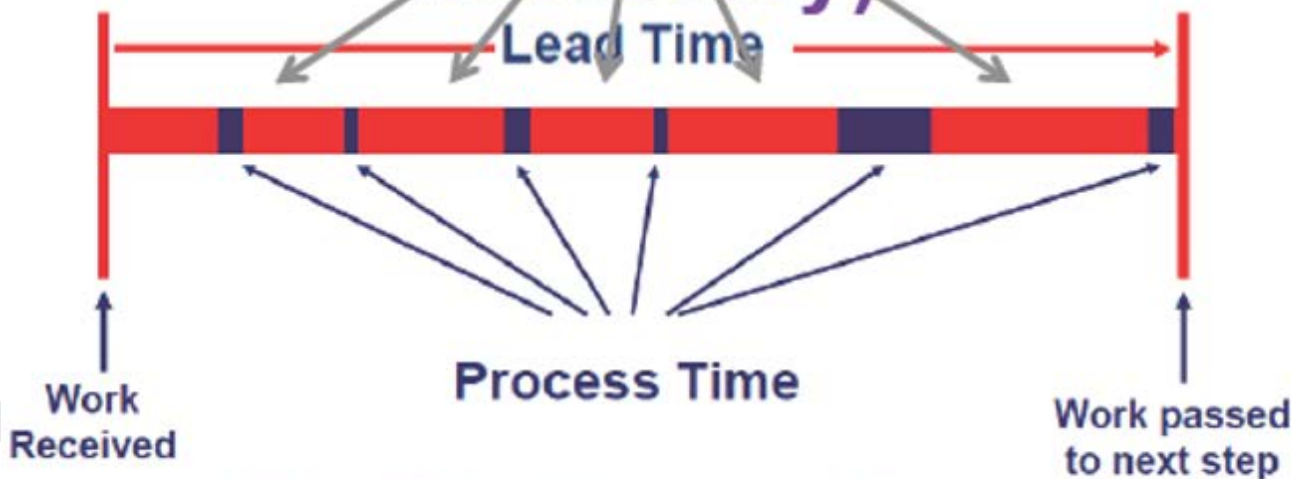
- ❖ The **time spent on activities** that consume resources but the **activities don't add value** to the product
 1. **Necessary:** Incidental waste (support processes, regulatory requirements, etc.)
 2. **Unnecessary:** Pure waste (motion, transport, etc.)

3. Lead time (LT):

- ❖ The **elapsed time** from the time the work is made **available until it is completed** and **passed on to** the next person or department or customer in the stream
 - ✓ Typically this **refers to passing a product** onto the next department or on to the customer
 - ✓ Includes **value added** and **non-value added time**

Lead time vs. process time

**Non-Value Adding Time
(either necessary or non-necessary)**



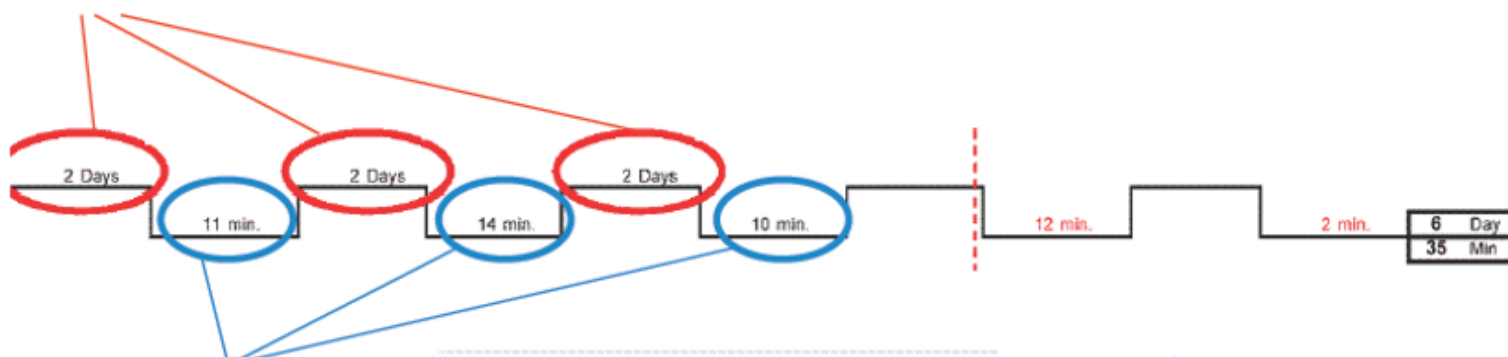
$$LT = PT + \text{Waiting / Delays}$$

value added+non value added

Lead time vs. process time

Lead time:

Period of time between the initiation and the completion of any process
value added time + non value added time



Processing time: time without non value added

How to reduce lead and processing time?

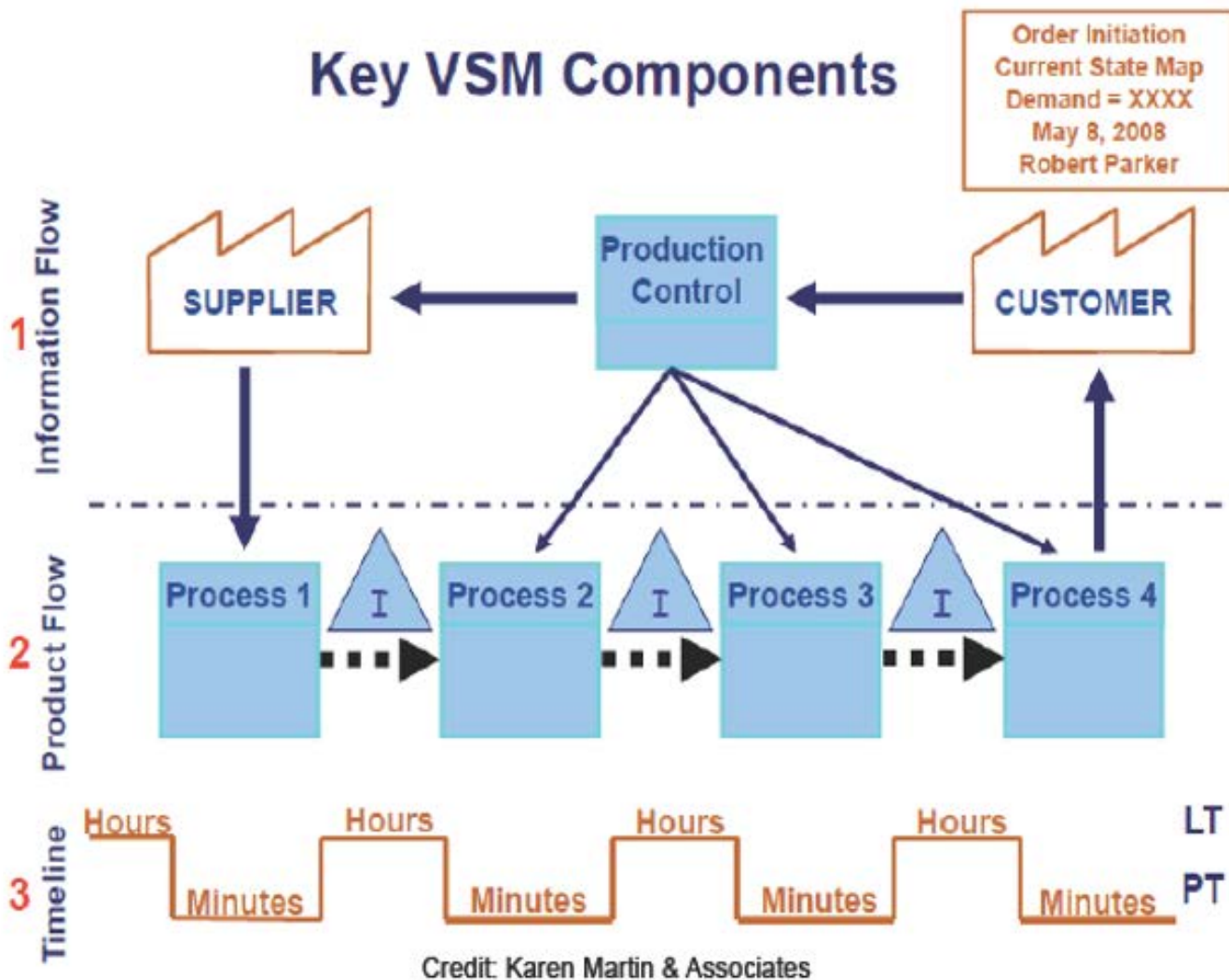
Lead time vs. process time

How to reduce lead and processing time?

Note:

Lead time can easily be reduced by eliminating interfaces, whereas reducing processing time requires usually investments in better equipment and training.

Three-part VSM



Steps to construct your VSM

What are the **steps** to construct your VSM?

