

TABLE OF CONTENTS

MODULE 3: LEAN TOOLS FOR CONSTRUCTION

INTRODUCTION	2
Unit 3.1 MANAGEMENT SYSTEMS	5
3.1.1 Introduction to the ISO excellence model.....	5
3.1.2 PDCA- Continuous improvement	12
3.1.3 Kaizen events: A tool for continuous improvement.....	19
Unit 3.2 STANDARDS.....	28
3.2.1 Work instructions	28
3.2.2 5S	31
3.2.3 Visual management – Andon	39
Unit 3.3 QUALITY IMPROVEMENT.....	42
3.3.1 Poka yoke - Jidoka	42
3.3.2 Problem solving A3.....	45

INTRODUCTION

This training module main objective is to provide students with a set of **lean tools** in order to apply them in the construction sector, explain the benefits and usefulness of these methods and how to employ them (recommendations).

We do not intend students to become experts on the tools but that they would learn how to use them and what can be achieved. We will give you some recommendations to manage it with your team. As a general recommendation, always we will try to apply the tool with a small area or pilot team to learn by doing and then we will deploy it to the rest of the organization.

This module consists of the following units:

Management Systems:

Target:

It is an introduction of different management systems of improvement that we can apply in one company.

Know the concept of continuous improvement for process and project.

Program:

- Introduction ISO 9001- ISO 14001 and ISO 21500- OSHAS
- Continuous improvement: PDCA Deming
- Continuous improvement: Kaizen event

Projects and organizations need to have defined the different processes to achieve good efficiency and sustainability. To achieve it, there are different models of organization and management system, certifiable or not, that help us achieve it. In many cases, they are compatible and complement one of each other for the best efficiency of the organization.

Standards:

Target:

Understand why it is necessary to control our work tasks by standardization and know which tool can be applied to our project and in witch moment.

Program:

- Work instructions
- 5 S tool
- Visual management and Andon

The improvement begins with the standards, without standards or references we can't start and apply the improvement of something, that we don't know what it is the starting point. The work instructions and the 5S tool will help us to define these standards and with visual management and Andon will help us to detect quickly deviations with our standards to act on the environment or process to return to the standard or correct it for improvement.

Before implementing the 5S tool, Andon, management visual or standards, it is necessary to understand well: why will we need to stabilize the working environment?

- Safety improvement

- Reduce waste
- Quality improvement
- Best external perception by my costumers, etc.

It is important that we don't search the perfection task o process, but to define current practices with standards, first. The standards show the best way to do something in this moment. With the defined standards, we can begin to measure and therefore control our process or project from now, we can begin continuous improvement. If we wait to have the perfect standards we will never start the improvement and we will continue to uncontrolled our projects or organizations.

Quality improvement:

Target:

Understand the main tool of resolving problem to begin the quality improvement way.
Know the different between to solve one problem and to improve my quality result.

Program:

- Introduction to problem solving processes
- A3: resolving problem tool
- Poka yoke and Jidoka solution.

How to get to see that non-quality or defects are an opportunity for improvement and that we will have to show it with pride, instead of looking to hide it. With these tools we will try to change this tendency and to learn of our errors with the team to have less it during our project or process.

Activity 1:

Target:

Quantify the benefit to apply the 5S method and work instruction in one practical case.
Be able to identify some critical points in different cases and propose some solution to recover it.

Program:

- 5S method step by step (number case)
- Critical situation to recover it.
- Work instruction exercise

Practice time, theory is fine but now what do I do? The "paper", the theory holds it all but it seems so simple that it can't be true to get these benefits? It is the best to try it and think about it.

Activity 2:

Target:

Apply the tool of solving problem A3 with a practical case, use the necessary supports and tools.

Program:

- Definition of problem
- Roots causes analysis

- Action plan
- Control
- Standardization

Evaluate the concepts and tools presented in the training. Reinforce the most important points of the different tools presented.

Test:

Target:

Evaluate the concepts and tools presented in the training.

Reinforce the most important points of the different tools presented.

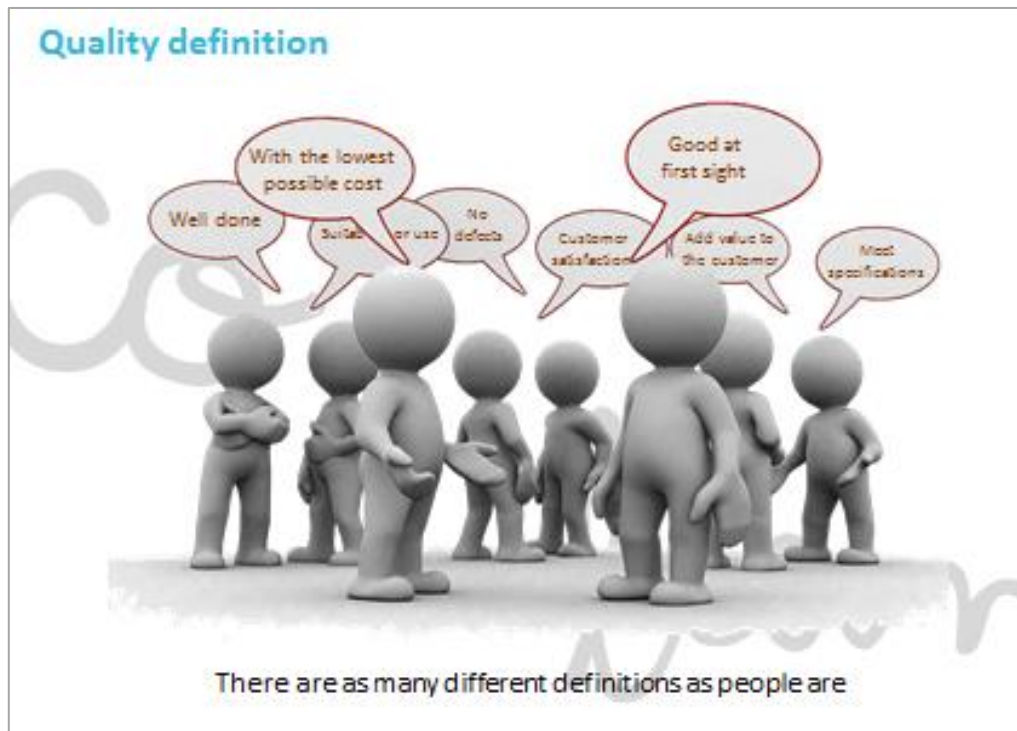
Program:

- Management systems
- Standards
- Quality improvement

Unit 3.1 MANAGEMENT SYSTEMS

3.1.1 Introduction to the ISO excellence model

Every person has a different definition for the Word Quality, but most of them include the consideration of satisfying a customer by serving him a product or service that meets his needs. When quality level is outstanding, we usually talk about “excellence”.



Since the emergence of the concept of quality in the business environment, there has been an evolution:

- First of all, the quality control, referred to the checks made to separate bad products and avoid serving them to the customer.
- Then, companies tried to ensure and guarantee that the products they created were good instead of controlling them and separating the bad ones.
- In the 80s the companies evolved to manage quality rather than control or assure it.
- Lately, people talk about excellence when quality involves not only products and production processes but all business areas.

Nowadays all these coexist in the business environment, so it's possible to find companies in different moments of evolution.



Quality Control

- Any system, action, tool... used to detect the presence of errors.
 - At the end of the process
 - During the process
 - Sampling

Quality control includes any check performed to detect and separate defective products.



Quality assurance

Meanwhile, quality assurance is regarded as an “effort to plan, organize, manage and control the quality in a production system with the aim of giving the customer products with the right quality”.

- Procedures
- Autocontrol
- Concerted quality, sampling at reception
- Audits

Quality Assurance includes work procedures and process controls to guarantee the quality of the end products.

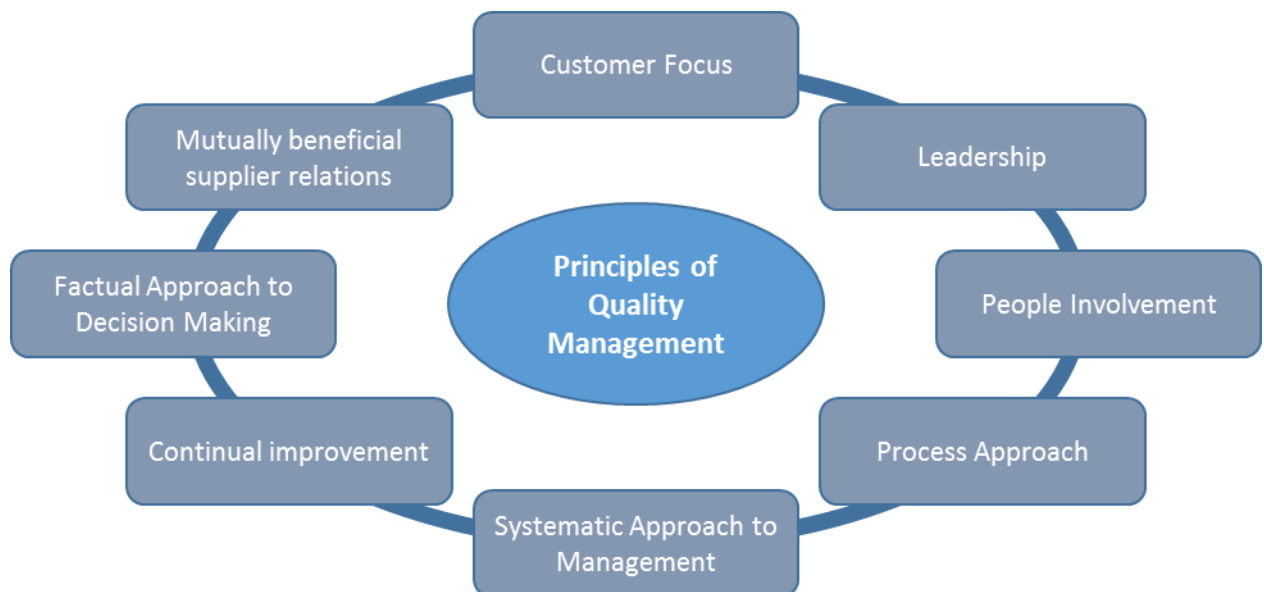


Quality Management

Coordinated activities carried out on a set of elements (Resources, Procedures, Documents, Organizational Structure and Strategies) to achieve the quality of the products or services offered to the client.

Quality Management tries to ensure that an organization, product or service is consistent. Quality management is focused not only on product and service quality, but also on the means to achieve and improve it.

The picture below introduces the Quality Management 8 principles, according with the International Standard for Quality Management ISO 9001, to guide the organizations towards improved performance.



Business excellence

Global satisfaction applied to the business activity in all its aspects and stakeholders:

- Customers
- Employees
- Shareholders
- Community
- Suppliers
- Public Administration

Business Excellence refers to outstanding practices in managing the organisation and achieving results, all based on a set of fundamental concepts or values.

These practices have evolved into models, such as EFQM model, for how a world class organisation should operate. These models have been developed and continue to evolve through extensive study of the practice and values of the world's highest performing organisations.

ISO 9000 Standards

- ISO 9000 is a set of international standards on quality management and quality assurance developed to help companies effectively implement and maintain an efficient quality system. They are not specific to any one industry and can be applied to organizations of any size.
- ISO 9000 can help a company satisfy its customers, meet regulatory requirements, and achieve continual improvement. However, it should be considered to be a first step, the base level of a quality system, not a complete guarantee of quality.
- Current versions of ISO 9000 Standards were published in September 2015 and include “ISO 9000 – Fundamentals and vocabulary ” and “ISO 9001 – Requirements”

ISO 9000 was first published in 1987 by ISO (International Organization for Standardization). It was based on the United States Department of Defence standards.

