

**SUAN SUNANDHA  
RAJABHAT UNIVERSITY**

**Week 9**

# **A 3 Report (2)**



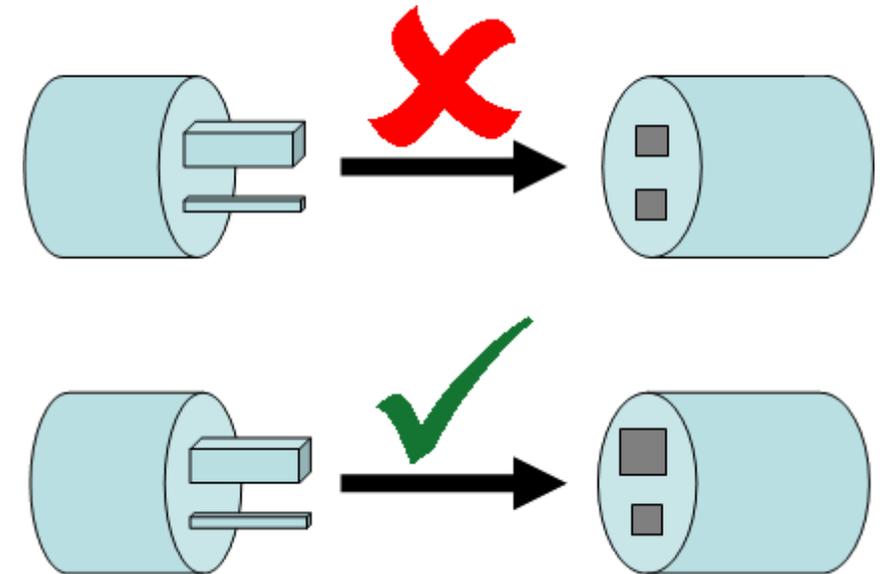
**Assoc.Prof.Dr.Nuntiya Noichun**

# Poka Yoke (Mistake Proofing)

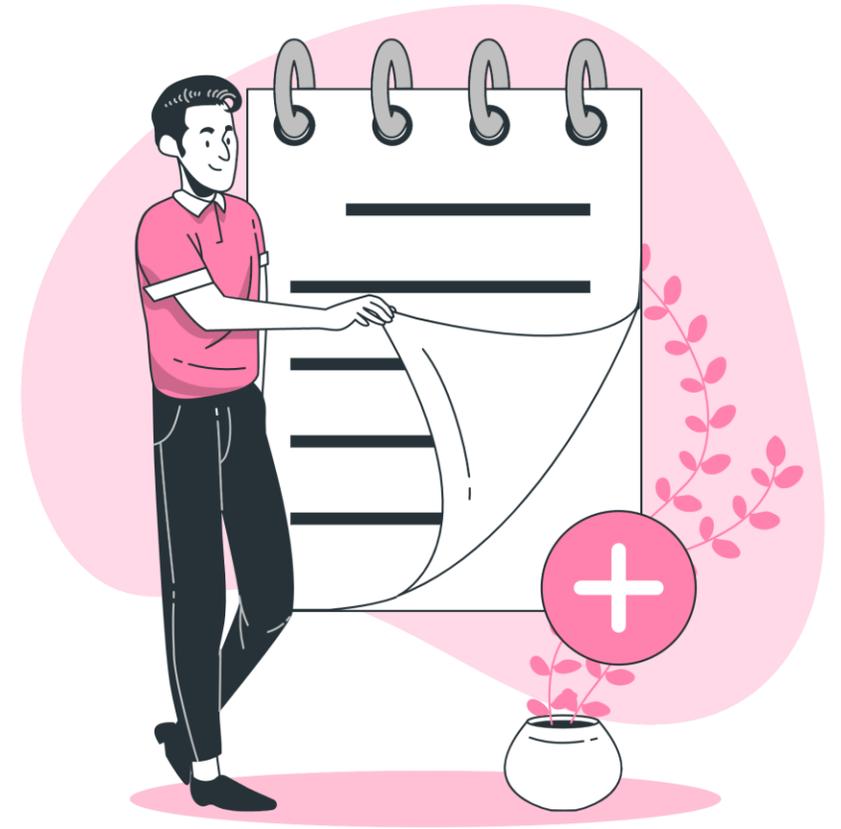
# Poka Yoke (Mistake Proofing)



The Poka-Yoke lean management tool is all about mistake proofing, or avoiding errors within your organization. This ensures that the appropriate conditions are in place prior to a process or new step being executed, which will stop defects in the first place.



- Sometimes it is not possible to detect where a defect may come about before it has occurred. In this instance, poka-yoke will act as a defense function.
- It stops errors as soon as possible by bringing attention to the error that cause it (whether this be human, mechanic or process based).



- This may involve adding design features that will make it impossible for errors to occur, or reevaluating the whole process therefore ensuring quality products and services.
- Most organizations will have processes that can allow for mistakes to be made along the way. If your organization adopts the poka-yoke tool, this will help in decreasing the errors made.

Mistake proofing techniques (poka-yoke) will support your organization and its customers in many ways, such as:

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- The reduction of work place errors means there is a reduction in waste, cost and the time it takes to get the final product to customers.
- The organization will have strong processes that work reliably, are predictable and work better with other organizational processes.
- There will be less time spent on training workers in areas that aren't needed
- Your organization will have a built-in quality control system, making auditing easier

# When to use Poka-Yoke and how?



As mistakes can be made anywhere in the business, this means that Poka-Yoke can be implemented anywhere across the business. An organization can apply Poka-Yoke to any type of process, helping it prevent errors.