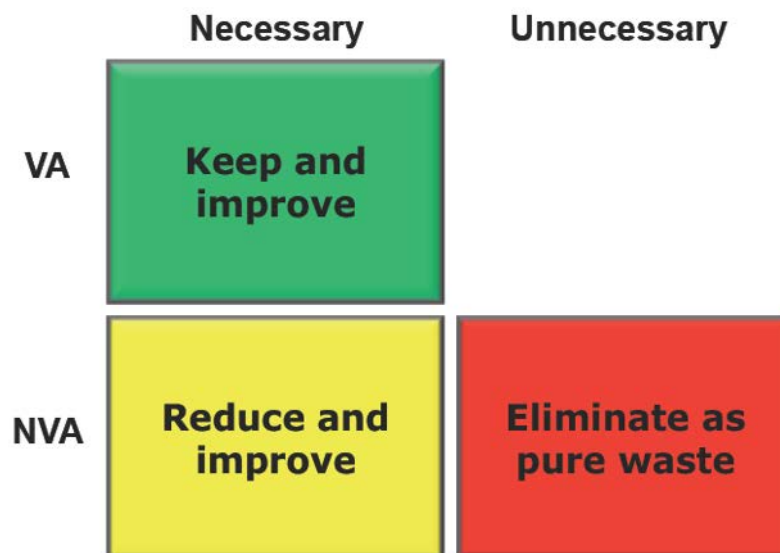
Let's see the steps now!

Steps to construct your VSM

1. Construct your **current state** value stream mapping (VSM)
2. Construct your **future state** value stream mapping (FVSM)

Steps to construct your current state VSM

1. **Define** the **process** to be **evaluated**
2. **Familiarize** yourself with the **symbols**
3. **Develop** the **current state map** based on observation
4. **Brainstorm** with your **team** to identify **missing information**
5. **Calculate**
 - i. **Value-added** time,
 - ii. **Non-value added** time and
 - iii. **Lead** time
 - iv. **Process** time
6. **Identify**
 1. **Waste** in the process and
 2. **Ways** to eliminate it
7. **Develop** a list of **potential improvements**



Steps to construct your future state VSM

1. Re-draw the **desired value stream**

based on the **identified waste** and **potential improvements**,

2. Calculate your

1. **Target value-added** time,
2. **Target non-value added** time, and
3. **Target lead** time
4. **Target process** time

3. Develop an **implementation plan**

4. Implement – improve – repeat

What to put in the process and data block?

- ☐ Write the name of the process
- ☐ **PT** = Process time (or C/T = cycle time)
- ☐ **C/O** = Change over time (often NA)
- ☐ # of workers, crews, or shifts
- ☐ **Takt** = The average unit production time needed to meet customer demand
 - ❖ Work time between two consecutive units to meet the customer demand
 - ❖ $Takt = Ta$ (Available time to work per period) / Demand of units required per period



Process Block

PT= 25 m
C/O= 40 m
2 Shifts
Takt= 60m

Data Block

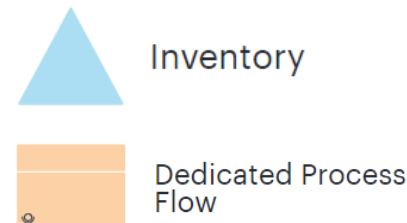
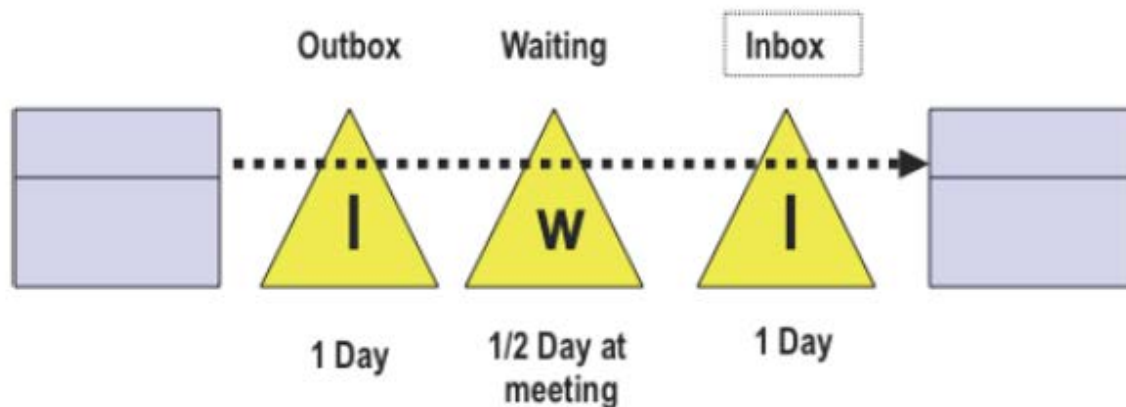
Example: Typical office

- ❑ Office functions support many **shop floor** value streams – **purchasing, payroll**
- ❑ Identify the **rate** of **customer demand**
- ❑ Search for **inventory** can be **forms, paperwork, in-baskets, out-baskets, voicemail, email**
- ❑ Find **cycles of activity** (standard work) (**value added**)
- ❑ **Identify:**
 1. Value-adding time
 2. Necessary non-value adding time
 3. Unnecessary non-value adding time
 4. Lead time

Example: The office current state

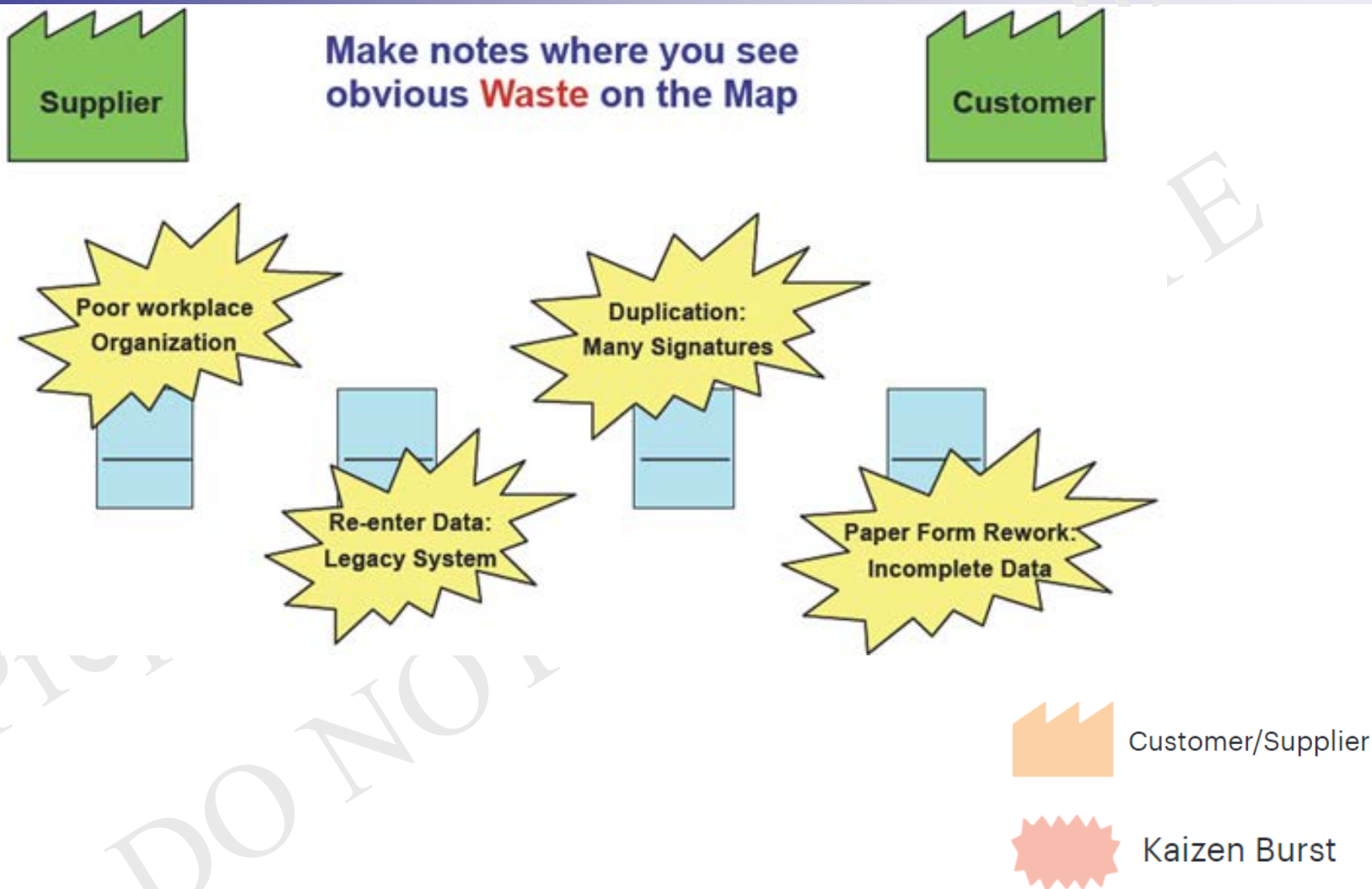
- ☐ **Define boundaries** of your value stream
- ☐ “There has to be a ‘**product**’ or ‘**service**’ to follow like a **purchase order or payroll document**”
Otherwise use a **normal flowchart**”
- ☐ What **capability** do you provide?
- ☐ Is the **demand stable**?
 - ❖ If **not**, what is the **range**?
- ☐ What is the **customer expectation** of performance?