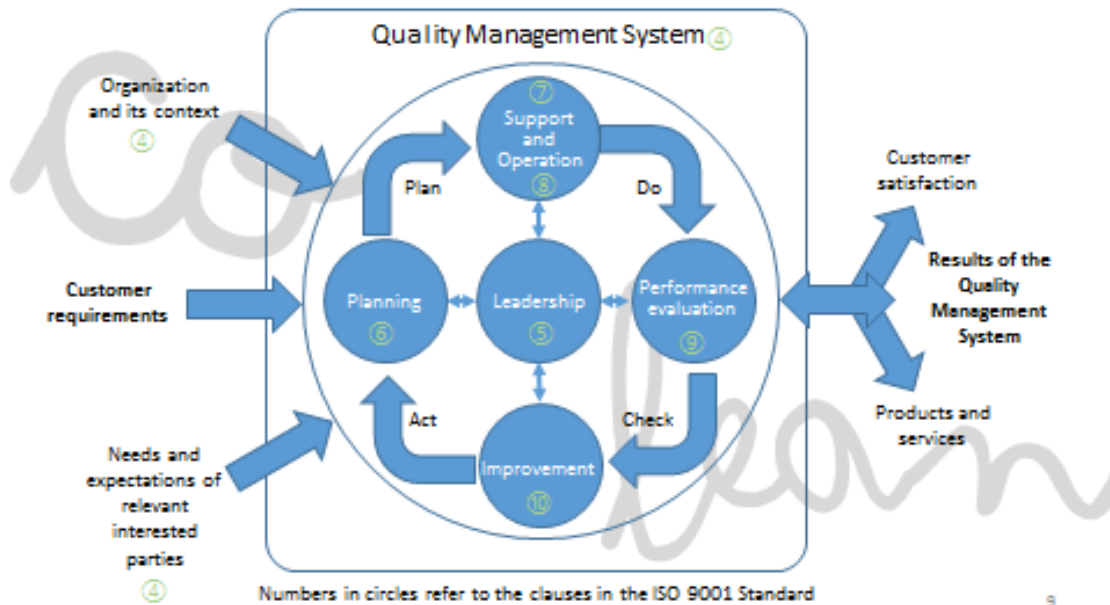
The ISO 9000 family of quality management systems standards is designed to help organizations ensure that they meet the needs of customers and other stakeholders while meeting statutory and regulatory requirements related to a product or program.

Third-party certification bodies provide independent confirmation that organizations meet the requirements of ISO 9001. Over one million organizations worldwide are independently certified, making ISO 9001 one of the most widely used management tools in the world today.

The main reasons for a Construction Company adopting the ISO 9000 standards are:

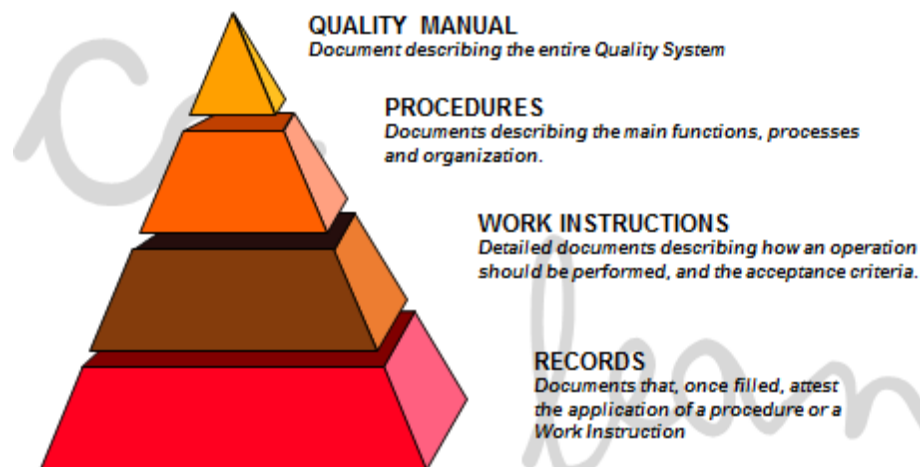
1. Standardize services and product quality: Application of the standard could ensure that build quality, methodology, and adherence to legislation are consistent, therefore ensuring consistent quality of product.
2. Reduce costs for the builder: Improvement of supply chain management and purchasing processes through ISO 9001-approved methods can reduce costs and increase profit margins.
3. Ensure continual improvement: Application of the standard should ensure that your business and associated processes improve year after year, increasing profits and growing the business accordingly.

Representation of the structure of ISO 9001 Standard in the PDCA cycle



Quality system documentation

Although the latest version of the ISO 9000 standard is not very demanding in relation to the volume of documentation that a company's quality system must include, the slide shows the documentary structure usually adopted by the companies implementing the standard.



Quality Audit

Methodological, independent and documented process that allows to obtain evidences and evaluate them objectively to determine the extent to which the audit criteria are met

- External: Carried out by external organizations by exigency of the client and according to an established Standard.
- Internal: Performed either by the organization itself or by external organizations contracted by it.

Quality audit is the process of systematic examination of a quality system carried out by an internal or external quality auditor or an audit team. It is an important part of organization's quality management system and is a key element in the ISO quality system standard, ISO 9001.

Quality audits are typically performed at predefined time intervals and ensure that the institution has clearly defined internal system monitoring procedures linked to effective action. This can help determine if the organization complies with the defined quality system processes and can involve procedural or results-based assessment criteria.

Certification

Prove, through a reliable document, issued by an authorized body, that a particular product or service meets the requirements defined by a standard.

Although commonly referred to as "ISO 9000" certification, the actual standard to which an organization's quality management system can be certified is ISO 9001:2015.

International Organization for Standardization (ISO) does not certify organizations itself. Numerous certification bodies exist, which audit organizations and, upon success, issue ISO 9001 compliance certificates.

Many countries have formed accreditation bodies to authorize ("accredit") the certification bodies. Both the accreditation bodies and the certification bodies charge fees for their services. The various accreditation bodies have mutual agreements with each other to ensure that certificates issued by one of the accredited certification bodies are accepted worldwide.

An ISO 9001 certificate is not a once-and-for-all award, but must be renewed at regular intervals recommended by the certification body, usually once every three years



The image above shows a summary of the main standards of different areas (quality, environment, safety ...) used by organizations. There are some among them, highlighted. Those are the most commonly used standards in the construction sector:

- ISO 9000 – Quality Management
- ISO 14000 – Environmental Management
- OSHAS 18000 – Occupational Health and Safety Assessment Series
- ISO 21500 – Project Management

It also presents some examples of the seals with which certification bodies award the companies that satisfactorily pass the corresponding certification audit.

3.1.2 PDCA- Continuous improvement

In nature, some species adapt to changes in the environment, in a continuous process for millions of years. Others could not handle the suddenly changes in climate and became extinct.

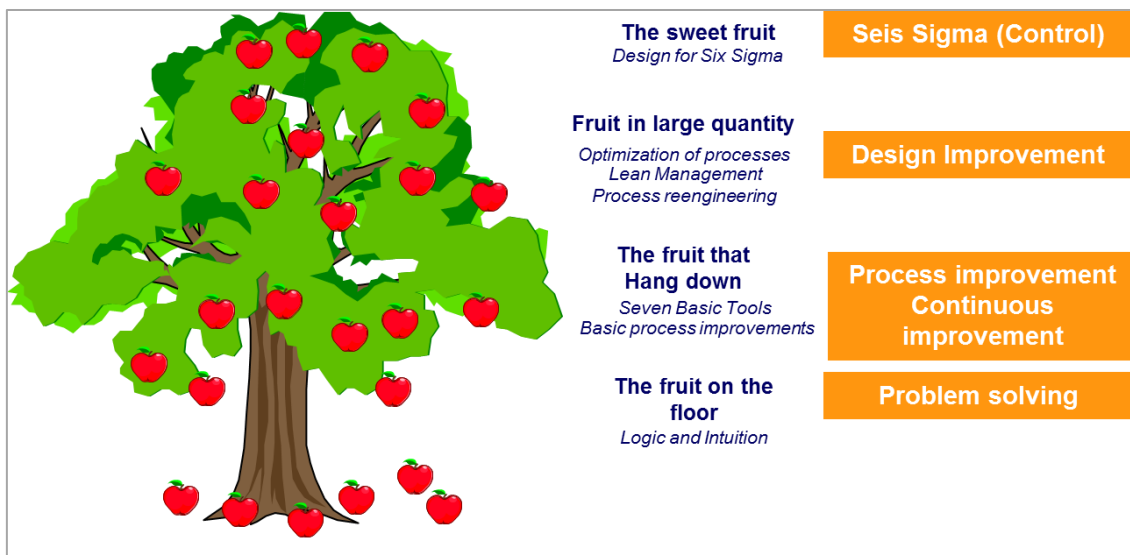
In the development of species on the planet, only the fittest managed to survive the changes in the environment. The excavations, the museums and the books show us the species that do not exist.

As in the natural world, those organisations unable to adapt to changes have disappeared. It is impossible to imagine that activities of one company, products or services remain unchanged over time. It is necessary to adapt to the environment, altering methods and production systems, eliminating and creating products and services adapted to the changing demands of the market.

We cannot get to do different things with the same mentality, to be able to compete and improve with respect to our competitors, we have to do things differently, try different things wrong to learn

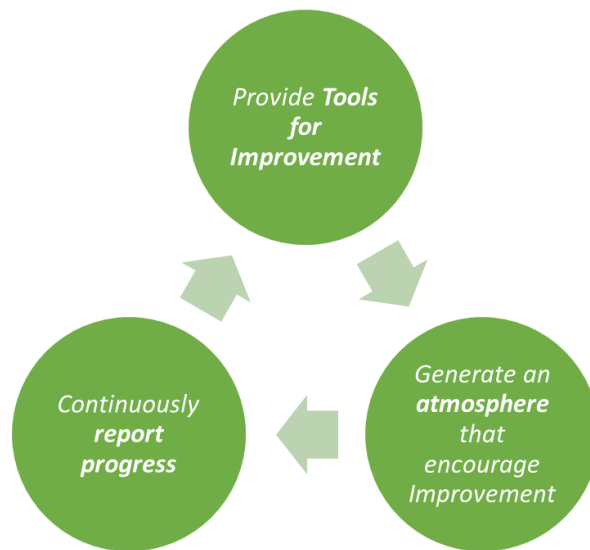
What are our goals for the short term future? Sometime the improvement is only to reduce the variation of the result. With this improvement, you can improve the average only. When you change something, try to collect some date before and after to show the improvement and motivate the teamwork.

Some approaches to improvement: harvesting the fruit of process improvement



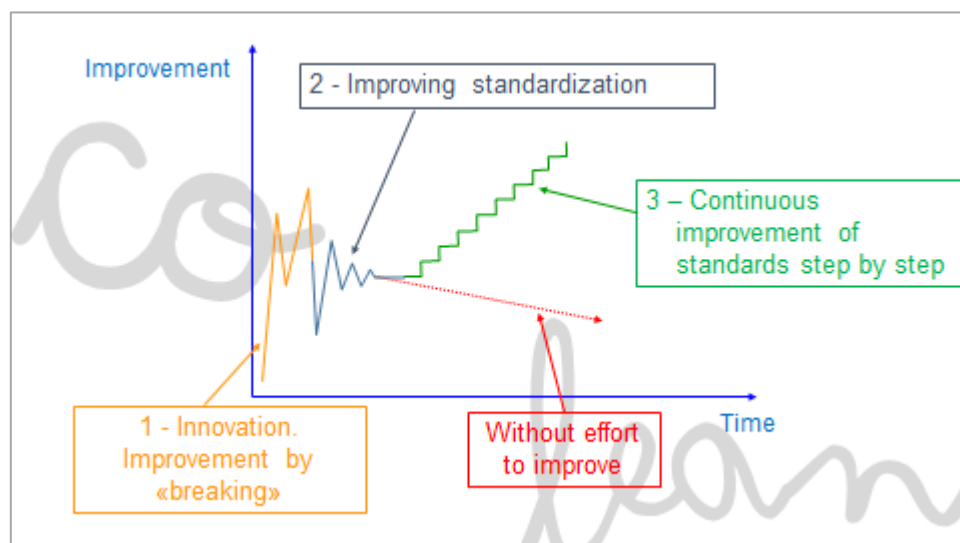
To start with the improvement we have to start collecting the fruit of the ground, begin to use the logic to make the resolution of the problems that we have daily in our organization. Later we will get another type of improvement.

The continuous improvement cycle never ends.



Over time in our company we find different curves of improvement (see picture below), in most cases we have curves of activity impulses without constancy in the time they end up falling.

In continuous improvement the curve must be constant, without peaks. This way the work teams will be encouraged to continue with the project.



Attitudes that promote improvement

- Continuous Improvement cannot be stopped, it has no end.
- Thinking from a bigger perspective.
- Let's ask five times "why?" to find the root cause, so that we can solve the problem on a permanent solution.
- Introduce good ideas without delay.

- Stop bad habits immediately.

These ideas are the foundations for continuous improvement; it makes us question everything before we act.

Attitudes that block improvement

- Everything is ok, there is no problem.
- This is what we have been doing for every time. It is the best method for us.
- It is not my responsibility to make improvements.
- I'm too busy to do anything other than work.
- Do not prepare, do not train despite lack of knowledge.
- Complaining to bosses, staff, others.

And these are the attitudes that block continuous improvement; we will try to get our staff to eliminate these thoughts that are the ones that have always been between us.

Observing reality with objectivity

Objectivity implies describing the facts, not interpreting them.