# Poka-Yoke Steps



The steps in implementing Poka-Yoke are as follows:

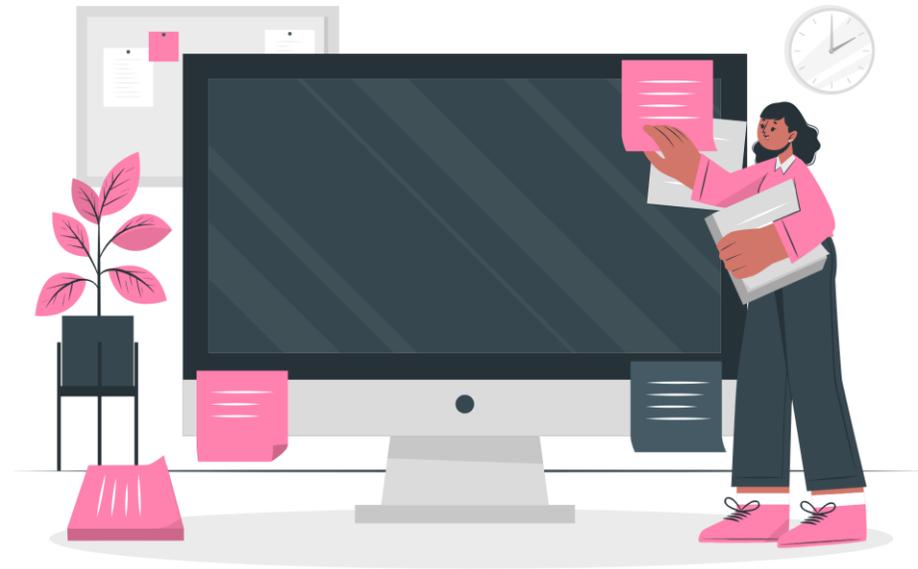
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1. **Identify** the Process or operation that it needs to be applied to.
2. **Analyze** the 5-Why's & the possible ways this process may fail.



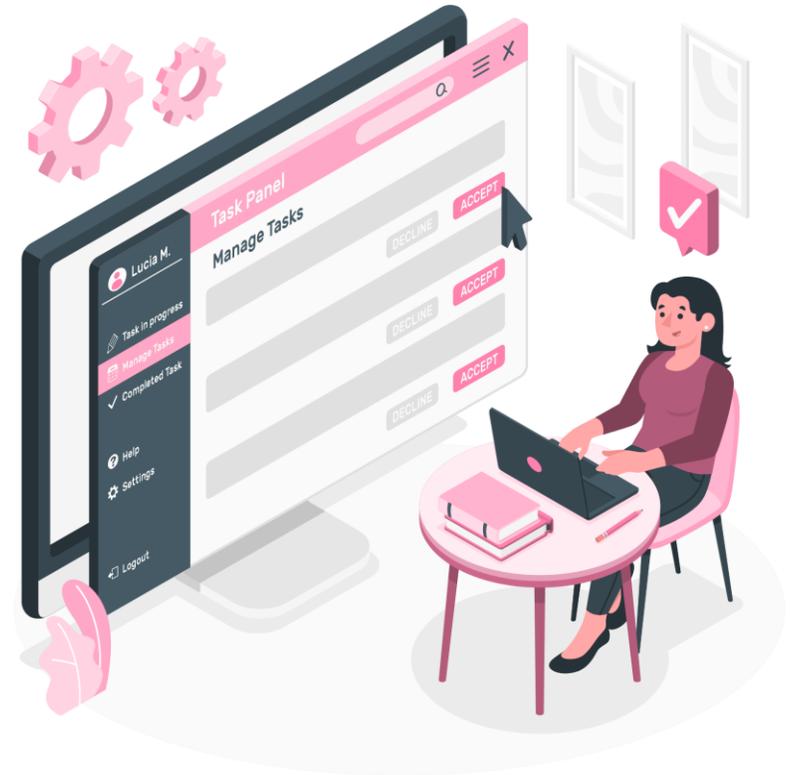
This rule is as simple as the name suggests, and is where you must ask yourself 'Why' 5 times consecutively in order to find out why something is occurring or behaving that way. By doing this, you will slowly but surely be able to peel away the layers to a problem, eventually finding the root-cause of it. More often than not, the supposed answer to your question will actually lead to asking another question rather than the final solution.

In regards to the Poka-Yoke technique, let's use the example of customer satisfaction being low around the products they are getting delivered. The 5-why analysis may look a little something like:

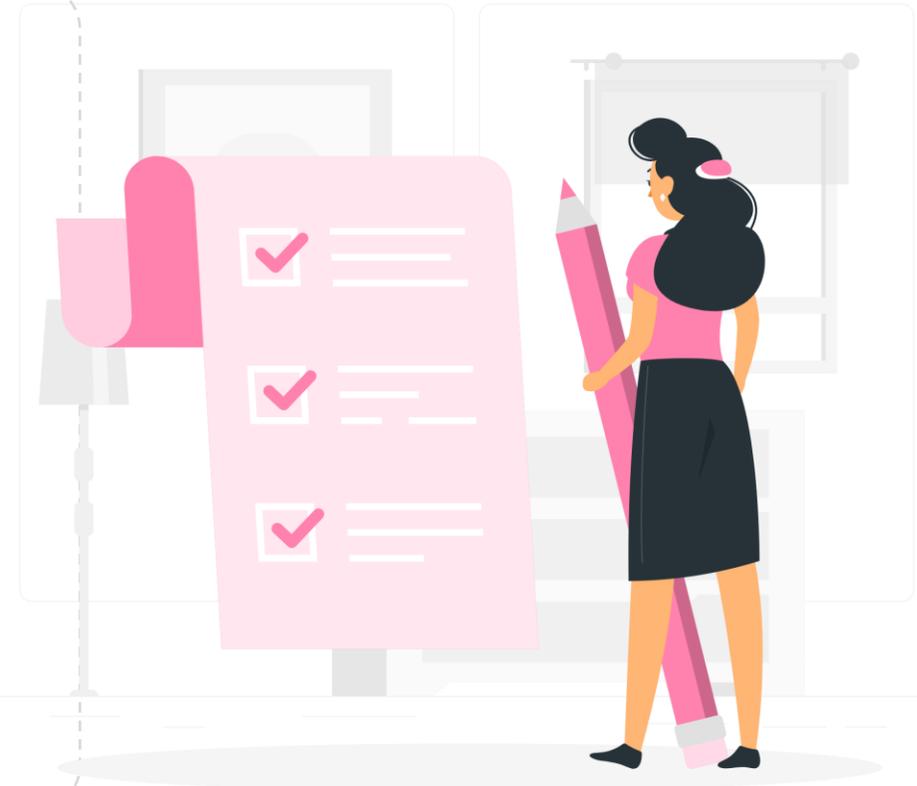


- “Why are the products shipped not meeting satisfactions?” Because they are taking longer to get there than when initially said
- “Why are they taking longer to get there than initially said?” Because there is a new team of casuals in the dispatch department who haven’t had adequate training.
- “Why have they not had adequate training?” Because the head of this department is currently on annual leave, meaning they have been trained by a step-in employee

As you can see, a root-cause has been found, which was down to a training issue. Now that the organization is aware of this, they can allocate some extra time to this training and implement steps that will allow them to send products on time.

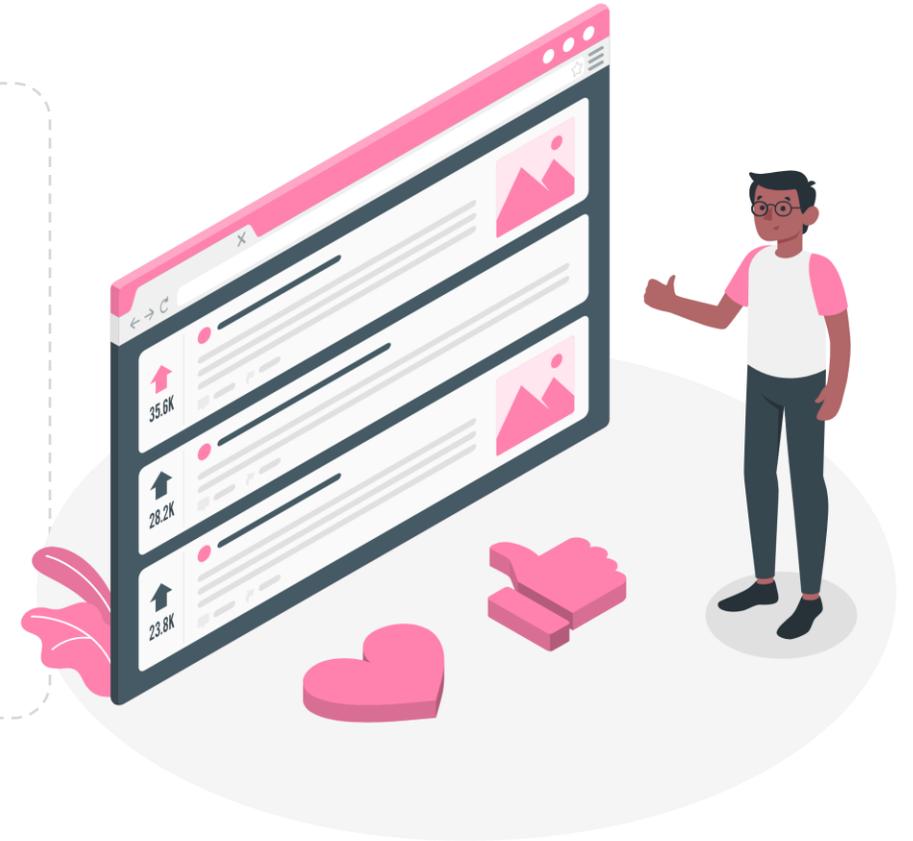


Don't get too caught up on the name – 'why' may only need to be asked 2 times in order to find out the root-cause of a problem, or conversely, it may need to be asked 15 times. This will depend on the length and scope of the process you are investigating and how many people are involved with it.

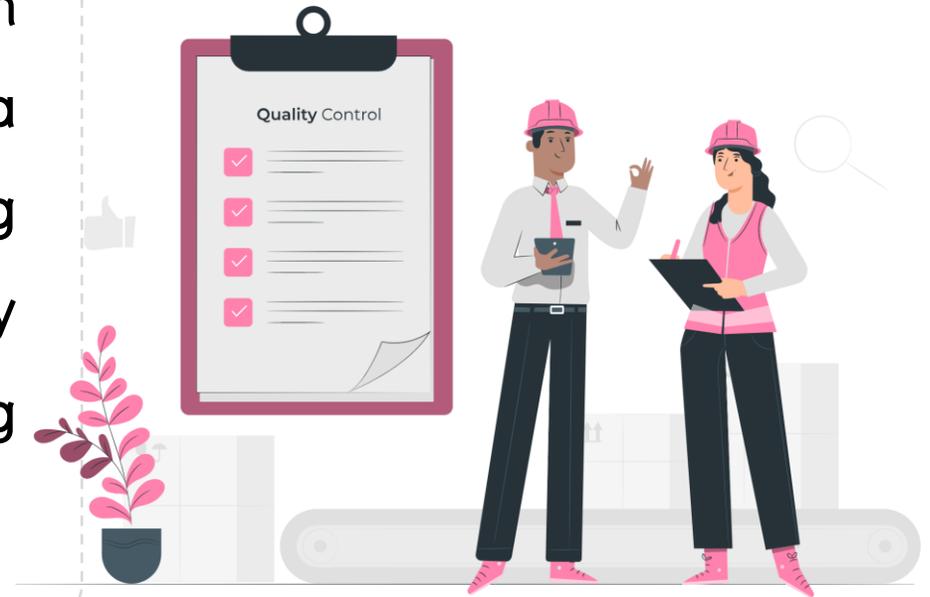


Select a Poka-yoke approach that is appropriate to the process

For example, a shutout approach might be used when errors need to be prevented, while an attention type may be more appropriate to highlight the error has already been made.