Example: Current office – Current state

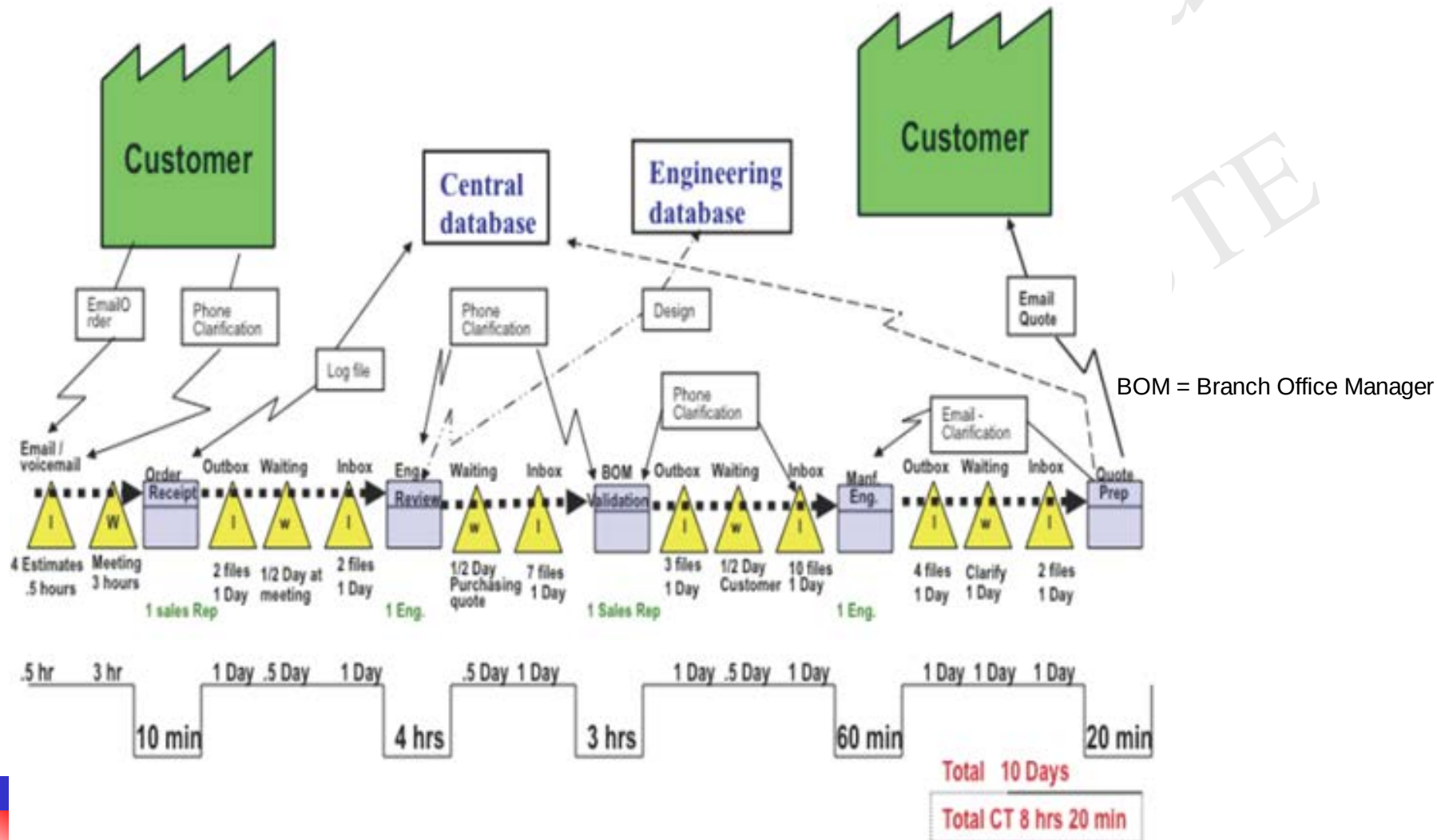


- ☐ **Waiting** should be recorded **if**
 1. There is **no apparent “end” takt time** and
 2. **Next process** is **far away**.
- ☐ Use **cycle time** of **customer process** to understand the **total lead time**.

Example: Current office – Current state



Example: Current office – Current state



Mapping tips

- ❑ Use **colored post-it notes paper** for mapping
 - ❖ **Easier to move** post-it notes **than redraw**



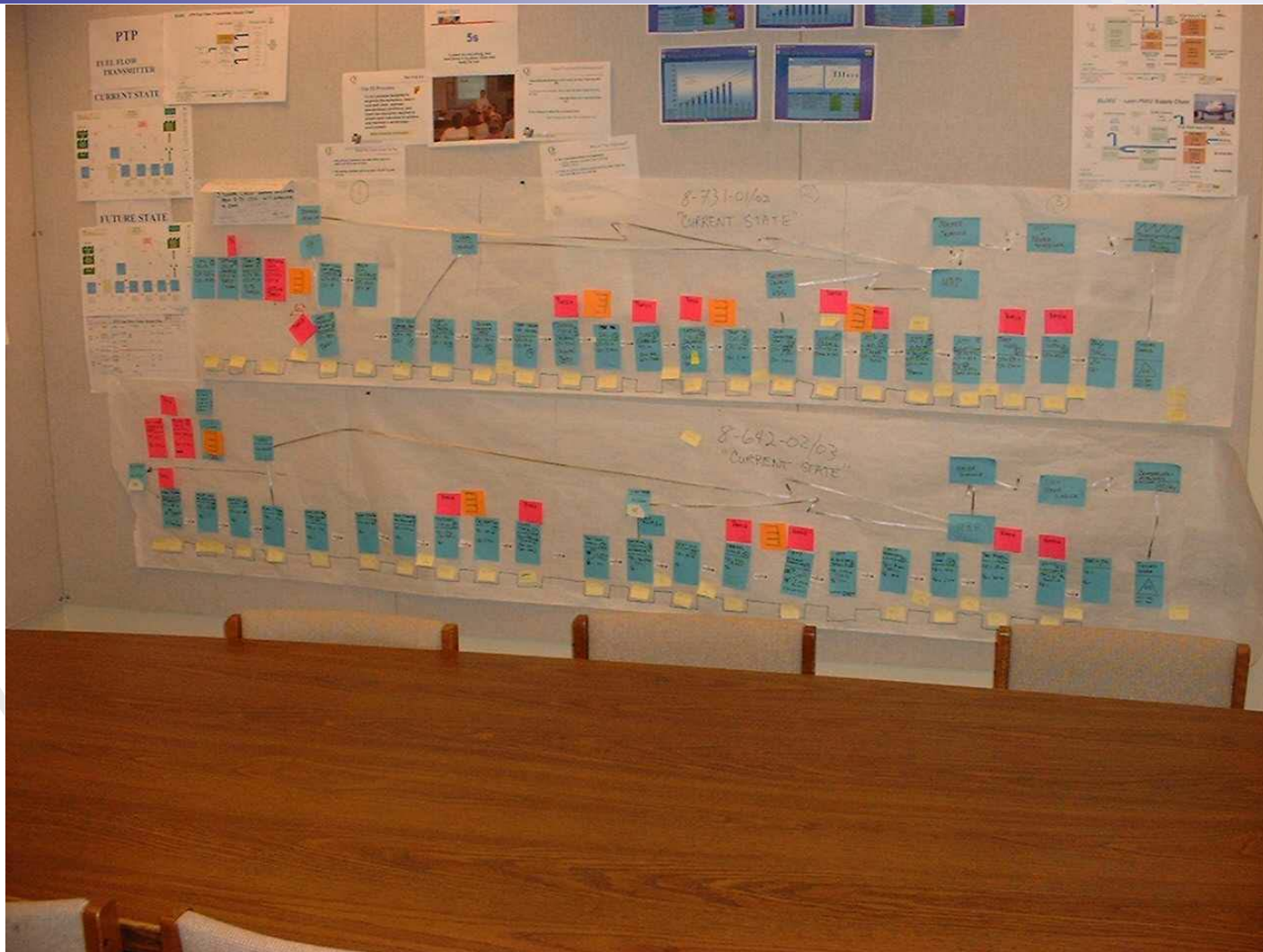
- ❑ Use **roll of butcher paper**
 - so you can use a **wall** and see the **whole VSM**