What do we really see? "Differentiate between what is real and what is not (interpretation)." Remark the importance of objectivity against interpretation. A good study of the problem is very helpful to its resolution; we must abandon the theories of: I think It seems that

Key points of improvement

1. In order to carry out any improvement, we must reflect by following a method:
 - Help to reduce time of the process
 - A standardization is achieved (every tasks are doing it in the best way possible)
 - Don't forget some stage of the process during the analysis
 - Use SAFE methods and SAFE process.
2. Importance of reasoning process versus process of test and failure.
3. To be objective, one must describe the facts without interpreting them.
4. The information that can be measured is necessarily objective.
5. To analyse the data of a problem you have to choose a common unit of measure.
6. Any problem is due, in most of cases, to several causes.

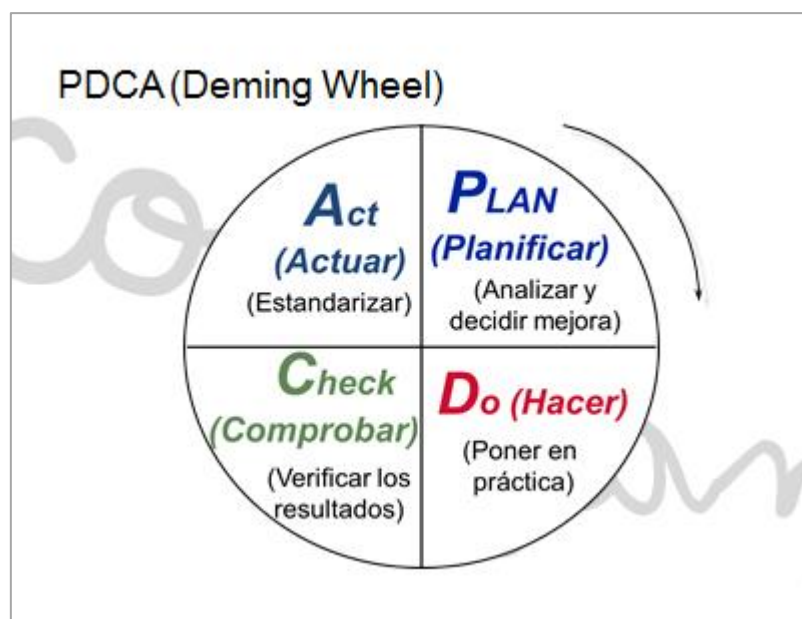
Following a method in continuous improvement is essential; it helps all staff follow the same procedure for analysing and solving problems. Data is important when analysing problems.

And a few pitfalls

- Ignore creative potential of groups
- Mix problems instead of separating them
- always take provisional actions
- Search causes without good definition of the problem
- Use assumptions instead of information
- Go to search solutions without to know the root causes

But there are also pitfalls in continuous improvement, it is normal that we go to some of the described but know them helps us to avoid them.

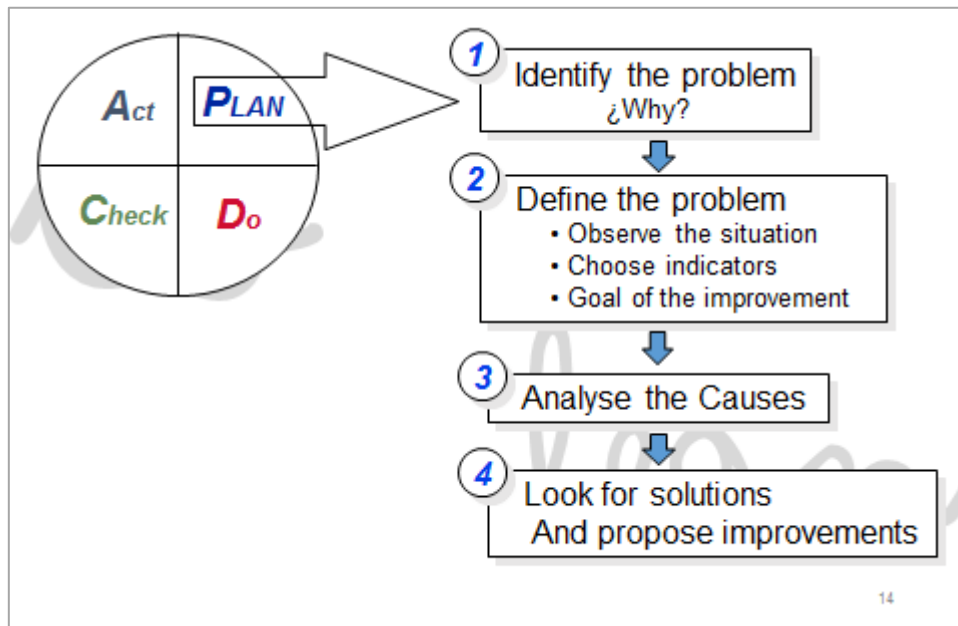
PDCA Deming Wheel



The Deming cycle is used to carry out continuous improvement in the organizations and comprises four steps or stages and which are: Plan, Do, Verify and Act.

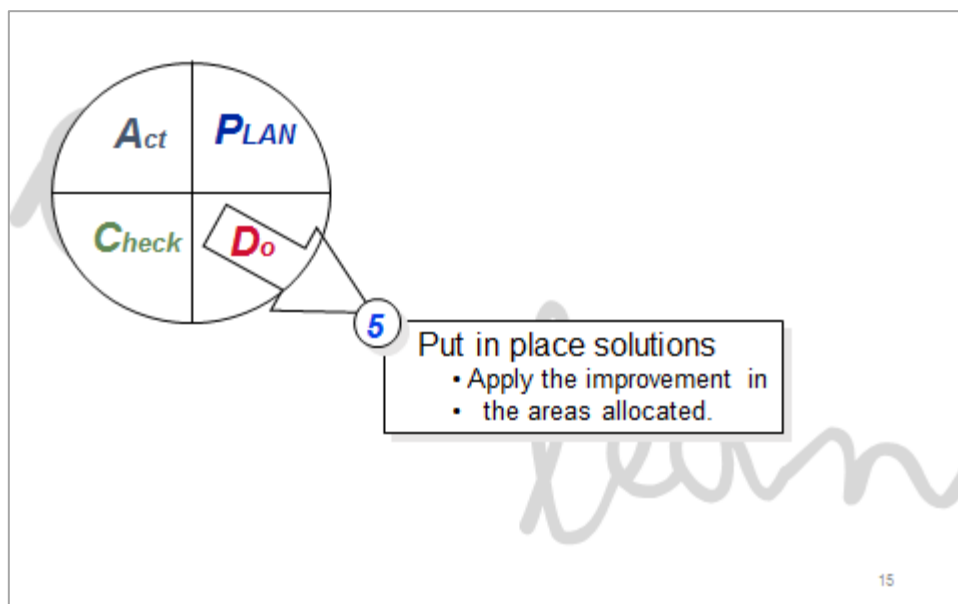
The 7 phases of PDCA

Plan



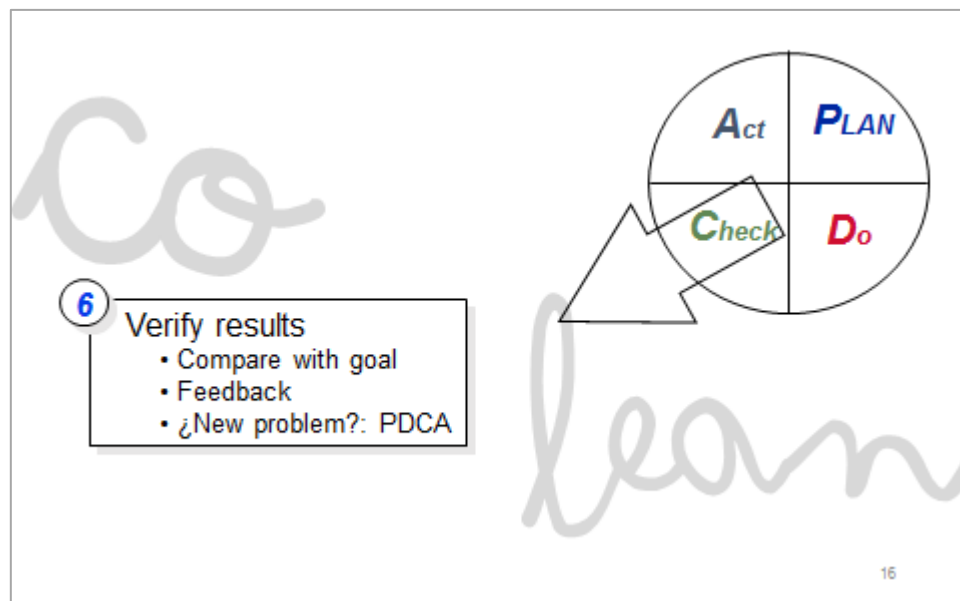
With a good definition of the problem, you have solved half of the problem. Search for the root cause, i.e. by using the 5 Whys technique: never stop to the first explanation, it is the superficial causes, but it isn't the real causes that you need to solve it.

Do



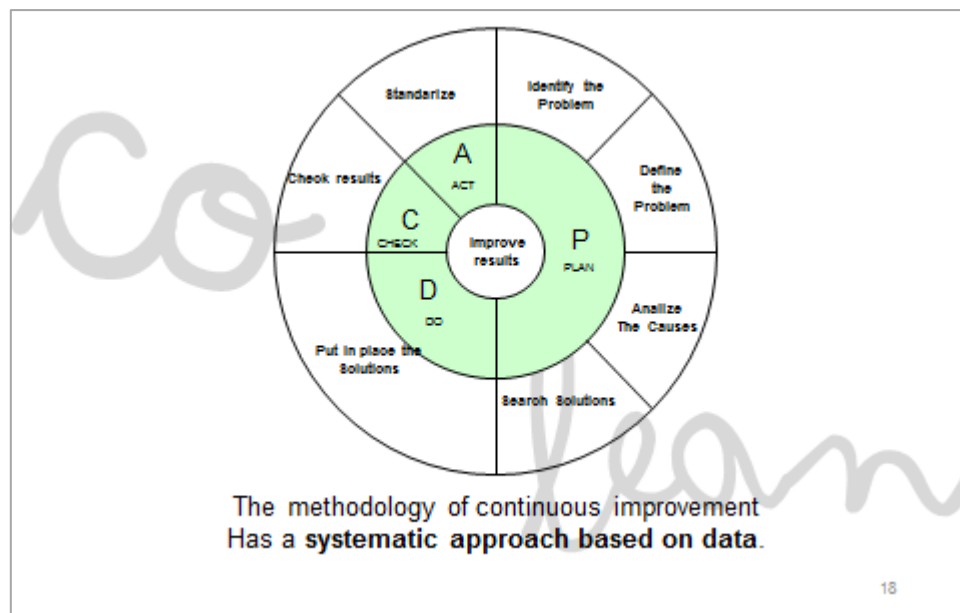
In the second phase of the Deming cycle, it is about to put in practice everything that was planned before. If you have made any errors in the Plan phase, this error will affect this phase in a forceful way.

Check



Having taken the action plan into practice, we must compare the results obtained with the expectations of the planning. Depending on this comparison, conclusions are extracted.

The methodology



With this wheel of methodology we have standardized how to act against any problem that we found. Keep in mind the importance of data, without them it is very difficult to act on any problem.

Here are some **lean tools** that can be used throughout the problem-solving process:

1. Identify the problem:

- Audit, Evaluations

- Brainstorming
 - Affinity diagram
 - Strategic Analysis DAFO
 - Matrix of prioritization
2. Define the problem
- SIPOC
 - Plan VOC
 - Charter project
 - QQDCC
3. Analyse the causes
- Brainstorming
 - Affinity diagram
 - Cause-effect Diagram
 - 5 Whys
 - QQDCC
 - Dispersion diagram
 - Pareto diagram
4. Search for solution
- Brainstorming
 - Classification, Vote, priority matrix
 - Cost - benefit analysis
5. Implement solutions
- Action plan
 - Diagram Gantt
 - Matrix of communication
6. Check results
- Sheet of results report
 - Histogram
 - Pareto Diagram
 - QQDCC
 - Check list audit
7. Standardize
- Instructions Sheets
 - $D \times V \times P > R$

3.1.3 Kaizen events: A tool for continuous improvement

1. LEAN THINKING: ADDED VALUE AND NON ADDED VALUE

Resistance to change Applying and managing continuous improvement methods within the organization implies that people and processes have to be changed by questioning themselves permanently. Improvement means changing the way things are done regularly and to do so, organizations, teams and people would have to modify their habits and get out of their comfort zone. Continuous improvement may not be a natural thing for many people. First, they would need to overcome resistance to change and get out their comfort zone.