Depending on what has been chosen, an operator will either be alerted before a mistake is about to be made, not allowing the process to carry on any further, or they will be alerted right afterwards, allowing them to step in and intervene.



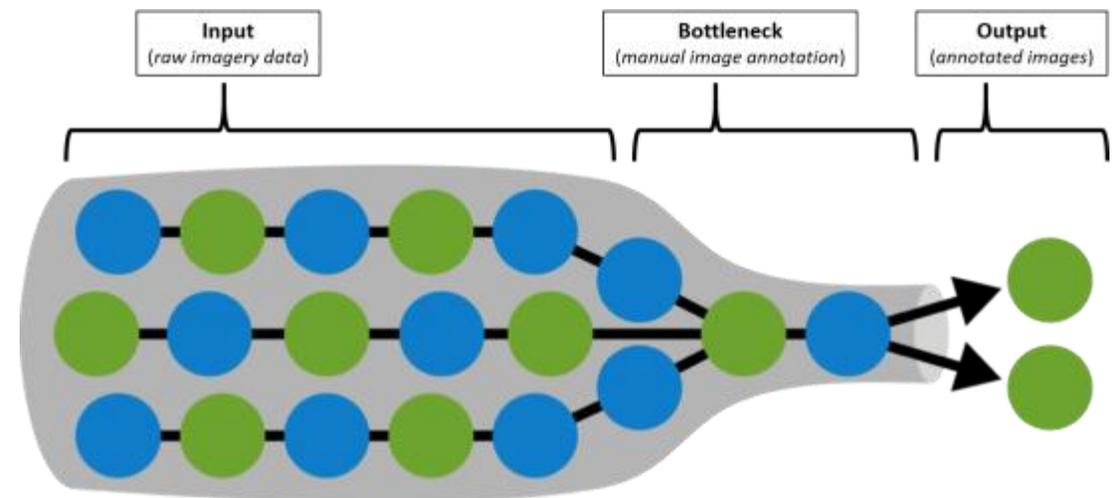
- **Contact:** Detect the error of a product using a physical attribute such as the shape or size of something
- **Constant Number:** An error will be triggered if a particular number of movements or steps are not made
- **Sequencing Method:** Using a checklist to make sure all process steps are carried out

# Bottleneck Analysis

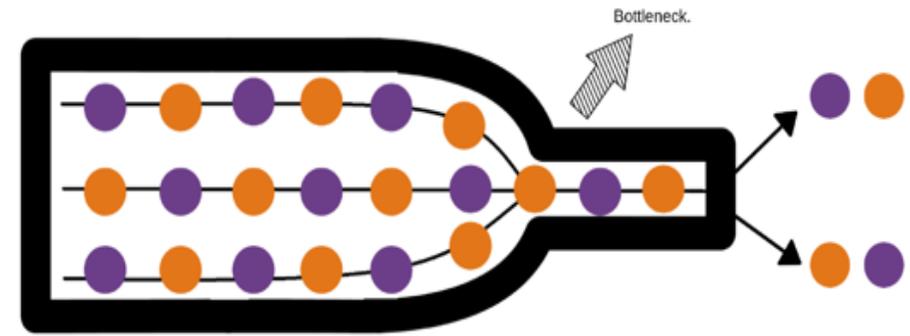
# Bottleneck Analysis



A bottleneck analysis is a lean management tool that looks at any areas within a process that are causing the workflow to become backed up or slower than it should be. A bottleneck analysis can help in identifying the exact point along the workflow that is causing these blockages, and work to mitigate them



If you look at the bottle above as an example, imagine the colored dots as the tasks within a process, and the lines they are on is how they are flowing. As you can see, when the tasks reach the neck of the bottle, they slow down and all have to get through the bottle at a slower rate.



The 'neck' of the bottle is where the constraints or wastes within the processes can be found. This may be a particular step in a manufacturing process, or perhaps an approval that needs to be made before all the tasks carry through to the next step. A bottleneck analysis will focus on finding out what these blockages are, and working to eliminate them.

# Examples of Bottlenecks:



- Approvals
- Transportation logistics
- Communication
- Manufacturing processes
- Business processes