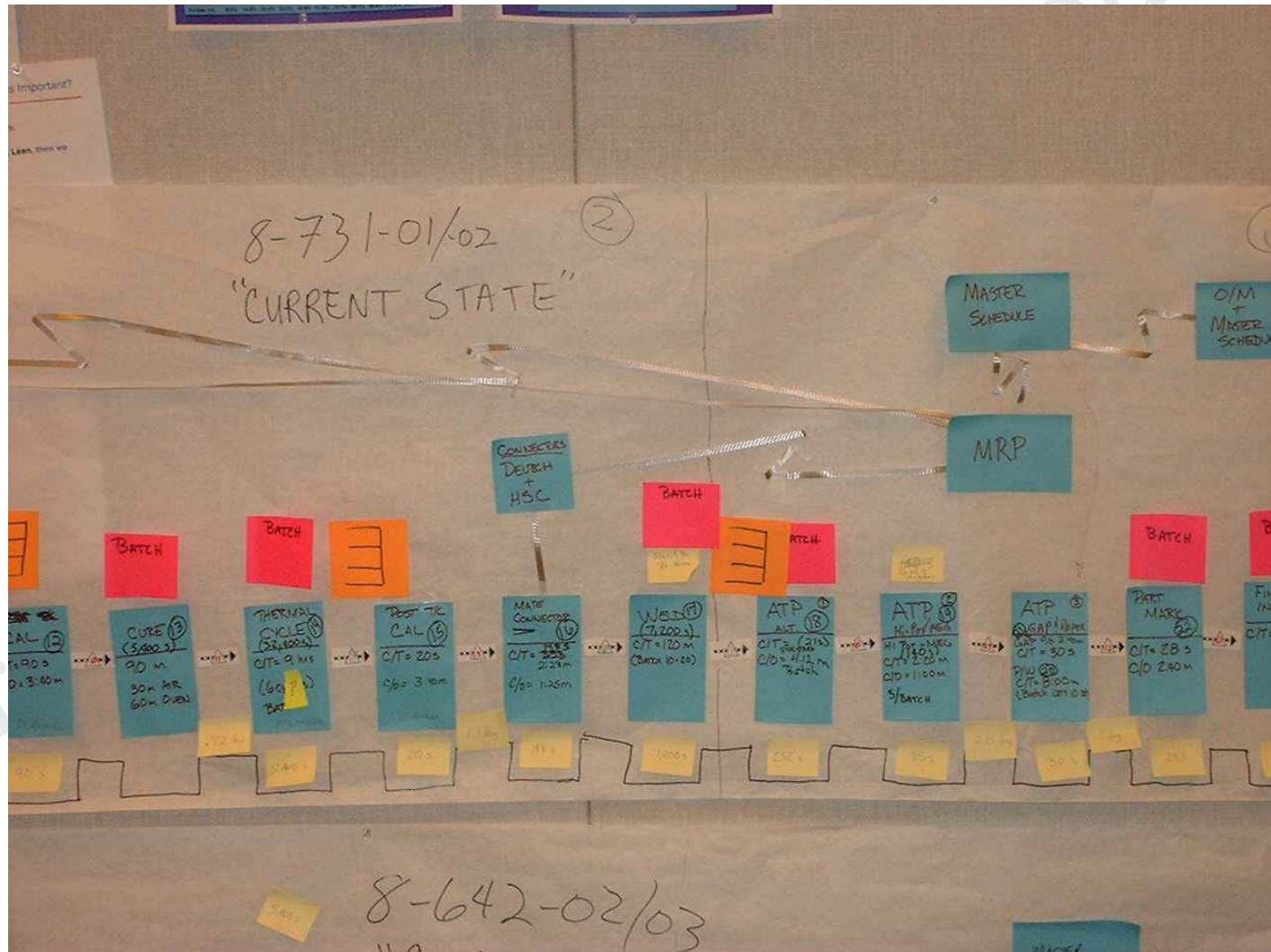
- ❑ Use **string or ribbon** to show **material & information** flows