What is value?

Added value refers to every activity that transforms (for better) products and services. In other words, value is what customers are willing to pay for.

Ask yourself what is value... think about it, propose new ideas. Are customers willing to pay for certain operations/activities? Search for materials, product wastage or our extra processing?

What is waste?

Meanwhile, waste refers to all activities that do not produce added value to products and services. Waste can emerge anywhere, anytime.

How do we define waste? What do we mean by waste? Every task people do normally at work can be either added value or waste. But how people identify both correctly?

Working efficiently means working less

Improvement does not mean doing things faster but getting them right the first time round. Focusing the efforts on just doing things rapidly can lead to increasing added value activities but also non added value wastes. So, improvement is based upon the idea that added value time can be boosted by reducing or eliminating waste time.



In kaizen events, the objective is removing waste. To reach the objective, efforts must be focused on removing waste. The first challenge: be able to recognize the existence of numerous inefficiencies in processes (MUDAS). The road to improvement begins with the ability to detect and identify waste. Next, the target is removing waste.

A tool for reducing waste



Could you identify any of these wastes in your daily routines? It is vital people get to know waste and could be able to identify it correctly

2. WHAT IS A KAIZEN EVENT?

Kaizen is a Japanese term meaning “change for better”. Kai: Change Zen: Good. Kaizen refers to continual improvement.

Kaizen events aim at removing waste by a concentrated effort action in a specific area. Expected results: make quick changes leading to visible improvements.

Kaizen workshops are about making concrete, palpable and visible changes. Results can be shown via pictures or data. Kaizen workshops are not just an event for proposing improvement new ideas (ZEN). They go further for they seek the implementation of those ideas.

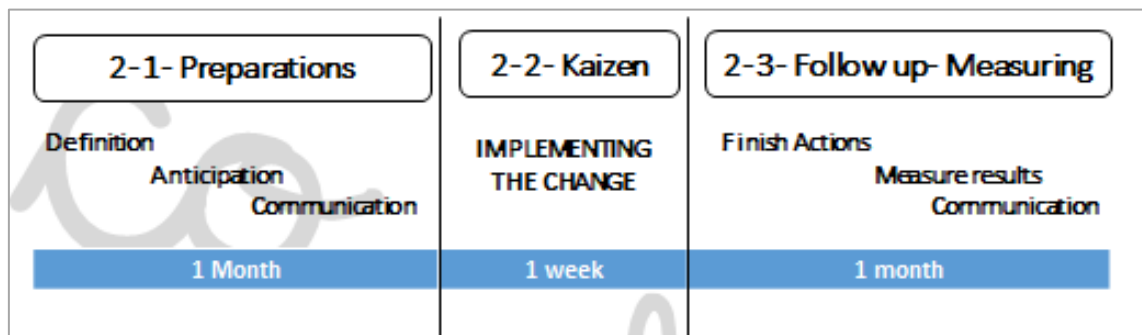
Kaizen workshops are held as a short event (1 to 5 days) involving small work teams (5 to 8 people) made up of the people who work the process, managers and staff from supporting areas (quality, maintenance, prevention, etc.). It is essential to create a multidisciplinary team. Also, participants with no knowledge of the process can bring a fresh perspective to the group.

What is their purpose? Analyse processes, waste, reduce changeover times.....and propose new ideas for improvement, implementing as many as possible over the workshop. Unfinished actions are included in an action plan for future evaluation and execution. The main objective of kaizen events is to implement as many as possible actions over the workshop.

In other hand, they are based in collaboration and seek the maximum effectiveness as stakeholders work together in a joint effort to reach a concrete objective very quickly. Bear in mind that CLIENTS are the team's main and sole target. Kaizen events are a collaborative tool that helps organizations to come up with new ideas that would increase customer satisfaction. This has to be a win-win situation for all.

3. STEPS OF A KAIZEN EVENT

Kaizen events typically consist of three stages, all equally important in order to accomplish the expected results.



1. Preparations

This phase usually starts one month before the event takes place.

Objective:

- Determine the area to be improved and how to do it
- Guarantee an optimum workshop performance

At this point, following questions have to be clarified:

- What area/process are we going to tackle?
- Why are we doing this improvement activity?
- ¿What is the best time to undertake it?
- Who participates?
- What kind of resources, information or materials for the workshop do we need to prepare it in advance?

Typically, kaizen events are planned using value stream mapping to analyse a process or project. Although sometimes, Kaizen workshops are set up to bring about an “urgent” improvement so organizations are able to respond to customer's needs (e.g. modifications, quality, quantity, etc.). Kaizen events are just focused on a concrete area, a process (or part of it) or a project. They are not meant to address all the problems.

Deliverables:

- The workshop charter
- Detailed execution plan
- Communication to managers and team members

- Improvement dashboard contents
- Managing workshop support document
- Preparations Checklist done

The workshop charter

This document delimits the scope of the project and reflects the work guidelines in order to ensure its success.

Key issues:

- Describe clearly the reason why the workshop is going to be held, as it is one of the most crucial messages to communicate to staff.
- Delimit correctly the scope of the activity, better if not too large.
- Measuring: we do not need a complex scoreboard. Try to choose a couple of relevant indicators (KPI) that would reflect properly the problem.

The checklist

This document compiles the list of items to help the team to verify and ensure they do not forget any important step, resource or material to efficiently undergo the workshop.

- Some of this list's questions may not apply, according to the nature of the event or its context.
- Each task should be assigned a deadline date and a person in charge.
- Start completing the checklist one month in advance.

Communication

Communication activities are an important piece in a kaizen event. So they should be carried out properly in order to assure the highest event performance and encourage the continuous improvement culture within the organization. People in the organization should be aware of the project objectives, scope, actions and results all along the initiative.

2. The workshop

The duration is set in consonance with the scope and nature of the workshop, which are run according to the work guidelines defined in advance. The event typically consists of five steps: **introduction, analysis of the existing process, proposals for improvement (future state), implementation, definition of a new standard work and closure.**

2.0 The introduction

The workshop leader briefly introduces the work guidelines and also:

- Presents the event charter, agenda and resources
- Addresses the concept and principles of kaizens
- The eight wastes. Added value vs Non added value
- Principles of continuous improvement
- Enemies of the improvement

Presentations usually take 15 minutes.

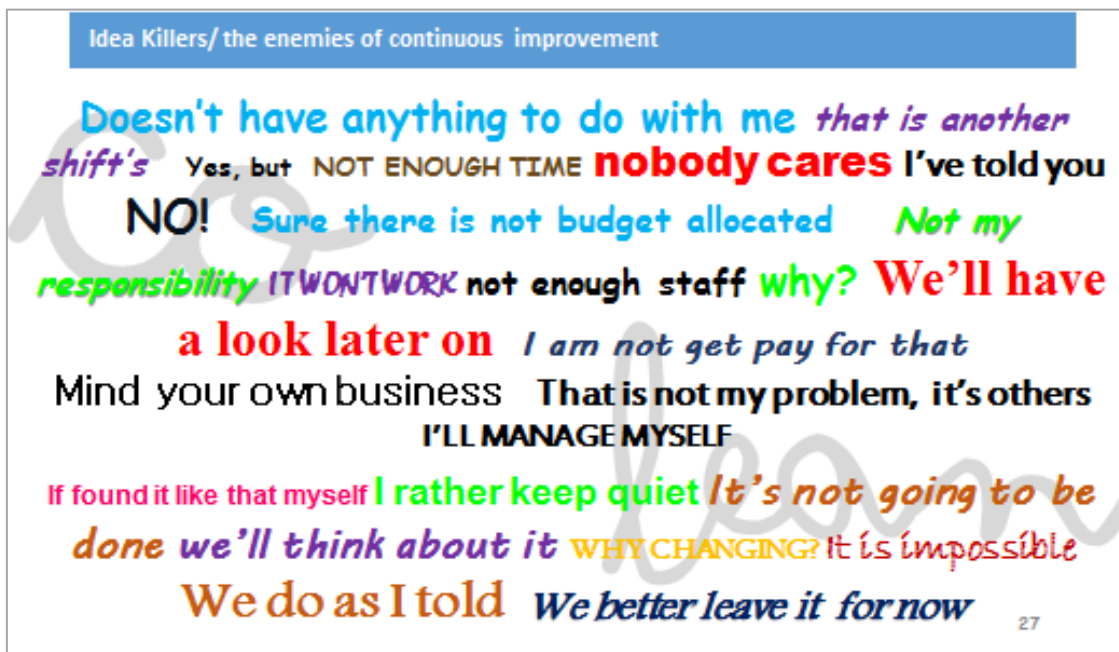
As a recommendation, prepare in advance a guide document to help the leader manage the workshop following these steps:

- 1. Introduce the workshop and explain its objectives to the team
- 2. Explain the work guidelines

The principles of continuous improvement

1. Put aside preconceived ideas, refuse current practices
2. Think up about “what it can be done” instead of “why we can’t do it”
3. Act promptly after proposals
4. Do not seek for perfection: accomplishing up to 60% objectives is acceptable
5. Amend mistakes immediately
6. Turn problems into new ideas
7. Look for the root causes of problems: use the 5 Whys technique
8. It better to collect 10 people’s opinion instead of waiting for an individual brilliant idea
9. Test and validate ideas
10. Understand the unlimited potential for improvement

During the introduction, explain thoroughly the 10 principles. The leader’s role is to convince and encourage team members to propose new ideas and accept changes. Team-working and collaboration is the route to achieve it.



As shown in the picture above, certain attitudes prevent improvement from occurring and should be avoid.

The metaplan

The following is a brainstorm type exercise that allows teams to get a global vision of all the problematic situations within the defined area, and also verify how people experience those problems. The purpose of the task is to address these two questions:

- What are the root causes of our inefficiencies? Why we do not reach the efficiency target
- What should we do to streamline our processes and reach efficiency goals?

Write each idea or comment on a post-it and remember that:

1. All ideas are valid
2. There are no good or bad ideas: all are equally possible
3. Everybody can contribute to the debate
4. Provide at least 10 ideas
5. The idea is to get the whole picture

Tools

It follows an introduction of the chosen lean tool or/and related concepts that are going to be applied over the workshop, e.g. 5S, Poka Yoke, Visual Management, Kanban, Lean Logistics, VSM, Etc.

2.1 Analysis of the current process

The first part of the workshop, the team should focus on the examination of the process to get the real picture, free of all prejudice.

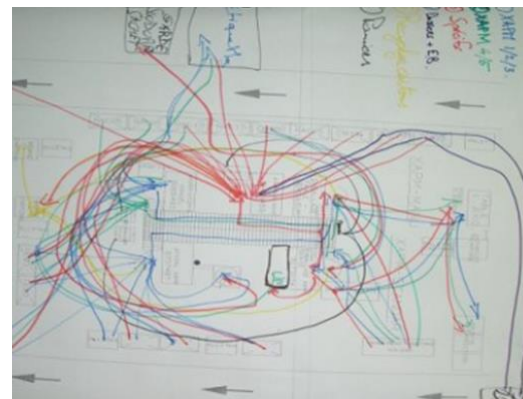
Target: learn about the process real state by observing day to day operations

- Pictures of the area reflecting the current situation
- The latest period production data (to be compiled at preparations)
- Visit gemba and observe
- Record videos
- Draw an outline
- Pareto chart
- Indicators

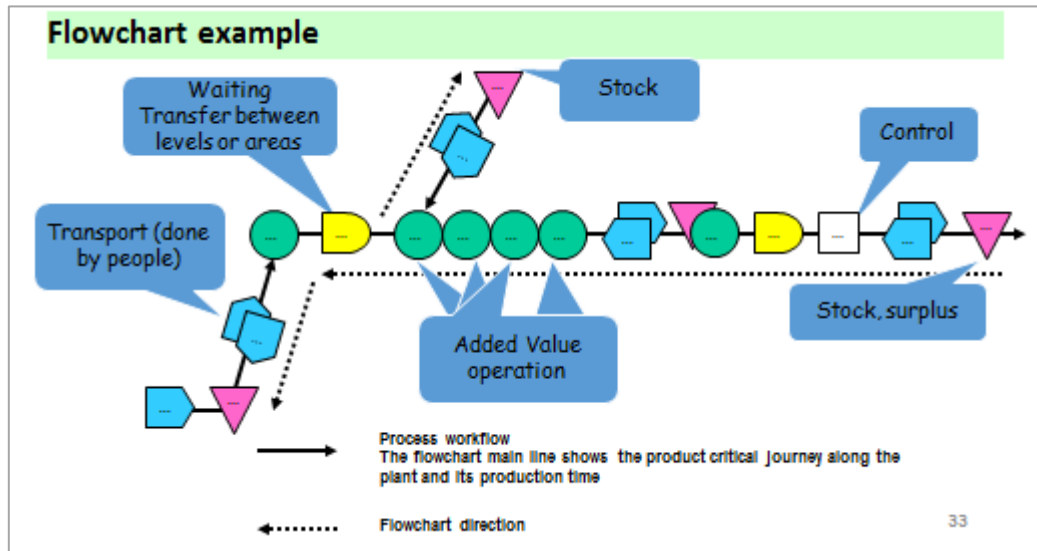
Drawing the operators, material and equipment workflows

The aim is to identify and draw every people, parts or machinery movements over a day. Apply different colors to each type of resources. Sometimes it is useful to record a video to aid team members' analysis

Flowchart: a graphic representation of the process



In some cases, the flowchart reveals all the activities that entail producing final products. That helps to expose the AV and NAV of our process.