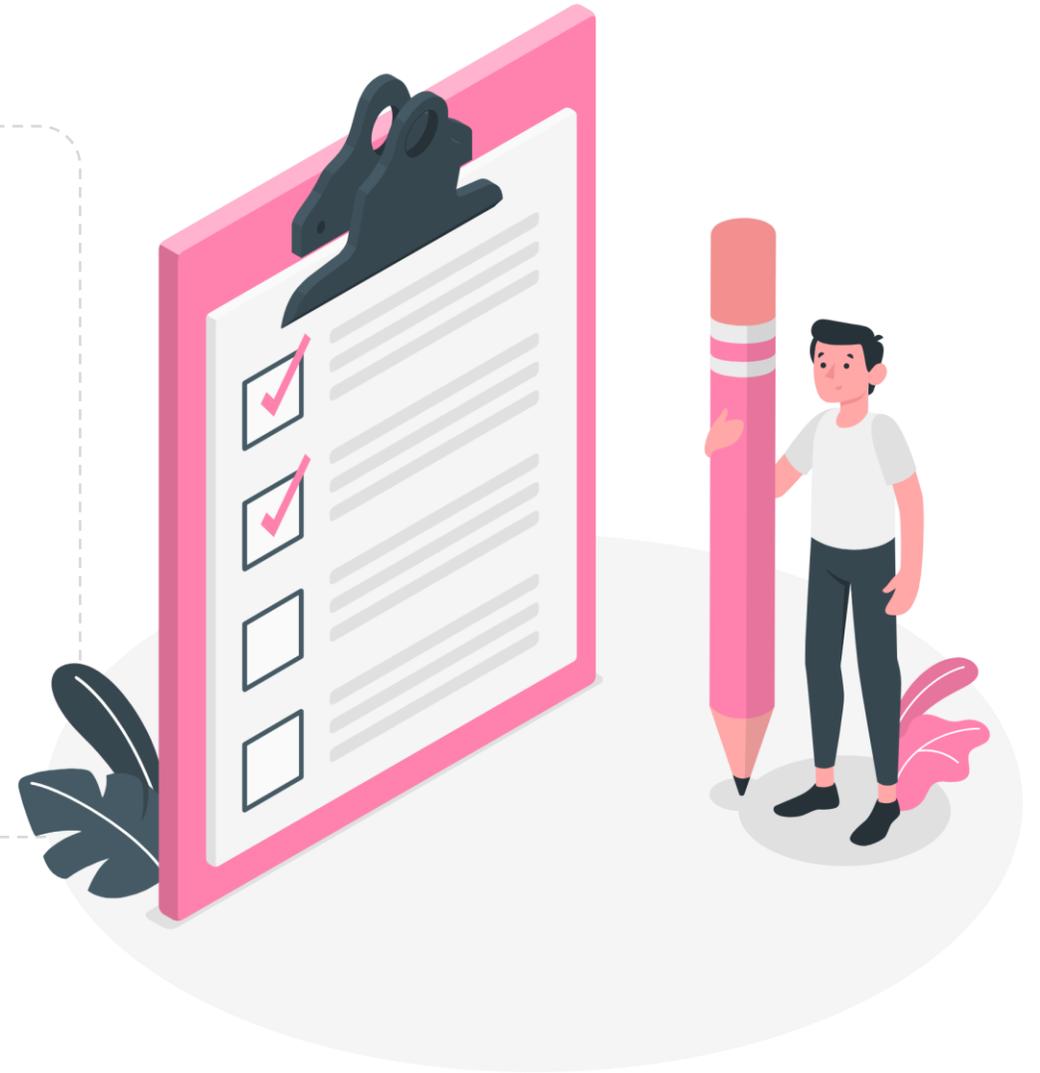


# Benefits of the bottleneck analysis:



Once this blockage has been identified, improvements can be made that will aim to reduce the waste created from this workflow. Bottlenecks are often created by unnecessary or inefficient steps within a process, that ultimately just create waste. The bottleneck analysis will be able to identify where this waste is coming from, which can then be removed.

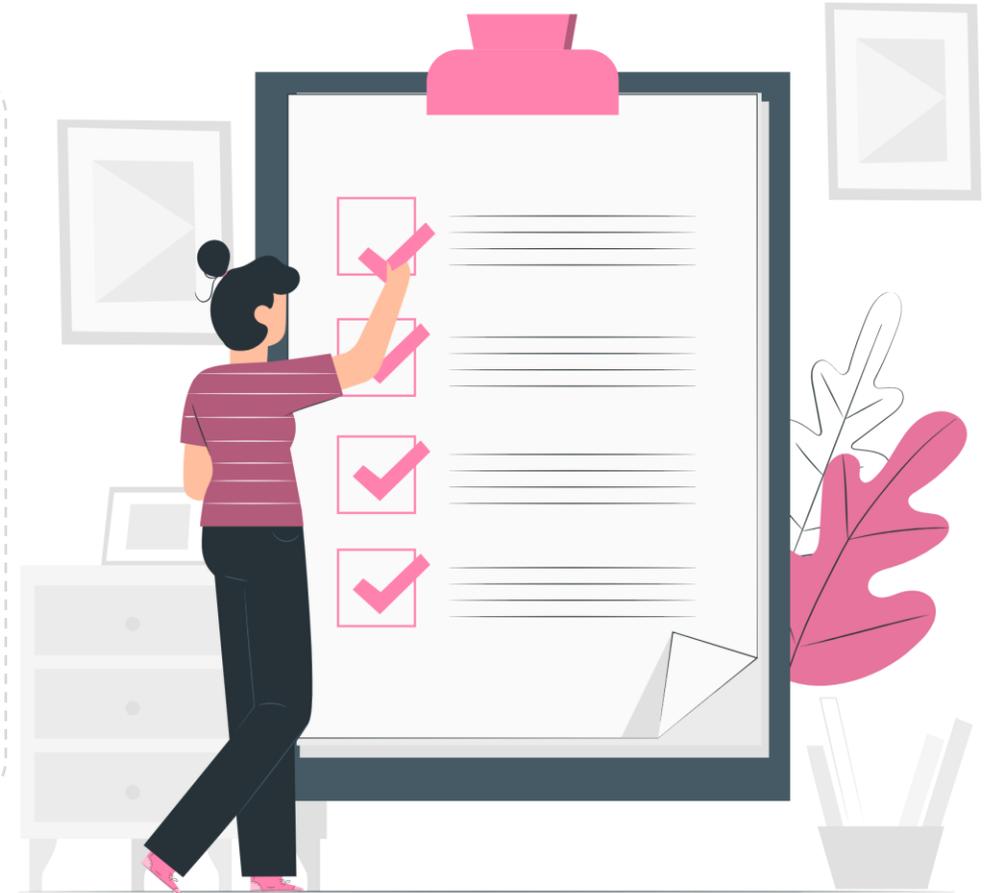
Another benefit is that the organization will have an increased knowledge regarding their processes and workflows. This will help in the ability to make more informed decisions in the future that may stop more bottlenecks occurring.