Example

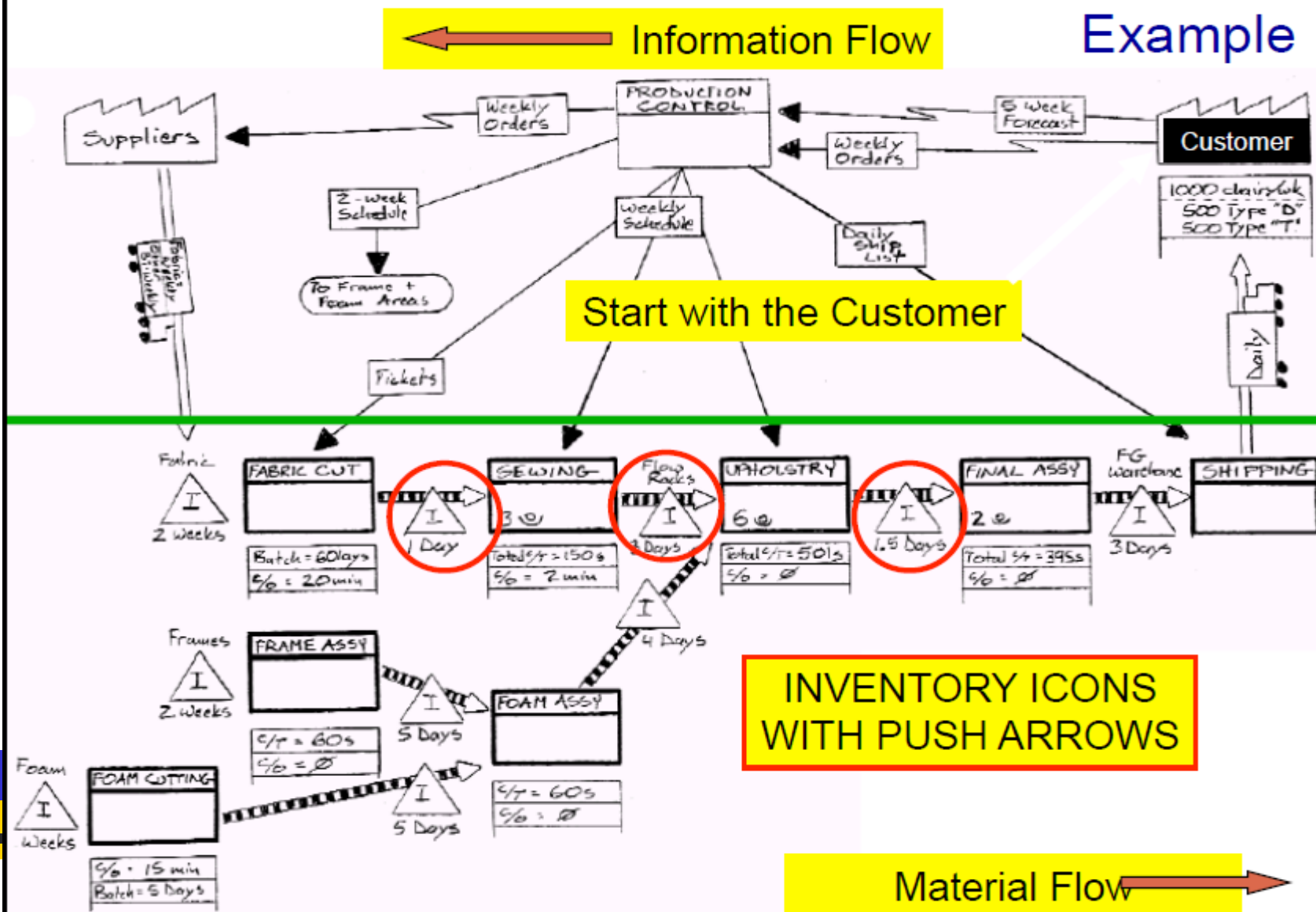


Example

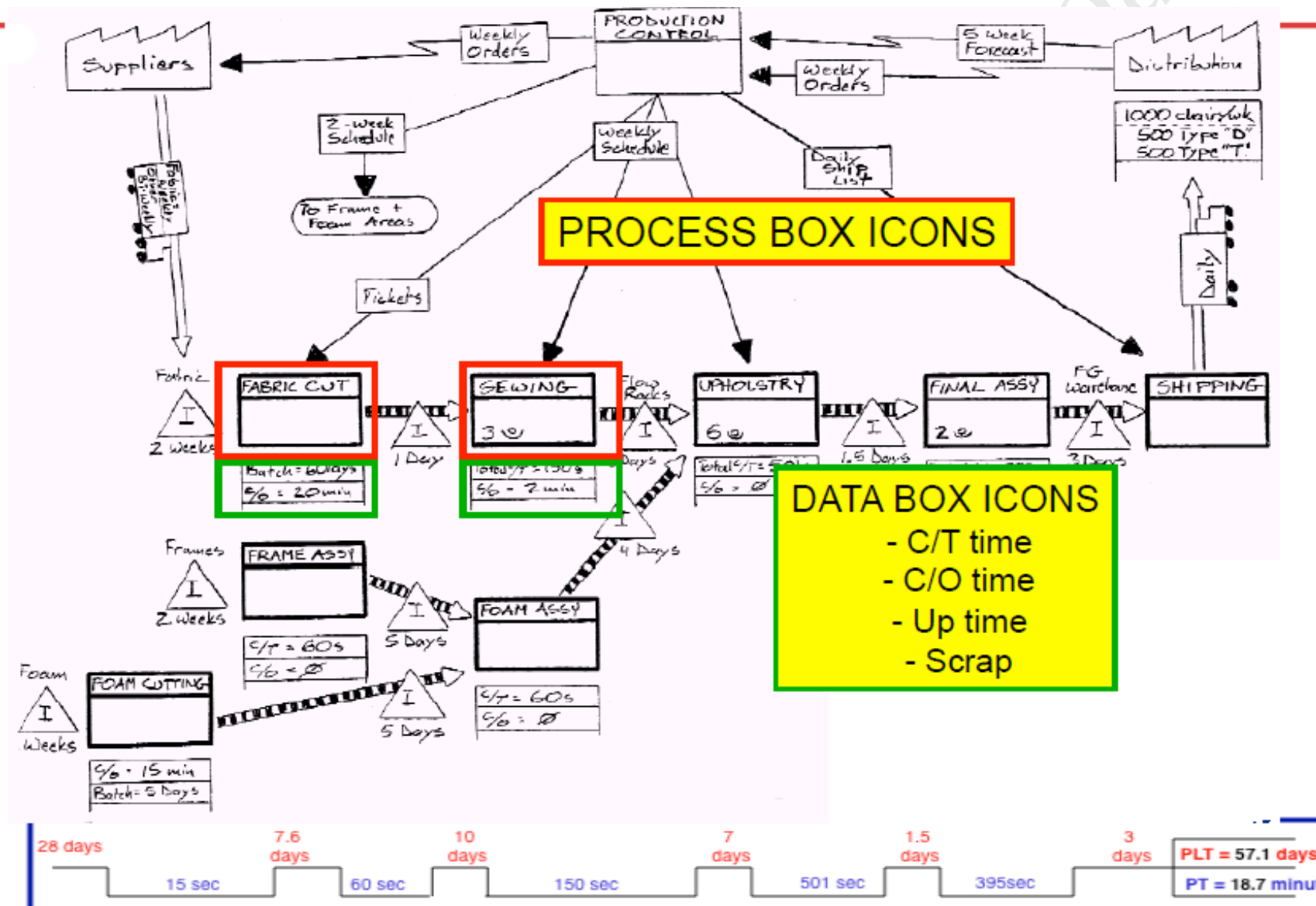


Example

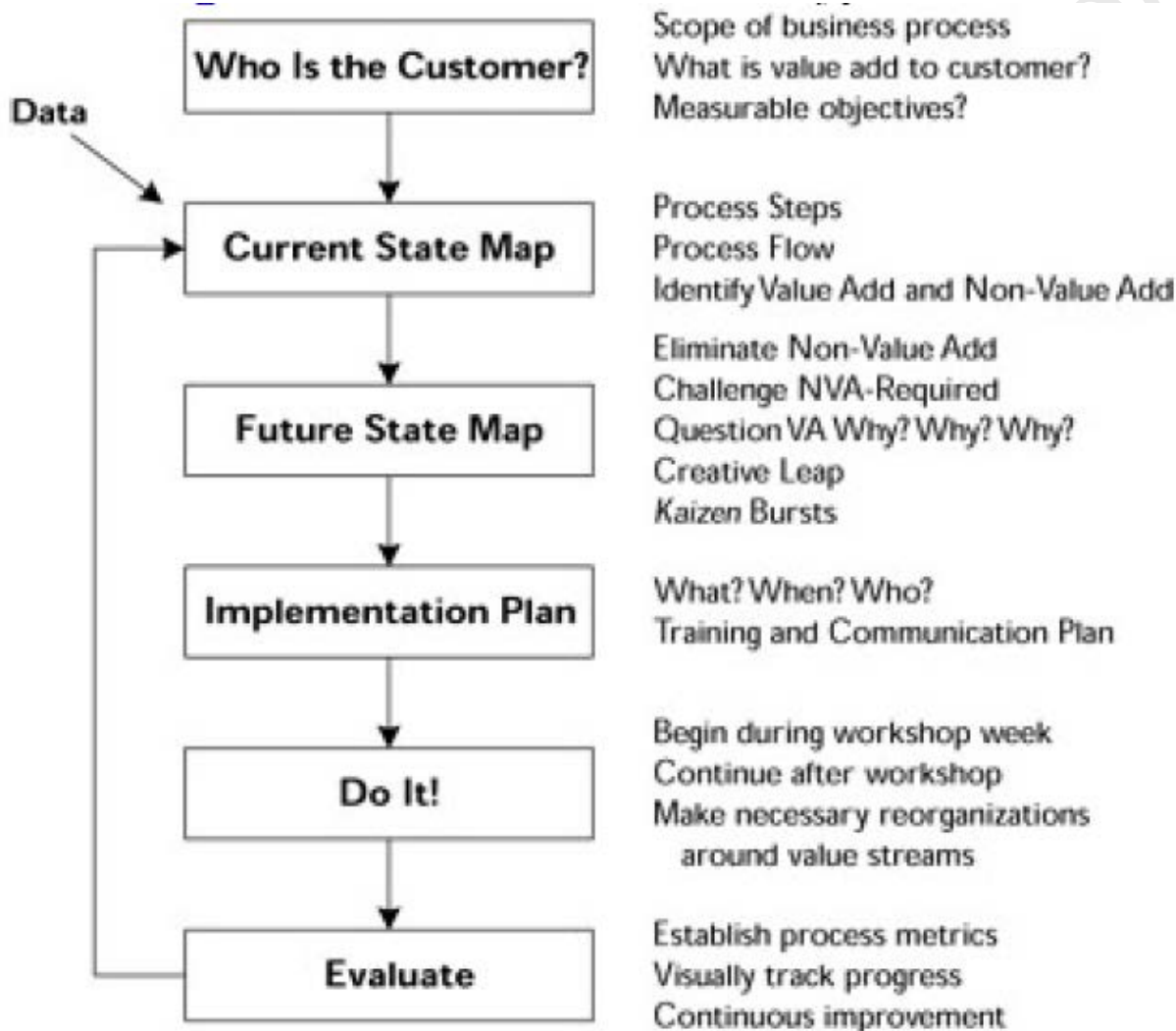
Example



Example



Kaizen using VSM



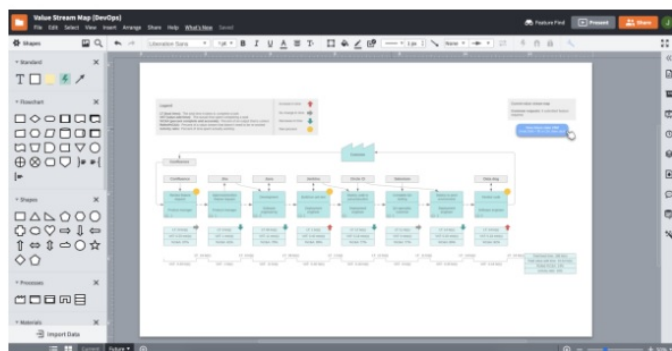
VSM software

Value stream mapping software

Lucidchart is a visual workspace that combines diagramming, data visualization, and collaboration to accelerate understanding and drive innovation.

<https://www.lucidchart.com/pages/examples/value-stream-mapping-software>

A VSM software to visualize and optimize any process



Better understand the flow of production and information

A value stream map is a lean visual tool designed to represent the flow of material and information through the production process of a product or service. With roots in the manufacturing industry, a VSM can be used to demonstrate information and customer flow within business services, patient flows within healthcare, and so much more. With our value stream mapping software, you can upgrade your VSM from a static whiteboard visual to a living document using industry-standard shapes, templates, and an intuitive interface.

Long-Term Management

(Swim Lane Diagrams)

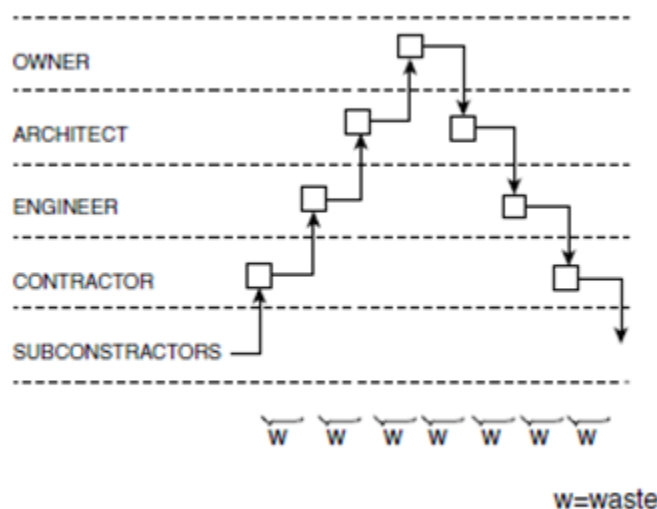
Introduction

❑ Lean practitioners are aided by tools such as value-stream maps and swim-lane diagrams to

1. **Document and analyze current states** of processes and
2. **Propose desired future states** that eliminate constraints and wasteful practices.

RFI example

- ❑ For example, a swim-lane diagram documenting the request for information (RFI) process required by traditional, design-bid-build contracts reveals unnecessary causes for delay.



Original Process

Swim lane diagrams comparing the RFI communication process during traditional design-bid-build

What is the problem here?

RFI example

- ☐ In this circumstance, a **subcontractor working on site**, finding an error,
cannot query an owner directly,
but must communicate in writing along the **document chain**
required by a legal contract.

What is the solution here?