2.2 Proposals for improvement

Next, compile ideas and proposals to eliminate identified waste into an Action Plan (flipchart and digital device). Prioritize actions, during and after the workshop, and assign the responsible person for implementation.

2.3 Implementation

As we pointed out earlier, the key idea of kaizen is to implement improvement proposals rather than just formulate them. The following step the target is to change and streamline the process by testing proposals.

- Test and measure actions for improvement
- It may not be the definitive solution; the idea is to measure the impact in the process
- Put yourself in the *workers shoes*

2.4 Definition of a new standard work

Once improvements have been tested and implemented, the team defines the new standard work so it can be shared with the rest of the staff for training purposes.

New improved standard work:

- Standardized work (Security, quality, flow of material and information, ergonomics, work procedure)
- Work instructions are accessible and visible at every workstation
- Measured and visual (video, pictures)

2.5 Closure

At the end of the workshop, the kaizen team presents a report to the management team on the work done, the changes implemented and the actions yet to be executed.

- Reports should be presented by the team itself
- Use digital/IT means for presentation
- The more visual the document, the better: add pictures, videos that reflect the area/process before and after the changes
- Develop an Action Plan for the following month

Our recommendation is that the final report should be presented to the managers by the kaizen team itself, not its leader. It includes the work done and the goals achieved along the event and also the future actions. Use a presentation template and include as much visual content as possible.

3. Follow up: measuring

Once the workshop is finished, the team's objective should focus on accomplishing the remaining improvement activities that have been identified.

- Develop and execute a training plan, if required
- Pending action plan follow up
- Key indicators monitoring

This method is not about seeking perfection but to make change real and help organizations to overcome resistance to the cultural changes. In many cases some of the improvements pointed out cannot be performed over the event. Deadline for completion is usually set within the following 5 weeks after closure. Daily or weekly follow ups are highly recommended.

4. WORK GUIDELINES OF A KAIZEN EVENT

Kaizen event leader's role:

His/her main duty is to conduct properly the workshop (before-during-after)

He/she is not:

- Who proposes problem solving ideas by himself/herself
- Who does all the work

Team leaders' main tasks:

- Anticipate the successive steps
- Oversee works run on schedule
- Moderate debate, listen to and let people express their views
- Guide people towards meeting the objectives: e.g. avoiding unnecessary discussions
- Distribute tasks among members
- Maximize time available
- Compile the work done by the team into a report

5. TYPES OF KAIZEN

Kaizen events are an effective method for promoting continuous improvement within an organization or project. Basically it is a one-week focused event set up for problem-solving that allows organizations to continue activity or concentrate on other problems. The key idea

behind this method is that it brings the opportunity for a group of co-workers to analyse and resolve problems through collaboration.

Kaizen events are a helpful tool for:

- Implementing 5S
- Security and ergonomics
- Facilitate work
- Reduce waste
- Reduce product wastage
- Quality improvement
- Work processes

6. CONCLUSIONS

- Preparations are an essential part of this activity as it helps maximizing performance
- Communicate appropriately along the project's three phases
- The workshop target is basically to implement improvements. Corroborate with pictures the changes.
- Workshop leaders' main task consists in ensuring the team follows the workshop methodology and work guidelines, coordinating and guiding the group towards their goals, not proposing ideas on her/his own

Unit 3.2 STANDARDS

3.2.1 Work instructions

The standard work has its foundation in the pursuit of the excellence of the work. Without standardized work, it cannot be guaranteed that operations are always prepared products in the same way. When an operation has to be done in a concrete way to guarantee the quality assurance of the product, it is necessary that staff which makes this operation do so in the same way, for that standards are born.

Standardized work is the most efficient way to do any process with security and quality. It is very important to do the operations in the same way, is for that the big importance of the standards, every staff have to use the same tools, same jigs, the same instructions in the work. With standards, the quality required by our clients will be guaranteed.

Why companies implement work standards?

By standardizing the operations, provides the base to assess and manage the process. Will be the base for the improvements. The standard work documents are used for:

- Check the actions sequence works, have to be with quality and repetitive.
- Supports the visual control, we can detect easy a not normal operation.
- Offers a help to compare the current process with the documents.

When creating the required documents for the execution of the works, at the same time, we are preparing the base to study them better and we have the possibility to do improvements. They are living documents. With the standards, we can check the occupational health too.

Standard work:

- Ensures that operations are safer and more effective.
- It's a tool to start improvement actions.
- Facilitates the method of documents improvements.
- Provides information that is available when it is necessary.
- Helps to maintain a high level of repeatability.
- Improve the productivity.
- Reduces the learning curve of the workers.

When implementing the standard work in the construction, you are defining a way of working to get all the people who do the same work, to do in the same way.

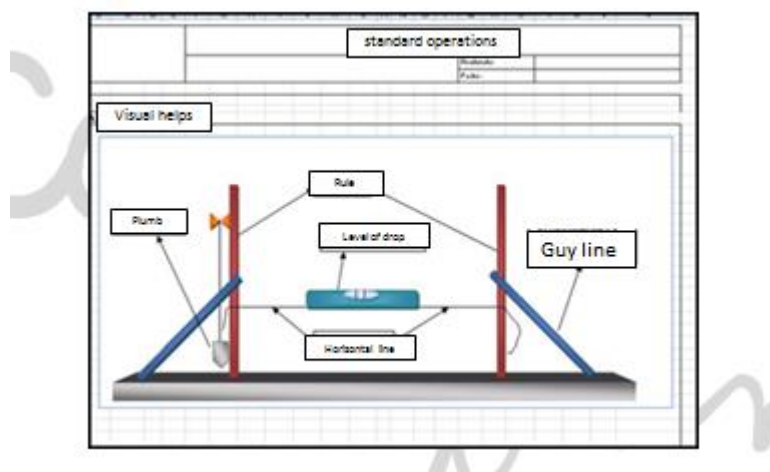
It is necessary to ask to all workers, they have the knowhow of the work and with that information we have to do the work standard documents. It would be better to ask to more than one worker.

The documents have to be easy to learn, we have to avoid big texts without any picture, we have to use pictures, colours, marks or something to get it, in that way, the workers feel part of the company and they can improve too.

Process to implement standard operations

1. Select a specific process.
2. The measurement of time corresponding and put it in the “time process table”.
3. Calculate the capacity of the operation.
4. Design or document the best capacity sequence.
5. Draw the process “standard work”.
6. Document the operations instructions.

We have to do activity plan to implement the standard, it is necessary to create a team with a leader and to have periodic meetings to do the actions mentioned. After that, the team have to check with the workers if the standard operations are easy to understand. We have to practice with them and modify if it is necessary. Our target is to have an understandable and effective standard operations.



The picture above shows a standard sheet which explains step by step the procedure of lifting a brick wall lists the steps to follow and add explanatory pictures of the process. The best thing is to use pictures from the same company where the work is done so for the employee it is more familiar.

Operation instructions

They must be carried out so that every step of the process is properly understood and that any operator understands quickly and clearly what you should do in your job.

For the recreation of the process instructions, is recommended to involve operators, engineers, staff and quality of human resources, so that, as a team, consider all the relevant aspects in the development process.

Multi-disciplinary teams help elaborate instructions that write operations are seen with different eyes, and takes into account different departments.

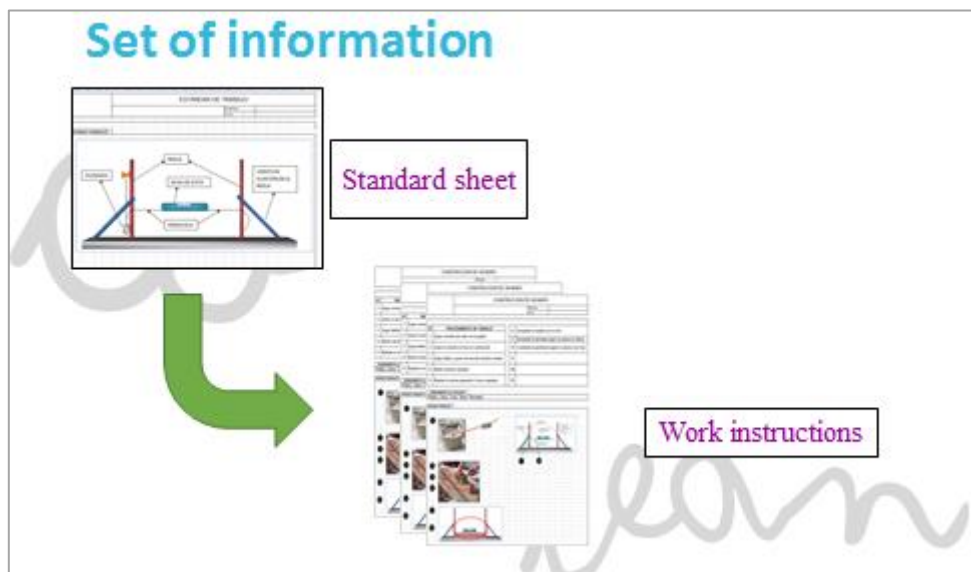
Standard worksheets

- The worksheet has to be clear and visible for EVERYBODY.
- The criteria of quality and safety must be quantified.
- See exactly what really happens during the operation, before making the worksheet.

- The standard work which does not respond to the actual observations ends up being a requirement that cannot be met and therefore the sheet of operations should be modified.

While the standard sheet is doing, we need to test it in the place of action and staff that will make, it is very important that compliance with all that sheet references, if there are inconsistencies between the standard and the reality, it has to be changed as needed so that it is correctly defined.

When the standard sheet has several operations, the instruction sheets that help complete the initial standard sheet is necessary. These instruction sheets explains step by step how the operation is performed and should be continuously revised and updated before any change in the product or tools.



3.2.2 5S

5S' objectives

Improve the work area by organizing the resources that are used in the development of the activity, assuring they are easily accessible, clean and ready for use.

Many times, we are looking for tools to do a job and when you find it, the tool is broken, does not work or it is not in its place because someone has changed it for us.

With the 5S methodology, we will leave the work area in optimal conditions for work in security, having the same only what is needed to do the job, and good conditions of use, as well as create a methodology of check that will allow us to keep it in time.

Normally in the work areas, where it is built, prepares, stored etc., we find them riots, dirty, with many things that are not needed making it difficult for the movement of people, putting at risk our security, wasting much time looking for things needed to do our job.

Common scenes in a building site

We are used to seeing all these things in our job and we assume that it is normal, which is part of the environment and we live with it.

- Tool cabinets are usually dISOrdered.
- Tools dispersed around the site
- The machines are dusty and full of grease, etc.
- There is water and/or products spread on the ground.
- There are materials that are damaged or broken.
- People don't matter that the trash piles up in certain corners: They believe it is normal.
- Pallets with raw material and product taking up space.
- People who go through the same site as trucks or machinery.
- Some containers / boxes are left empty or dirty.
- Materials, are poorly located, access to catch them is bad and dangerous
- Materials without identifying.
- There are many things that have no use.
- Things are not stored in specific locations.
- ...

What is the 5S methodology?

- a) It is an activity of productivity improvement involving everyone in the Organization.
- b) It is a powerful tool for improvement of the organizational climate and the abilities of people.
- c) It is an activity for the improvement of materials and their flow within the work.
- d) Effective aid to the maintenance of equipment and installations.
- e) A system that allows you to measure objectively and improve the image of the Organization in the face of customers and workers.

The 5S is an activity of improvement that was born in the automotive sector in Japan.

The 5S enables the collaboration of everyone in the company, everyone is involved and everyone's task is to keep it. With the 5S, as well as create a good working environment, it is a

powerful tool for improving, is easily detected when something does not comply with the standard.



1st S: SORT

At this stage, the objective is to identify and classify the necessary materials for the tasks, and on the other hand, to separate and remove those unnecessary materials.