# How to conduct a bottleneck analysis:



The process to this tool is detailed and requires a lot data-gathering about processes, which may be time consuming for the organization, but will be worth it in regards to costs saved and efficiencies gained.

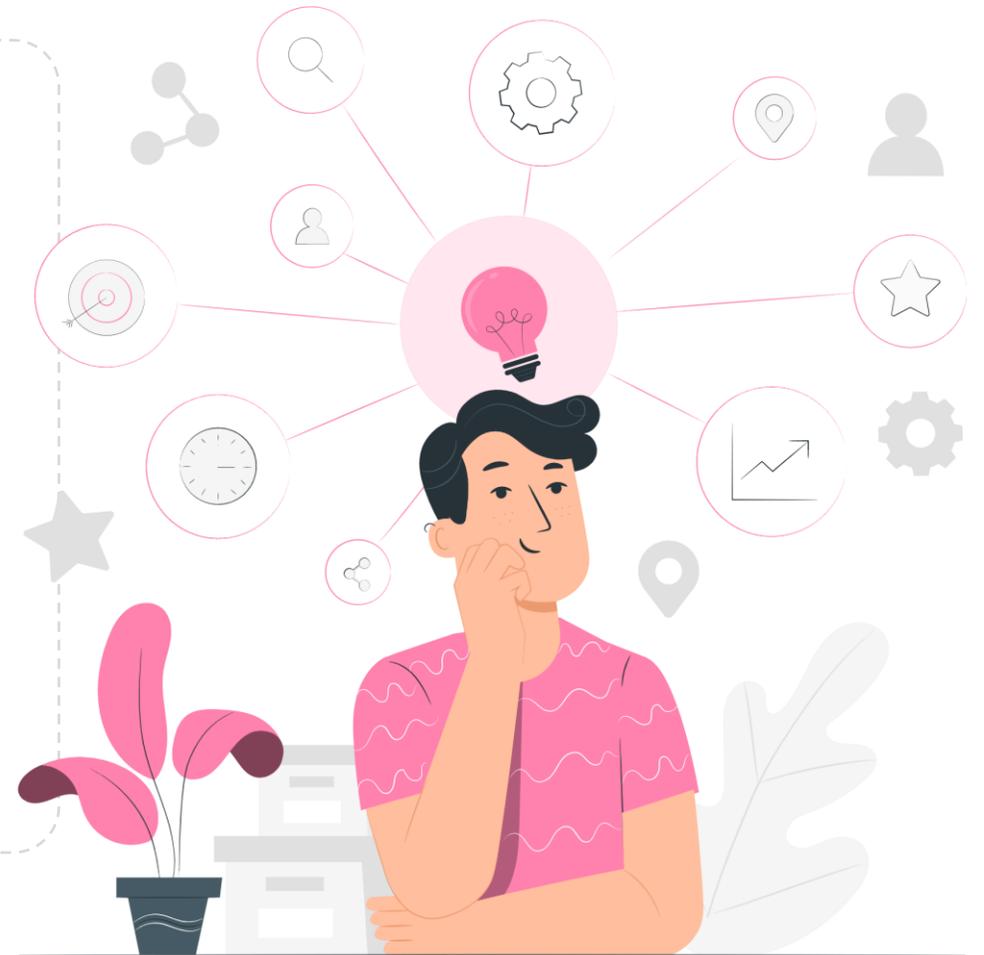


It is important to remember that when you are performing a bottleneck analysis, you do not only want to look at the area the blockage is occurring, but the whole process, including steps prior to this and also after it. By doing this, you will be able to get useful information about what may cause this bottleneck to occur, and what the implications are afterwards. It is important to do this because if you eliminate a bottleneck at the start of the process, this may cause other implications further down the track.

When conducting the analysis the type of information you want to be gathering will relate to how long a step in the process may take, the costs associated with it, how many people are involved, and what steps are dependent on other ones being completed.



Once you have found out what the most crucial bottlenecks are, steps can be put in place to reduce them. This may involve introducing quality control and quality assurance before a bottleneck, or even having corrective action tools in place after the bottleneck.





If the bottleneck can be removed all together without any implications, then this would be the most effective and efficient thing to do.