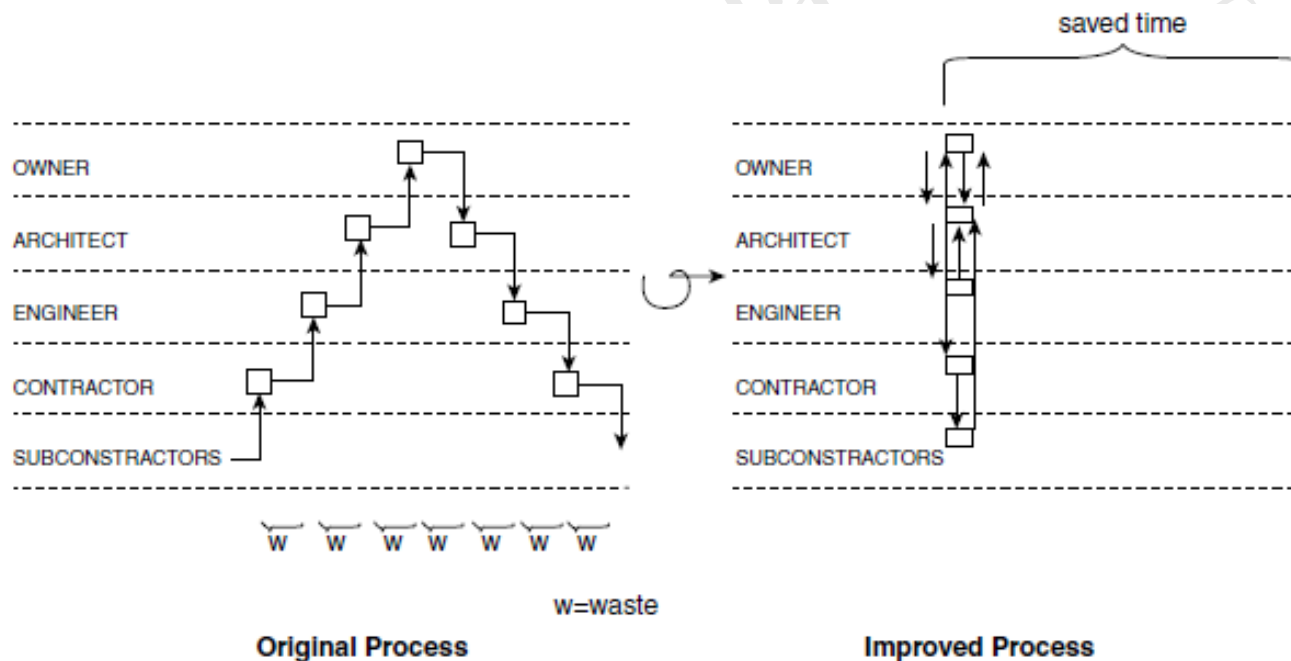
RFI example

- ❑ By contrast, if critical stakeholders instead **meet collectively in a Big Room meeting (or through an online platform)**, **communication is liberated**,
and issues can be **resolved much more quickly**.
- ❑ Lean tools such as **swim-lane diagrams** help lean project managers **visualize and quantify before-and- after impacts** of their interventions.

Let's see what happens!

RFI example

- ❑ For example, a swim-lane diagram documenting the request for information (RFI) process required by traditional, design-bid-build contracts reveals unnecessary causes for delay.



Swim lane diagrams comparing the RFI communication process during traditional design-bid-build projects (left) versus a typical lean project delivery Big Room meeting (right)

Source: Adapted from Rybkowski (2012)

Note: The horizontal axis represents time.

Long-Term Management

(Case Study)



VSM at “GROUPE XYZ”

- ❑ By: Gilles Bélanger, Engineer, MPM, PMP, MBB
President, Gilles Bélanger & Associates Inc.

Introduction

Based in the Province of Quebec, Canada, GROUPE XYZ is a major player in the commercial and industrial construction field. They run their business in a French-speaking environment.

The company started their Lean journey in 2015. I am thankful for the privilege I have been granted to train a selected group of talented people in this organization. Several training sessions were held with stakeholders representing the following functions: Project Managers, Quality Manager, Health & Safety agent, Finance, Legal and Upper Management.

Value Stream mapping was first introduced to the groups with the drawing below:
With the following explanations:

VSM Purpose: Visualize wastes in the information and materials flow. The goal is to create countermeasures to improve the performance of a cross-functional important process that has customers and suppliers.

Creating the as is (current state) VSM

- ❑ In 2016, the company aimed at improving their “Quote” process after realizing their rate of success

was **not high enough to maintain** their sales level for the next couple of years.

- ❑ A dedicated group first created an A3 report titled **“Improve our ability to achieve quality estimates for future projects”**.
- ❑ They defined several countermeasures that includes a VSM as illustrated below:

Countermeasures and action plan

<i>COUNTERMEASURES</i>	<i>WHO</i>	<i>WHEN</i>
Define quality criteria for a quote	ML	October 30, 2015
Define criteria for judging the relevance of a project to be estimated by <i>GROUPE XYZ</i>	PA	January 30, 2016
Create the as is (current state) and the future state VSM for “Create a quote”	PA	April 28, 2016

Creating the as is (current state) VSM

- ☐ Bélanger worked with them to create a VSM charter to make sure stakeholders were properly identified as well as their expected roles in drawing the **as-is** and **future state VSM** and to define the expected gains.
- ☐ They worked with a team of **five stakeholders** to identify the main processes for one day and half.
- ☐ The group decided to focus on the **constraints** that each process was facing.
- ☐ It was also decided not to **draw the timeline**, but to work **instead with the summarized** Lead Time (LT) and Process time (PT)

Creating the as is (current state) VSM

Definitions



The red triangles represent the inventory found before each process (in this case: number of documents to be treated).



The curved arrow stands for 'Pulled' information.



The black and white arrow is for 'Pushed' information.

CONSTRAINTS= In this effort, the team wanted to capture the constraints and obstacles that each process was facing