We will detect and see all that we currently have in the working area, it is important to have staff from other sections so that they see it with other eyes and wonder things that the titular staff not poses it.

You must choose an area in particular, which is not very large, trying to do all the building site at the same time; it is a very large risk of that goes wrong.

If it's a building without start, we have to be very well defined materials and tools are needed on a daily basis to not be invaded by unnecessary materials.

How to do it?

What makes the distinction between the necessary and the unnecessary is the frequency of use. Proposals for unwanted materials to be thrown away may need management's authorization.

<i>FREQUENCY OF USE</i>	<i>WHAT TO DO?</i>
Unused objects from ago 1 year or longer	Throw away
Objects used 1 or 2 times in the building site	Store / Separate file / ask when it is necessary
Objects used 1 time per month or per week	Store in the building site
Objects used more than 1 time per week, daily	Store in the building site / Carry over

We have to distinguish what we want to stay according to the frequency of use. Of course everything is “trash” pull it from the beginning, otherwise we do not know for what or who he is, leave it aside.

The table above gives an idea of time and use with what to do with the element in question.

How to do it? Recommendations

- At the beginning, take photographs of the lack of organisation
- Split the area and assign each zone to a team (maximum 4 people).
- Also search around “hidden” places (inside, under or at the back of furniture, machinery, etc.)
- Use red cards to identify unnecessary elements.
- List the necessary and unnecessary materials.
- Take apart unnecessary materials to other area from the usual work area.
- Management’ support is required
- Do not delay the elimination of unnecessary elements.
- Eliminate the reason why unnecessary elements originate

It is important to follow step by step action plan for this S, it is important that the staff know the objective of this first S, support from the Managers is important especially for decisions that the team cannot take them.

Always has to be a leader in the team which is charge to manage it, avoid imbalances in workload, communication with the management, and check what is doing in the project.

2nd S: SET IN ORDER

The objective of this phase is to get people to locate and identify the materials they need, so anyone can find, use and replace them easily and quickly and time spent is reduced. This second S will put and identify everything that we have decided that we are left in the work area in a way that staff can find and use easily.

How to do it? Recommendations

- Place objects so they can be found whenever needed.
- Time for locating objects is essential
 - Take over or to keep aside what is used continuously.
 - Leave outside the work area but to view what is used occasionally
 - Leave on another place or in the entrance area which is used from time to time.
- Sort and identify each object with a purpose.
 - Safety: Avoid shocks, falls
 - Quality: Avoid oxides, mixtures, hits, errors.
 - Efficiency: Minimize efforts and time.
 - Environment: Remove waste.

Bearing in mind the list of elements we have done, we have to place them at the disposal of use adequate, if the tool that we use constantly can carry over, near but outside the area of work which is used occasionally and elsewhere but knowing where is the one used from time to time.

This work order must be done taking into account the opinion of the staff as well as the workers who may not be in the team but working in that area.

- Prepare the work white drawings to annotate during the process.
- Use the materials list as a reference to not forget anything.
- Keep in mind the utility of the different elements to promote creativity when it comes to ordering them.
- Start with common elements and then arrive at each position, machine, table, wardrobe...
- Consult all doubts with employees making them participants in the analysis.
- Understand that untidiness can result from deficiencies of the design and not lack of discipline.
- PUT ALL WHAT YOU CAN ON WHEELS, nothing directly to the ground.

To do it, it would be good to have a drawing in the area where it doing 5S workshop to make the proposals place you need.

Mark with colors the areas of transit of persons, machines, the areas of accumulation of raw material, auxiliary, the parking of pallet trucks, trucks, etc...

The colors once they have defined become the standard for the rest of the building site.

3rd S: SHINE

This S' main objective is to identify and remove all sources of dirt, and to get workers to maintain the facilities in a perfect state of use. At this step, people identify and eliminate the reasons for why become dirty, or clutter things in our job, it is the only way to facilitate the maintenance of the order and cleaning the area.

How to do it? Recommendation

This stage **does not mean** to do the cleaning just for the shake of it or hire a cleaning company. Instead, **it implies** taking care of the tools people use and return them afterwards in a good condition. Bear in mind that keeping things cleaned is far better than cleaning. We have to take responsibility for our tools, equipment, workspace etc. We have to forget about having to call another company to clean for us. Care of the tools is a thing of all, when something breaks down, we have to advise, report, to take some action to the tool or machine damaged repaired or replaced immediately, if we don't, that will be using it later, you will find it is broken and lose your time in doing your job and will create a bad work mentality.

Another recommendation is to analyse the sources of dirt: remove dirt, identify and eliminate causes, and create the standard for cleaning. In order to detect anomalies, always maintain the work area clean. The dirt that exists in our work place is usually caused by something, people, machines etc.

In order to detect becomes its dirty first must be cleaned, once clean we can easier see the causes of dirt and make actions to avoid them. Once eliminated the causes, we will establish

cleaning standards, how often, who, with what etc. to keep area clean and easier to detect anomalies.

- Do not underestimate the time required for this phase.
- Understand the objective: clean to locate the dirt sources and anomalies in the machines.
- To teach workers about basic operating conditions of equipment and installations.
- To teach on special points to consider in the cleaning of equipment, including safety measures.
- Use the "5 why" technique to identify the causes of dirt.
- Establish the maintenance procedures with the people that are going to run them.

Once everything is clean, it is important to have very clear the cleaning procedures.

In these procedures must appear tools, products used, the personal safety equipment to be used, precautions to take into account etc.

It is important, with procedures, to teach people who are going to make it.

If when in the training is detected that something is wrong, change the procedure until it is completed correctly.

4th S: STANDARIZE

This step's target is to help people to easily identify the right circumstances. Defined with Visual posters what is good and what is wrong in our area work.

How to do it? Recommendations

STANDARDIZE

- Each object has A NAME
- Each object has AN AREA
- Each object is in HIS PLACE
 - VIEW THE CLEANLINESS AND ORDER:
 - Draw shapes, profiles (on the floor, on the wall, on the boards).
 - Naming objects (all objects are identified).
 - Put labels (names, locations...)
 - To view the direction of flow (arrow on label).
 - To define signals or colour codes.
 - To make transparent (tapas, wardrobe doors...).
 -

“A place for everything and everything in place”, with the help of colors, photographs, forms of shadow or whatever necessary to be able to quickly detect that something is out of place or simply is not.

- Put visual standards (OK, not OK)
- Promote creativity.
- Search for mechanisms of low-cost installation, maintenance and use.
- Expose the procedures in accessible places.

These standards must be visible for all, have to be Visual, eliminate all possible texts, must be cost low for its elaboration and leave to the members of the team think do it, listen to everyone's ideas and try new things.

5th S: SUSTAIN

The main target at this phase is to maintain changes and keep on improving.

- Set the work instructions.
- To work permanently in accordance with established standards.
- To practice the PDCA system.

This "S" is that going to help keep everything that has been previously created. Without this phase in a short time we will again be as at the beginning. Back to top will cause demotivation of staff at the same time not belief improvement methodology that you want to implement. With this tool also is the solution to the problems that are detected in daily audits.

How to do it? Recommendations

For each area, rules are written down, visible to all and responsibilities assigned. There is a person in charge and a 5S schedule: 5 minutes per day/ 10 minutes per week/1 hour per month/Half a shift per year.

Once created the check-list for the daily audit, we have to educate people that it will make; a manager will be which is responsible for solving problems that come out daily. In areas that the 5S is implanted, it is important that every day the audit is done, we are in the period of change of habit, when it detected that people already work in accordance with standards, can gradually increase the time between audits but never eliminate it.

- Highlight the importance of following established procedures to avoid the back.
- Frequency of conducting reviews depending on the level of implementation.
- To teach the workers that to make the reviews.
- Make observations and assessments with the actors of the area.
- Avoid discuss evidence and justify situations.
- To be quick in implementing the corrective measures.

It is important to detect people who don't know or don't want to follow the standard.

The actions that appear in the audit must be solved as soon as possible.

It is important for the motivation of the staff, that workers see that management is committed to the project. Check-list sheets are living documents, they can be modified when it sees that items that are no longer required to check because it's normal to have it as we want and include new looks that it is not well there are.

5S IMPLEMENTATION

How to do it? Recommendations

Before the construction works begin, the 5S method can be implemented step by step by the team from the beginning:

- Carry out a preliminary audit in order to know the state of the building site in terms of cleanness and order
- Locate on the floor plan the place for materials and machinery
- Identify people and their role in maintaining the 5S method
- Produce the standards in advance by using pictures of how the workspace must be arranged
- Getting things right the first time
- Train people on the 5S methods before starting to work
- Set control routines before the construction works begin

When the construction works have begun:

- Identify a pilot zone or test area
- Identify the actors in the pilot area
- Complete the 5S' five steps in a short time, i.e. during a 2-5 consecutive day Kaizen workshop
- Communicate to all in the team the achievements and new standards of work.
- Take pictures of the workspace before and after the project.

When the implementation is done in an area already in operation, we have to find a pilot area where we see that it will do well, establishing the team and plan a workshop of implementing 5S between 2 and 5 days.

It is good to take pictures of the before and after and then translate it into a document to be able to teach to manager or to the rest of the workers in order to see the reaction and set another working area.

Risks of failure

- Not explaining the 5S work standards to new employees
- Lack of rigour in demanding compliance with set standards.
- Standards are not regularly checked
- Deviations or broken tools are not immediately corrected or repaired.

- Lack of involvement of managers

Benefits of the 5S methodology

- Reduces accidents
- Reduces the risk of errors
- Enable working faster, reducing non-value operations
- Facilitate work
- Helps reducing breakdowns
- Enlarger the available workspace
- Improve the company's good image
- Changes people's attitude:
 - Workers feel prouder of their work place
 - More fluid communication between management and workers.
 - Encourages cooperation and teamwork.
 - Higher employees' motivation

3.2.3 Visual management – Andon

Why developing visual management?

Visual management is a tool /method that helps to ensure: objectives, results, deadlines, communication and comfort

How are we able to detect that something not be as expected before the accident or the non-conformity? The way to get between the client and supplier talk in the same language to get the ultimate satisfaction of the customer in quality, quantity and delivery time.

Visual management is called controls or visual devices that enable people to recognize standards and deviations from them. This will allow us to react quickly to a deviation of product or non-compliance with a standard of safety, quality or work instruction.

Purpose of visual management

The main objective of visual management is to detect anomalies immediately for a fast reaction. Visual management makes easier the fulfilment of the goals. To have simple methods of detection to speed up response to anomalies that appears to us in our daily work. It allows us to quickly see how efficient is being a Department / project or if a project deadlines are being met, allows, without asking many questions, to know the current state of our production plant.

This method entails a quick interaction among actors, customers, suppliers, etc. It is important to choose the appropriate information on display, a person in charge, and the frequency of updates. For example, use a standard range of colors in graphics that show the actual performance indicators vs the objectives.

Rules of visual management

These are the key points people should monitor:

- Current state
- Objectives
- Indicators
- Planning
- Products
- No Quality
- Delays
- Organization

Panels should be accessible for all; they must have separate sections for everything you need to know the current situation. It is important to be understandable by everyone, the simpler as possible so it will be easier to maintain and dedicate some time to explain what it means.

The choice of indicators

- A lot of information = is not information
- A lot of information = too much time updating
- Frequency of update = the information added value

Choose properly the indicators that you would be needing and keep track of progress. Providing too much information can lead to confusion; besides, updating it will take longer. Be clear about the frequency of update should be required to take action.

Data are information.

Indicators or data without goals or compare them with previous data, they are good for nothing... you cannot take decisions to improve or correct. Example: Know if we are going to speed that we are going in the car means nothing if we don't have the information of the speed limit.

- Graphs must correspond to the rules of the Organization (homogeneity).
- If each Department communicates its objectives differently, it will be difficult to understand and to relate the information received.
- The indicators must be understood by all: simple and communicative.
- Universal measuring unit: time, EUR, number of actions, etc.

All departments are required to use the same format and language in their indicators, same units of measurement, etc. An indicator must reflect the reality and have a goal to take actions. Measuring only the necessary, good for nothing measure something that we know that every day is going to be OK or will not change.

Alert systems should be visual, visible and comprehensible. They must be clear, easy to understand, meaningful, and guide people straightforwardly.

Visual quality control

Understand the requirements of our customers.
Not hide problems.