# Takt Time

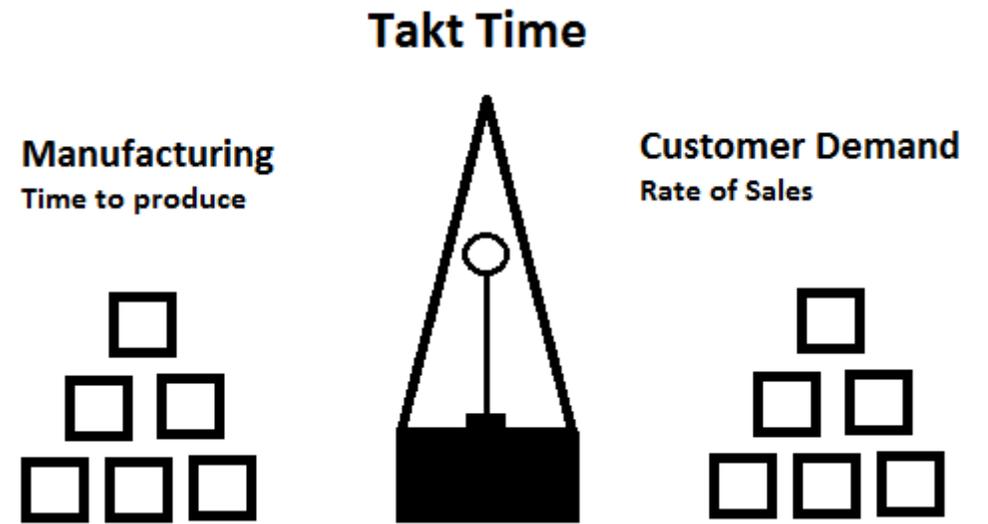
# Takt Time



Takt–Time refers to the rate at which you need to complete your work in order to keep up with customer demand. More simply put, Takt–time (TT) will ensure that the right product (RP) is delivered to the right customer (RC) at the right time (RT) and in the right quantity (RQ). It is possible to achieve the RC, RP and RT without implementing Takt, but this often leads to an excess in waste and therefore means your organization will not be operating in line with Lean.

Takt-time is often thought of as the 'heartbeat' of an organization, as it is creating a constant pulse across all processes, highlighting any issues relating to capacity, synchronization and most importantly, quality. If an organizations takt-time is 5 minutes, that means they have 5 minutes to complete a product or product component, as this is how long on average a customer is buying from them. The sell rate is the takt time.

It is important to calculate the takt time of your products or processes, as this can help in reducing any waste created by the processes.



# Calculating Takt-Time:



$$\text{Takt Time} = \frac{\text{Production time Available}}{\text{Average Customer Demand}}$$

**Note:** Production time available  
=  
total production time  
- breaks  
- maintenance activities  
- shift changeover  
- clean down time

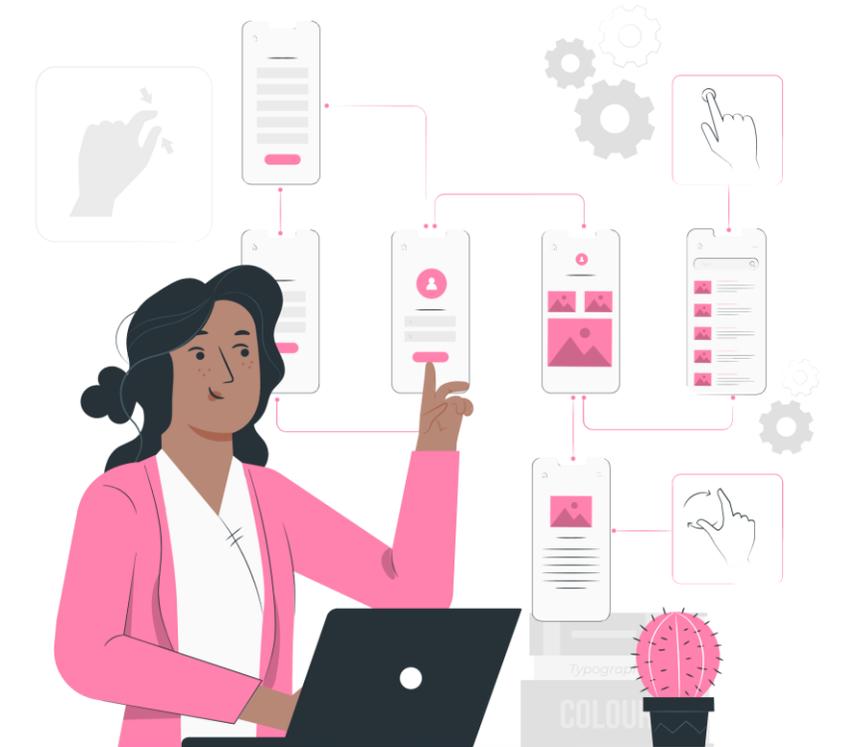
$$\text{Takt Time} = \frac{840 \text{ Minutes}}{168 \text{ Components required}} = 5 \text{ Minutes}$$

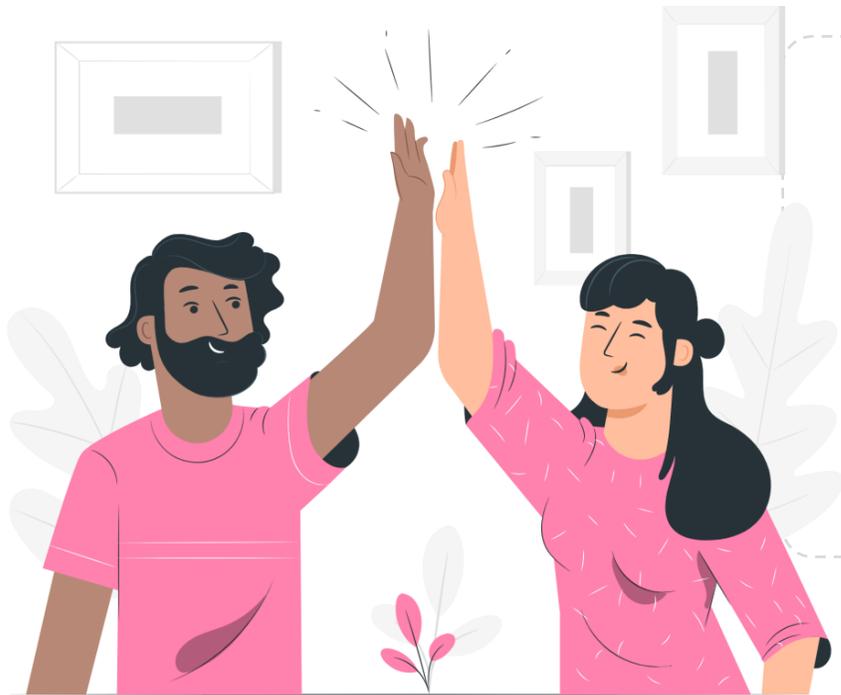
In order to calculate Takt-Time, cycle time must first be accounted for.