LT = Lead Time

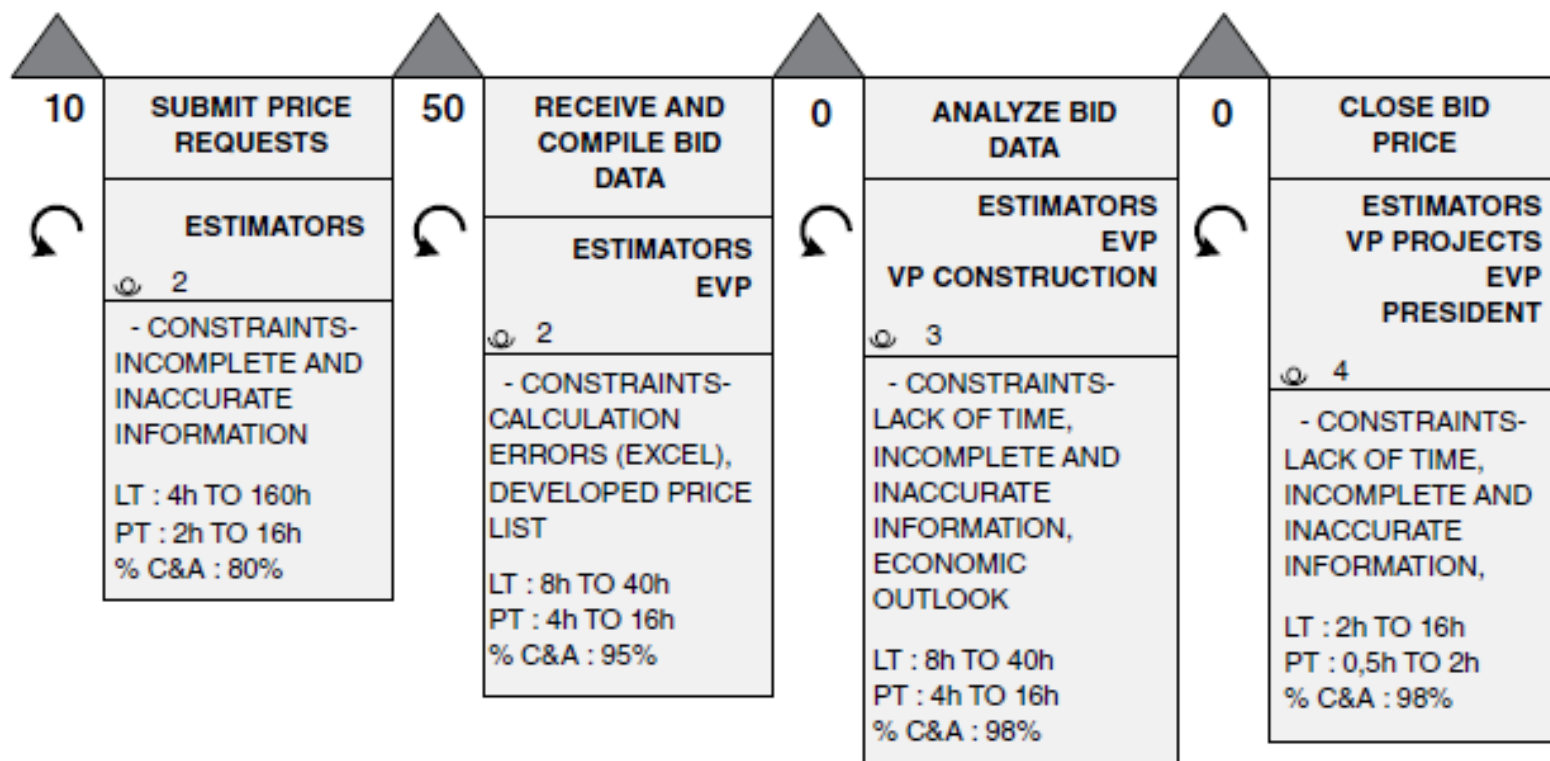
PT = Process Time

&C&A = Percentage of transactions that are Complete and Accurate

Let's see the As- is VSM generated by the team efforts

Creating the as is (current state) VSM

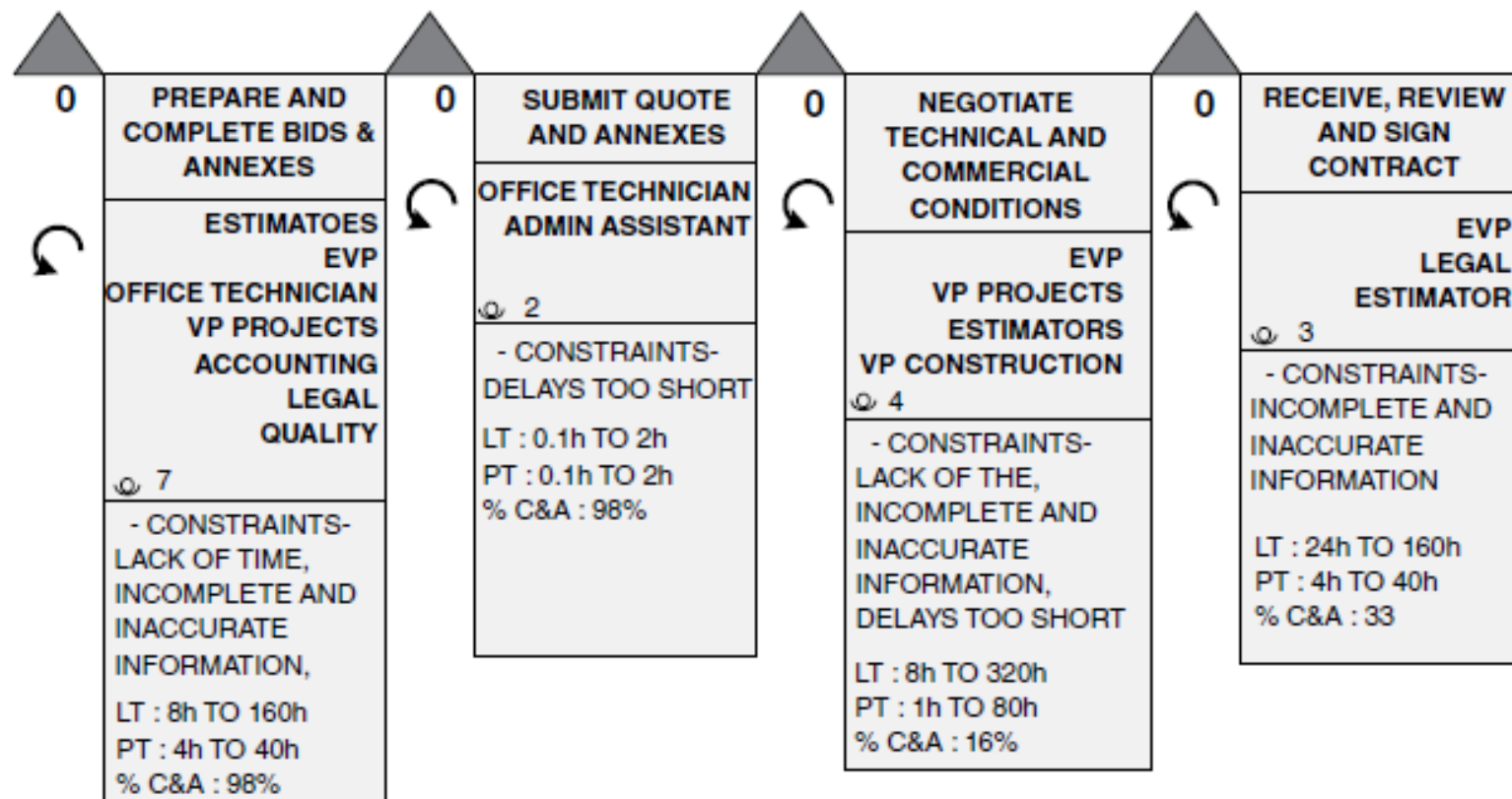
- ❑ Here is legible information for each process in the as is (current state) VSM from left to right:



As-is Value Stream mapping detailed process

Creating the as is (current state) VSM

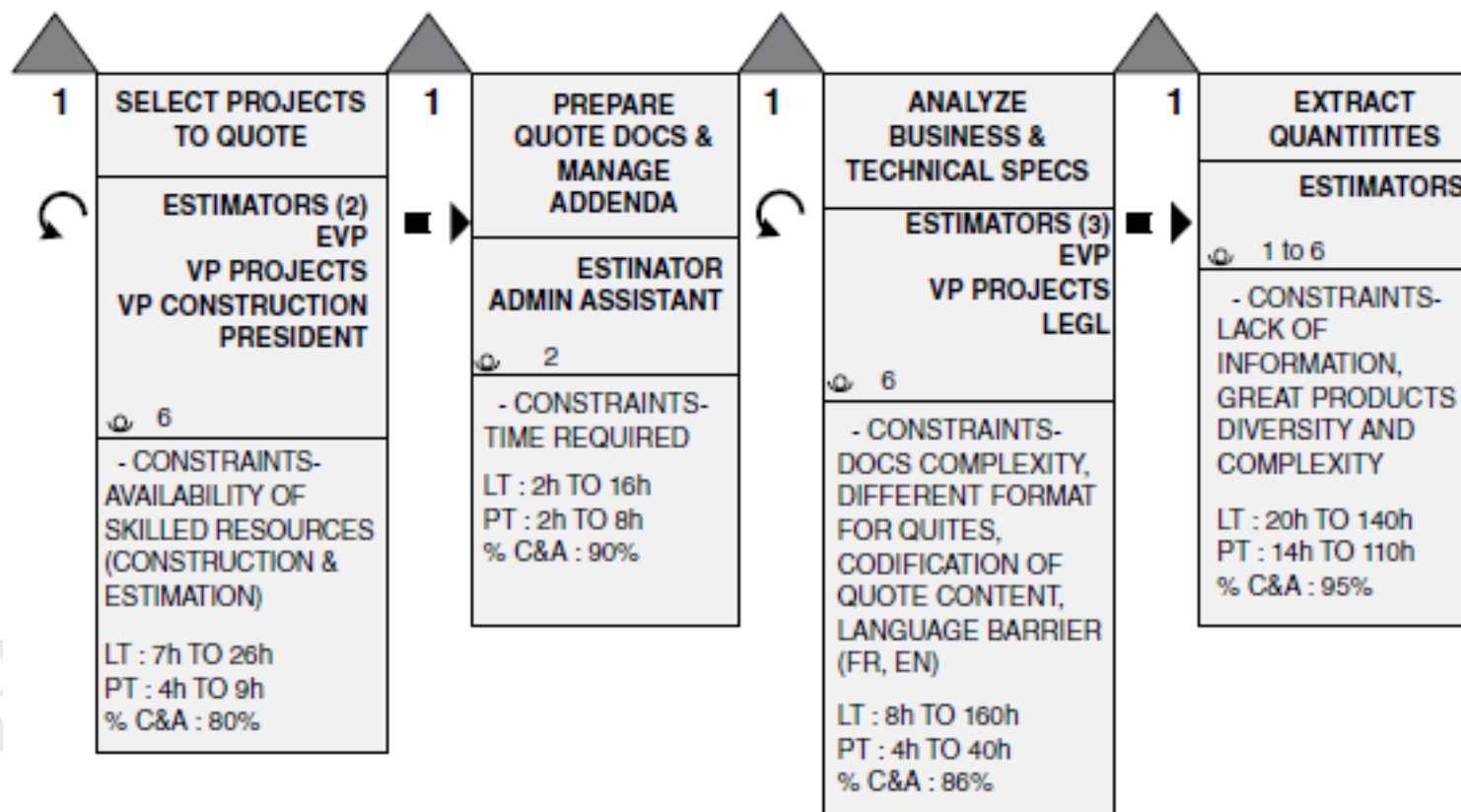
❑ Followed by:



As-is Value Stream mapping detailed process

Creating the as is (current state) VSM

□ And finally:



As-is Value Stream mapping detailed process

Creating the future state VSM

- ❑ A couple of weeks later they met again to draw the **future state** for the “**Create a quote**” process.
- ❑ We had a situation where **nobody wanted to provide new ideas**, maybe because it could have been understood as a critic to the present situation.
 - ❖ After a couple of **passionate and rich discussions**, Bélanger just **followed their intuition** and Bélanger started to **propose different alternatives** that **nobody really liked until, finally,**

one person stood up and said, **we are going nowhere** with this effort, **here is what we should do!**

Creating the future state VSM

- ❑ Bélanger said **alright, you tell us what we should do**, I'll sit down, and **you drive** the meeting from now on.
- ❑ During that **rich exchange**, the team **realized that one weak process** that was partly addressed in an **inconsistent manner** was the transfer of a contract to the **Construction team**.
 - ❖ **Many good ideas** were put on the table, they captured them all and started to draw the **“Create a quote” Future State VS**.
 - ❖ That **led to the addition of an important process** in any construction company: **‘Transfer Contract Knowledge To The Construction Team’**.

To reflect the addition of this process, the Value Stream name was changed to “GET A CONTRACT”.