Text-heavy with technical terms doesn't help

Low vulnerability

- Masonry units are locked.
- Masonry units are of good quality. They do not present major cracks, there are no damaged or broken parts.
- The pieces are placed evenly and continuous course after course

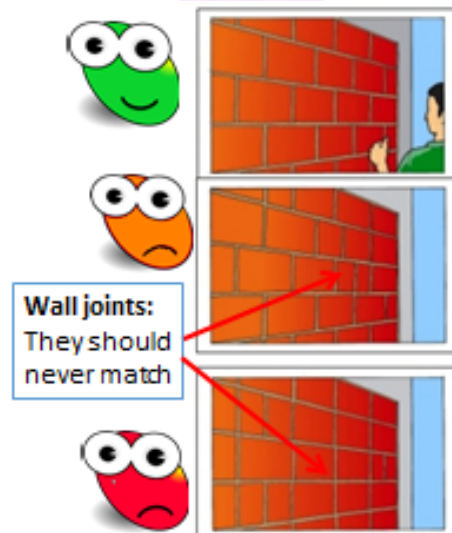
Medium vulnerability

- Some parts are broken, others are not being the majority of the first class.
- Some pieces have cracking or deterioration.
- Some pieces are placed evenly and continuous course after course

High vulnerability

- Masonry units are not locked.
- Masonry units are of very poor quality. There are major cracks with worn or broken parts
- The pieces are not inserted evenly and continuous course after course.

A picture says more than thousand words



Reading instructions that include pictures and other visual elements helps workers to understand the objective of the work.

Conclusion

Indicators must be easy to use, update, and understand by all people within the organization. They allow them to know at a glance the current situation of the plant.

What is an Andon system?

It is a means of visual communication to inform workers about the situation of a machine or a work area. Generally tend to use bright columns of various colors for reports of a state. Andons are often installed when there is auxiliary equipment separate from the work area. For example, a compressor: a mark indicates if it is working or has stopped. These systems are very practical because once programmed, their performance is always the same. Workers accustomed to them and know the status of schedule at the time.

Unit 3.3 QUALITY IMPROVEMENT

3.3.1 Poka yoke - Jidoka

Quality can be defined as “satisfying of the needs and expectations of the clients, with the minimum possible cost”.

Zero Defects is an important concept. There are always costs associated with defects in production.

Some sources of defects are as follows:

1. Processes omitted.
2. Mistakes during the process.
3. Mistakes in the setting.
4. Missing parts.
5. Wrong parties.
6. Processing of wrong parts.
7. Missing operations.
8. Mistakes of adjustment.
9. Mistakes in the setup of the equipment.
10. Poorly prepared tools or machines

Poka Yoke

This Japanese term means avoiding it, reducing (yoke) unintentional, accidental mistake (poka).

Poka-Yoke prevents work errors from resulting in defective products. This regroups the principles of product design and manufacturing, as well as technical means to avoid accidental and negligent mistakes.

In the 1970s, in the West a massive flow of Japanese products of better quality and cheaper. Among other factors, the extended use of poka-yokes allowed Japanese companies to lower their defect rates and consequently their costs. Shigeo Shingo perfected the methodology in the 1960s; his work consisted in systematizing the knowledge to apply it in the products and processes of the company.

Methods

Poka-yoke systems have three primary methods:

1. Contact
2. Counting
3. Sequence of movements

Each method can be used in both control and alert systems.

Contact mechanism

An example of a contact mechanism using a limit switch. In this case the limit switch makes contact with the metal detecting its presence. If there is no contact the process will stop.



Count Poka Yoke

Another approach is to count the number of parts or components required to complete an operation in advance. If the operator finds leftover parts, he will know that some process has been omitted.



"I have a leftover piece. I must have skipped a process!"

Sequence of movements

The third method uses sensors to determine if a movement has taken place. If any movement is missing, the sensor stops the machine and warns.



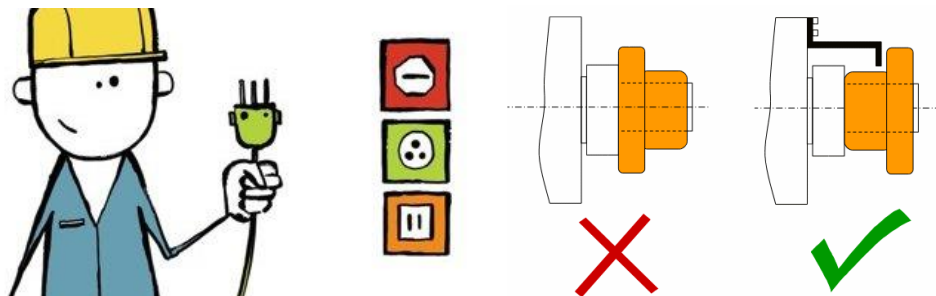
This method uses sensors and photoelectric devices connected to a timer.

If movement does not occur when required, the process is stopped.

Type of sensors

Mechanisms / sensors are traditionally used in poka yoke systems and are divided into four categories: mechanisms of physical contact, energy sensing mechanisms, warning sensors and artificial vision

Examples of Poka Yoke



Definition of JIDOKA:

Automation with a human touch means "intelligent automation" or "humanized automation". In practice, it means that an automated process is sufficiently "conscious" of itself, so the

process can: detect erroneous product, malfunctions or defects; stop by itself and alert the operator.

Jidoka's uses

Product defect: In this case it is a matter of automatically detecting the quality of the work done, by means of 100% automatic control, etc.

Malfunction of the Process: It is about communicating information from one machine to another or from one part of the machine to another so that it can be stopped if something irregular happens between them. For example: lack of material, maximum level reached.

3.3.2 Problem solving A3

Problem: a definition

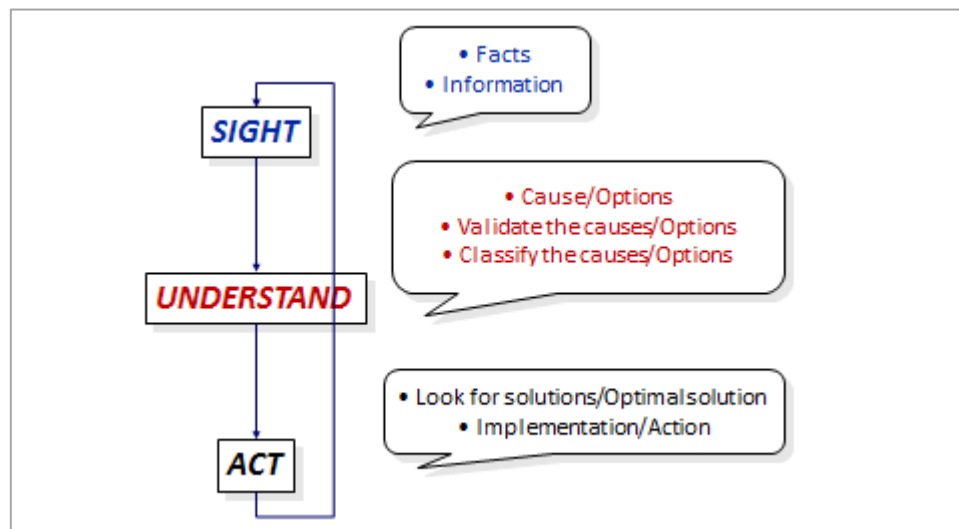
A problem is a mismatch between the current situation and the desired situation in some area of the organization. This concept is often mistaken for: the root of the problem, the solution of the problem or the objective to be achieved.

We encounter problems every day, both in work and private life, but what do we understand by problem?. The exact definition would be a gap between the current situation and the desired situation. Let's take an example, I need to make an urgent reference but I do not have the necessary raw material. The problem is that the difference between what is desired, which is to produce said reference, and the current situation, machine stopped, would be the problem

We tend to confuse a problem with its cause, its solution or its purpose. In the previous example, the problem was that it could not produce, but not its cause, for that we would have to respond to the 5 whys, because there is a rupture of stock of raw material, because there is a failure in the sourcing parameters.

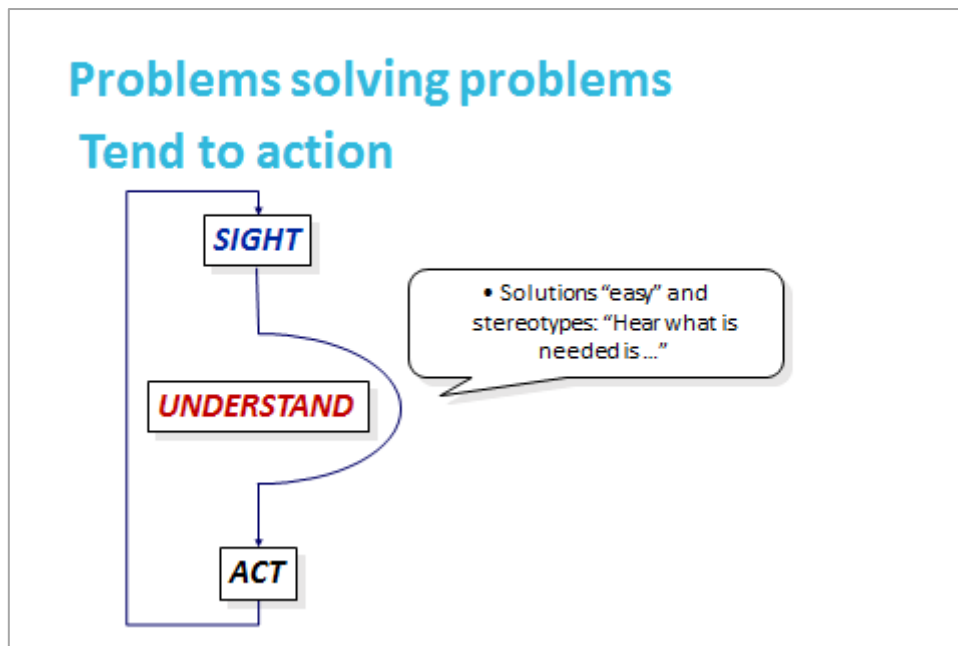
The solution would be the one that solves the root cause, correctly parameterize the provisioning of said reference.

Problems solving problems

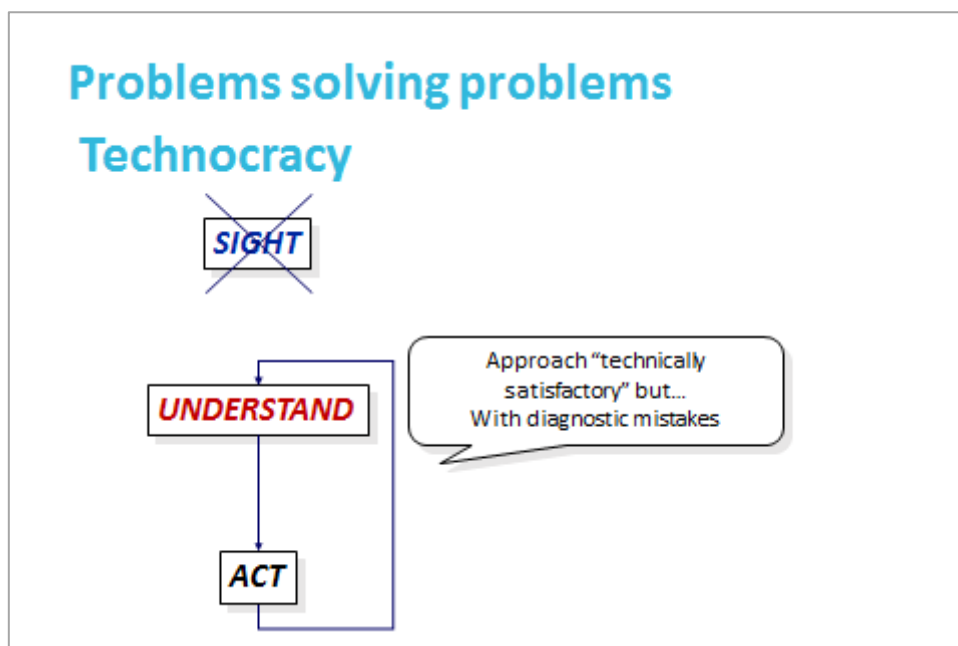


To solve a problem, there are three phases that we must follow:

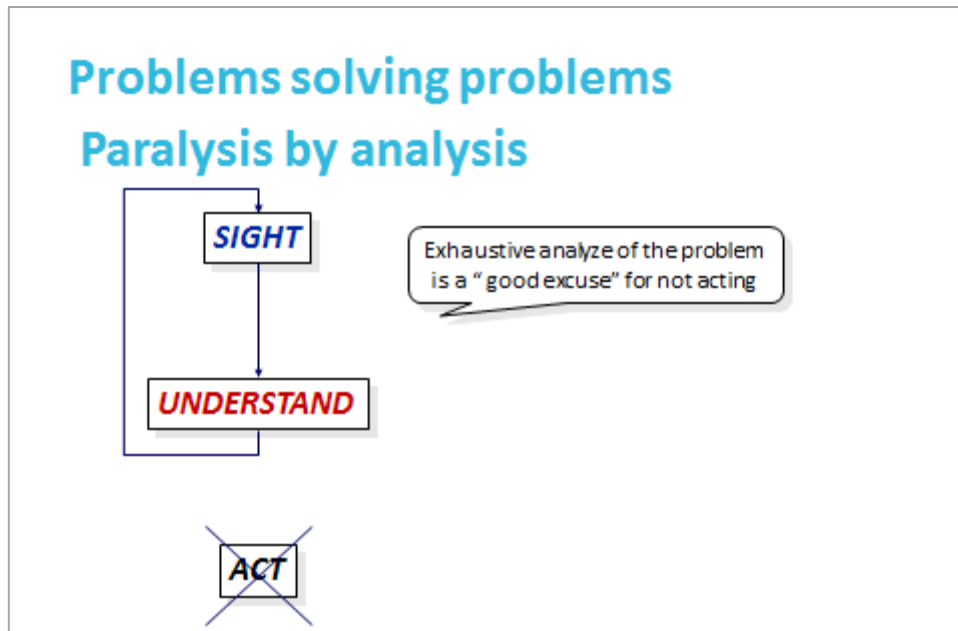
1. Observe: it is necessary to go down to the place where the problem occurs and gather information: shift in which it has occurred, time, affected parts, staff training, machine status ...
2. Understand: Once observed the problem, we must understand that it has happened, all possible failure modes, these will typify them according to their origin, for example, technical, human, or process.
3. Act: Once the causes or causes are known, we must seek solutions to them, and carry them out.



Sometimes we try to solve a problem by going directly to the action. We skipped the step of understanding the problem, so the action we take is directed at solving our preconceived idea not the true root cause of the problem. With this model we will not solve the problem since we do not attack the cause that causes it.



Another frequent error when solving problems is the so-called "technocracy", in this case we skipped the phase of collecting information, to make a good diagnosis. So despite an analysis of possible causes, this is not based on the reality of the problem, and therefore neither is the action to be implemented.



And finally there is a failure in problem solving called "Paralysis by analysis" and occurs when we allocate all resources to observe and understand the problem, spending too much time to avoid taking action and Acting. Obviously in this case not taking actions, no matter how well we identify the problem, we will not be able to solve it.

To solve a problem you have to be clear:

- What is the **problem**: a well posed problem is half solved problem.
- What I want to achieve (**objective**): Specify, Quantify
 - Criteria, Limitations,...

In order to solve a problem we must know exactly what it is, the more information we have, the easier it will be to find its cause and take action to solve it.

In addition to knowing the problem, we must know what our objective is, to define it qualitatively or quantitatively.

Definition of the fault

In order to completely define a problem, these are the questions we must answer.

WHAT?	What reference is the problem?
	What is the defect?
WHO?	Who or what has discovered the problem?
WHERE?	At which stage of the process the problem appears?
	Where is the fault observed in the product?
WHEN?	When the fault has been detected for the first time?
	In what circumstances, on what occasion has the fault appeared?
	Does the fault appear periodically? Cyclically on this series?
HOW MANY?	How many products are involved?
	How many identical faults are observed on a product?

A bit of history

Let's talk briefly about the history of the A3 format: When and why it was generated, and who was responsible for developing it up to the standard we use today.

Planning using the A3 format (420x297 mm) began in the 1960s as the format used to solve the problems of Quality Circles. At Toyota this evolved into the standard format for problem solving, proposals, plans and reviews

The key

The A3 format will guide us in the process and thinking of generating a complete plan. It provides:

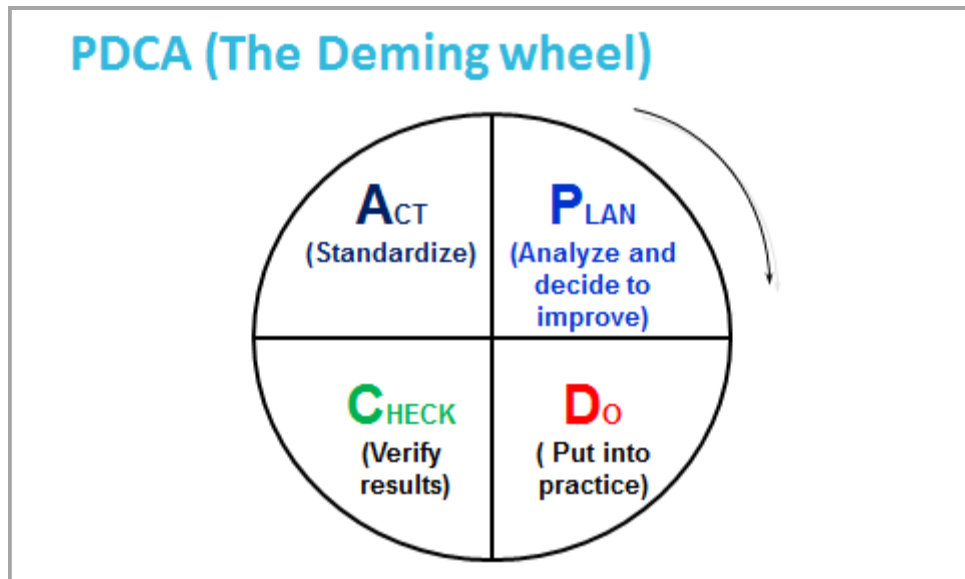
- A logical thinking through the use of the PDCA cycle that we will see later.
- Objectivity, since it is based on empirical data.
- Process and results
- It will help us to synthesize ideas and visualize them in a visual way.
- The participation of a multidisciplinary team will cause the whole team to appropriate the results of the A3.
- With the actions generated following a methodological analysis, the resulting plan will be consistent and consistent
- Provide us methodology in problem solving.
- A3, it will allow us to translate all the above into a sheet of paper, easy to understand by anyone.

The importance of this methodology is not its format, but in the **process and thought** behind it and that translates into

- Logical thinking process (PDCA)
- Objectivity (use of data)
- Process and results (50/50)
- Synthetic and visual
- Consensual with interest groups
- Coherency and consistency
- Systemic vision
- An A3 fully defines a plan, large or small, on a sheet of paper; must be visual and extremely concise, so that anyone can understand it.

The problem-solving process. The Deming Wheel

The Deming Wheel is a repetitive four-step management method used for the control and continual improvement of processes and products.



1st Plan: Analyse, locate problems and define action plans.

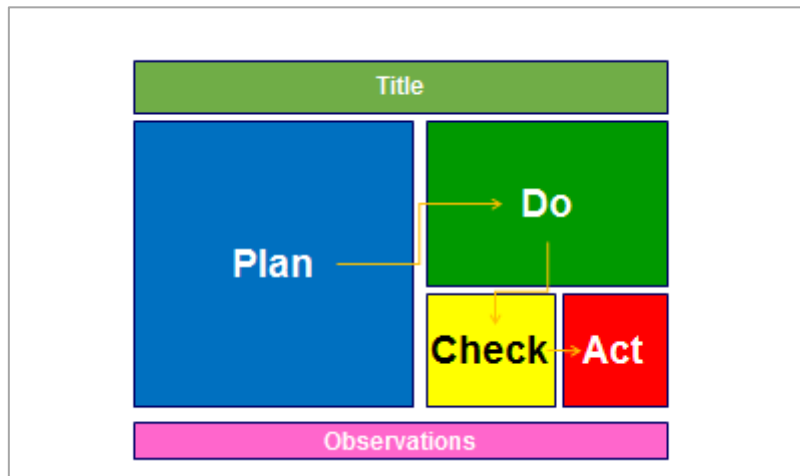
2º Make: Execute the action plans. Bring actions to practice

3º Check: Control, Check for improvement, check the effects of the implementation.

4º Acting: Correct action, conclusions, recommendation, standardization.

A3

Let's see a typical problem solving scheme with A3 in which the 4 phases of the PDCA cycle are integrated.



Plan

Within the Plan phase, we will perform the identification of the problem, using the questions we saw earlier on page 47. It consists of four steps:

1. Identify the need or problem and its importance
2. Establish the current situation
3. Analyse the causes of the current situation
4. Identify the desired solution (Objective)

Do

Discuss plans among all affected parts and implement them. Once the causes of the problem have been defined, the multidisciplinary team will agree on the actions to be taken to solve them. With defined action plan, will be put into practice.

Check

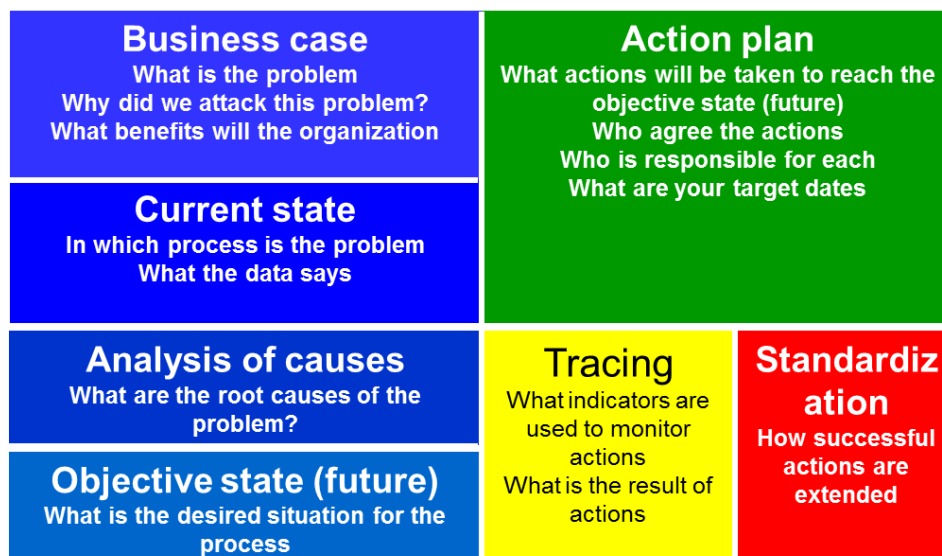
Standardize successful solutions: establish new rules and procedures. Once the action plan is implemented, it will be periodically monitored and its effectiveness evaluated through the indicators defined for it.

Act

Follow up actions and check the results. If action has been satisfactory, new standards and working procedures will be standardized and established.

The A3 Formats

There may be different formats depending on the need, always following the PDCA improvement cycle. A generic format for A3 is presented for training.

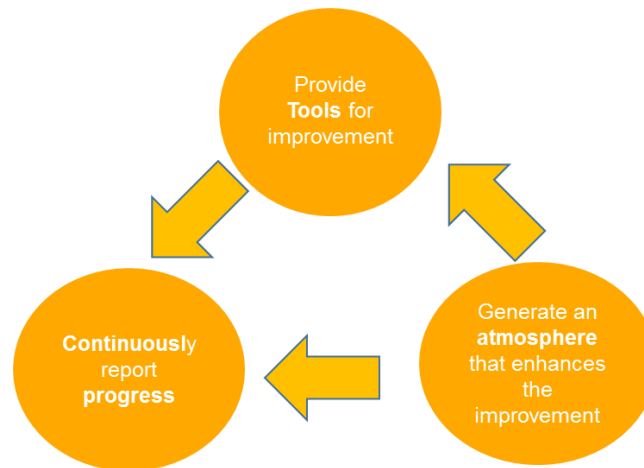


1. Business case: Definition of the problem, relevant information that connects the problem to the historical context and to the organizational structure
2. Current state: a simple diagram that describes how the process works with the main associated problems and data describing the situation of the problem
3. Analysis of causes: chain of causes and effects that lead to the root of the problem
4. Target state: proposed actions on root causes. A simple diagram that describes how the new process will work with the new measures implemented and predict the performance
5. Plan of action: the actions required to reach the objective condition. Who will perform each action and when
6. Tracking: how and when the user will verify that the target conditions have been reached and what results have been achieved (left blank at start).

7. Standardization: what actions are taken to ensure the maintenance and extension of the improvement made.

Key points

- If we see the A3 only as a format rather than a process, we will solve the problems as usual.
- Fill in the tables of the format in addition to not improving our ability to solve problems, generates Muda.
- How to guide the improvement cycle:



The A3 is a basic tool in continuous improvement. And it must be used correctly to solve problems efficiently, if we only complete it as "other format", we will be introducing another Muda into the organization.

In addition to the correct use of the tool to improve our resolution of problems we must generate in the organization of an atmosphere that enhances the improvement where all contribute their knowledge and are integrated within the improvement. Continuous reporting of progress will make improvement plans move forward successfully