Creating the future state VSM

❑ The forecasted metrics were calculated as shown in the table below:

❑ $(354 - 669.5)/669.5 = -47\%$

FUTURE STATE VALUE STREAM PERFORMANCE METRICS

VALUE STREAM NAME		GET A CONTRACT		PREPARED BY:	PA, VC
DATE:		25-Nov-15			
METRICS		Initial values	Projected future value	Projected % of improvement	
Total Lead Time		669.5 h	354 h	-47.0%	
Total Process Time		211.3 h	162.5 h	-26.5%	
Activity Ratio		31.50%	46.00%	46.0%	
Rolled C&A %		2%	3.3%	165.0%	

Future state Value Stream performance metrics

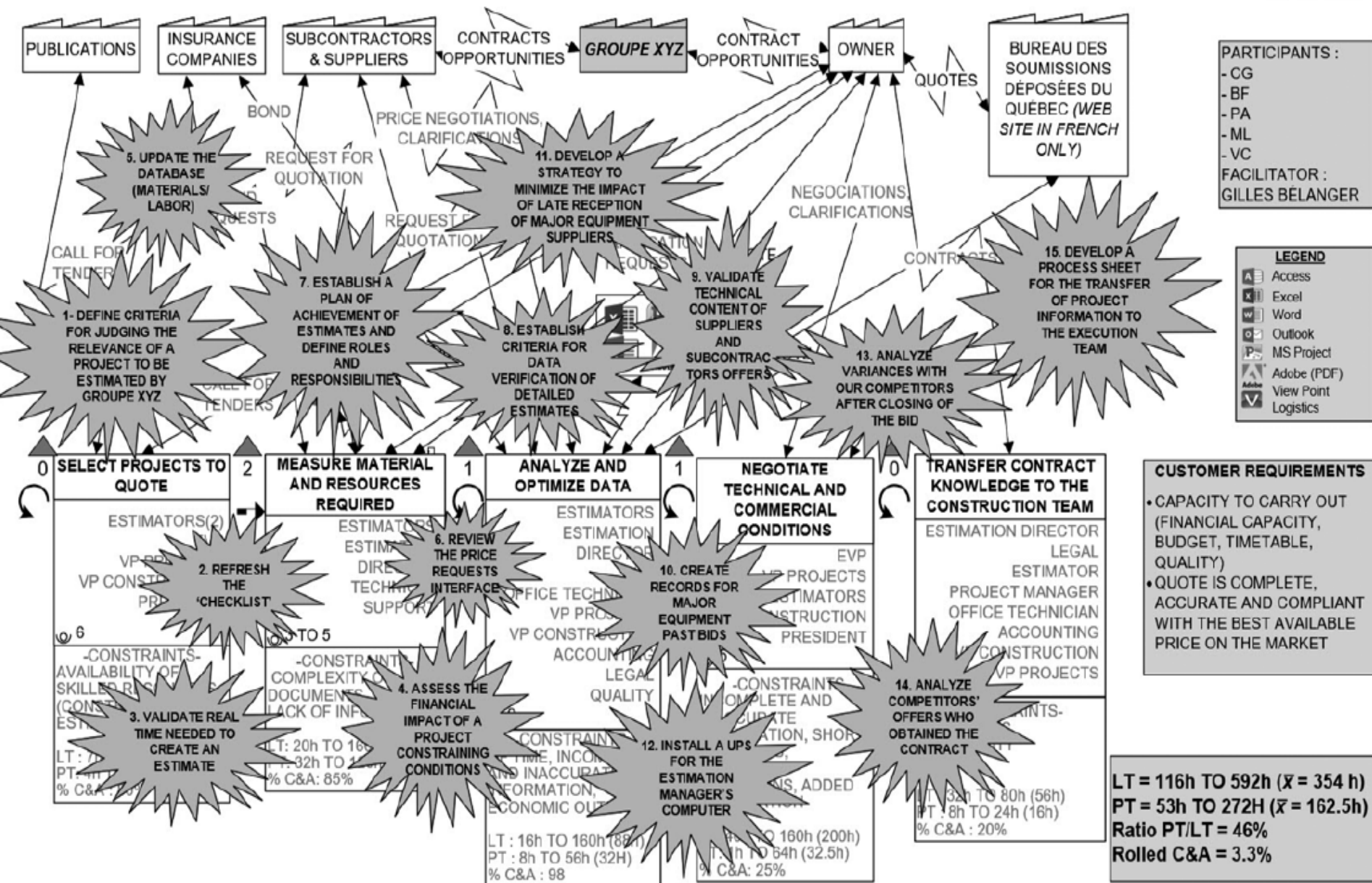
Creating the future state VSM

- They then created an **action plan** to execute each of the improvements identified in the **future state**, a **small part** of them are shown on the figure below:

VALUE STREAM ACTION PLAN

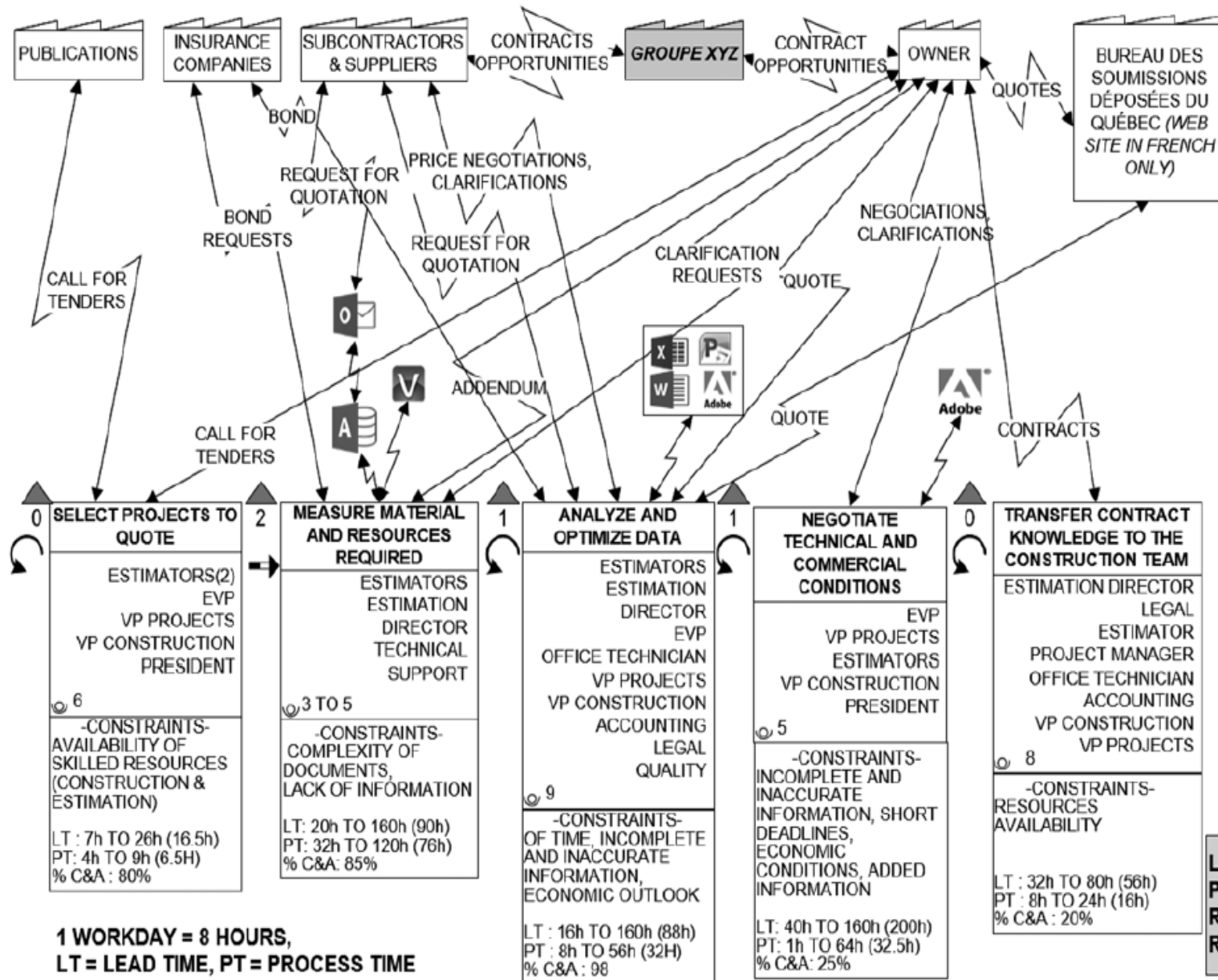
VSM NAME: GET A CONTRACT					CEATION DATE: 29-Oct-15																															
← APPROVALS →										SCHEDULED REVIEW DATES																										
EXECUTIVE SPONSORS			VALUE STREAM CHAMPION				VSM FACILITATOR				13-Nov-15																									
NAME: JP			NAME: PA				Nom: Gilles Bélanger				Dec 16, 2015 with PA																									
SIGNATURE:			SIGNATURE:				SIGNATURE:				16-Jan-16																									
DATE:			DATE:				DATE:																													
FUTURE VSM BURST #		MEASURABLE TARGET		COUNTERMEASURE DESCRIPTION			REALIZATION METHOD*		OWNER		IMPLEMENTATION SCHEDULE (2015-2016)										STATUS															
											10		11		12		1		2		3		4		5		6		7		8		9			
1		Number of criteria defined and approved		Define criteria for judging the relevance of a project to be estimated by GROUPE XYZ			Proj		PA																										60%	
2		Update Checklist		Refresh the 'CHECKLIST'			JDI		CG																										50%	

* REALIZATION METHOD: Proj (Project), KE(Kainzen), JDI(Just do it)



NEW 'AS-IS' VALUE STREAM MAP : 'GET A CONTRACT' – GROUPE XYZ

October 30, 2016



PARTICIPANTS :

- CG
 - BF
 - PA
 - ML
 - VC
- FACILITATOR : GILLES BÉLANGER

LEGEND

- Access
- Excel
- Word
- Outlook
- MS Project
- Adobe (PDF)
- View Point Logistics

CUSTOMER REQUIREMENTS

- CAPACITY TO CARRY OUT (FINANCIAL CAPACITY, BUDGET, TIMETABLE, QUALITY)
- QUOTE IS COMPLETE, ACCURATE AND COMPLIANT WITH THE BEST AVAILABLE PRICE ON THE MARKET

LT = 116h TO 592h ($\bar{x}$ = 354 h)
PT = 53h TO 272H ($\bar{x}$ = 162.5h)
Ratio PT/LT = 46%
Rolled C&A = 3.3%

موسسه مهندسی و مدیریت ساخت علوی پور

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