# What is Continuous Improvement?



A continuous improvement process refers to your organization's constant efforts to be ever-improving, through the reduction of waste. This could refer to improving your people, processes, products, or services.



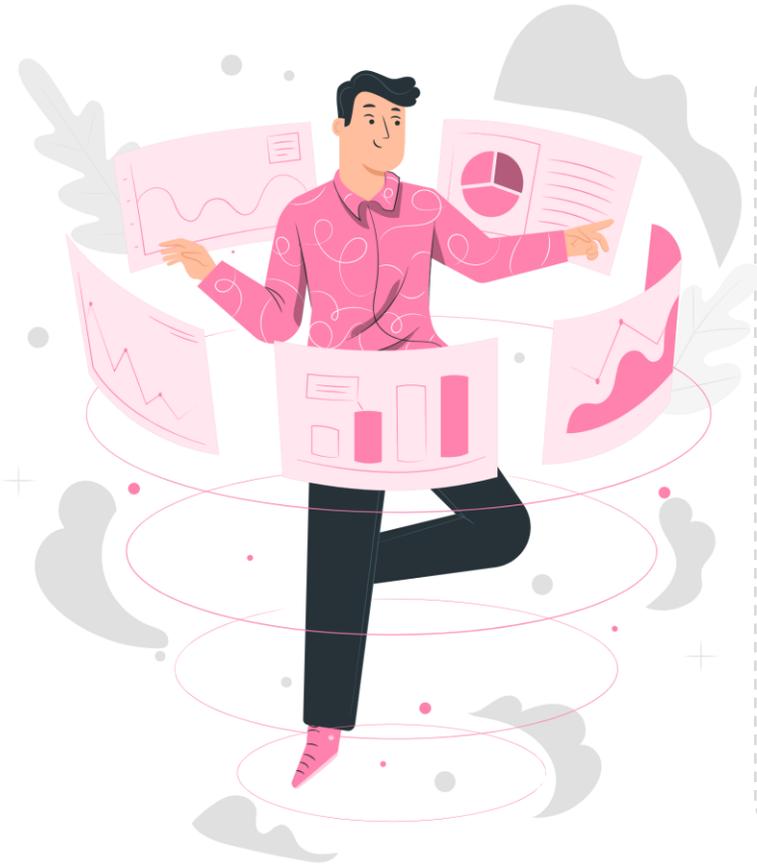


Continuous improvement can be broken into two categories of ‘incremental’ improvement or ‘breakthrough’ improvements, which will both affect your organization in differing ways.

# Incremental Improvements:



These will slowly enhance your organization through small, more subtle changes that can take longer to be fully implemented into your organization. This type of continuous improvement means that small steps can be made that make an impact to your organization, without disrupting the entire organization.



Incremental improvement allows for ideas to be put forward by employees at all levels, and for these to actually be considered. This type of continuous improvement can be used when the change is not urgent, and will help in decreasing any anxieties the employees have about the change, as it will be smaller in nature.

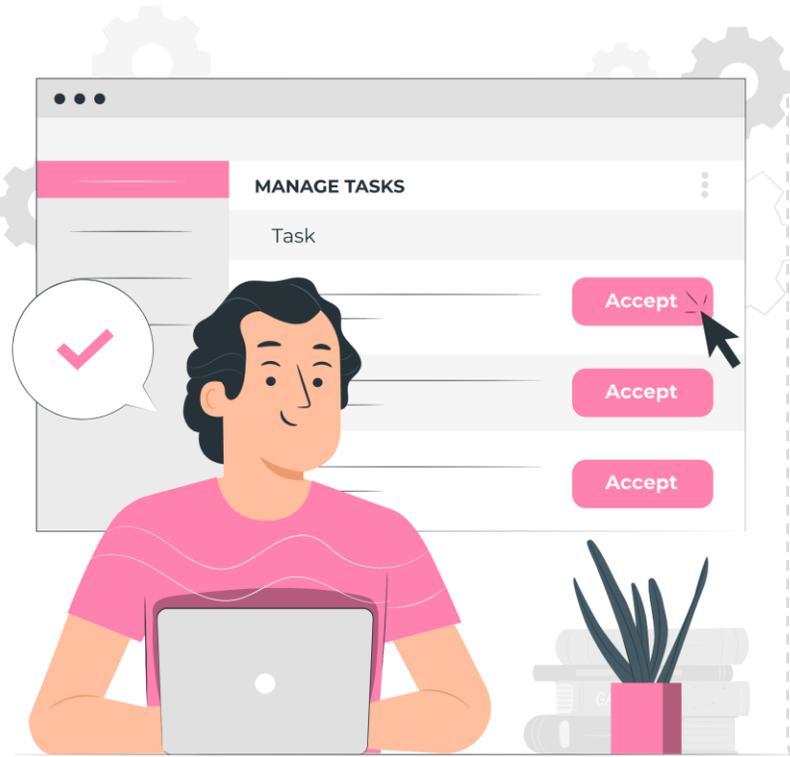


# Breakthrough Improvements:



These will be more radical, large improvements that may shake up your organization when they are implemented. These are often necessary if your organization is going through a crisis or catastrophe and has to respond with some urgency.





This type of improvement will likely be driven by your top level of management.

The costs of breakthrough improvement are going to initially be a lot higher than other options, as the whole change is going ahead at once, rather than in sections.

# Benefits of Continuous Improvement:



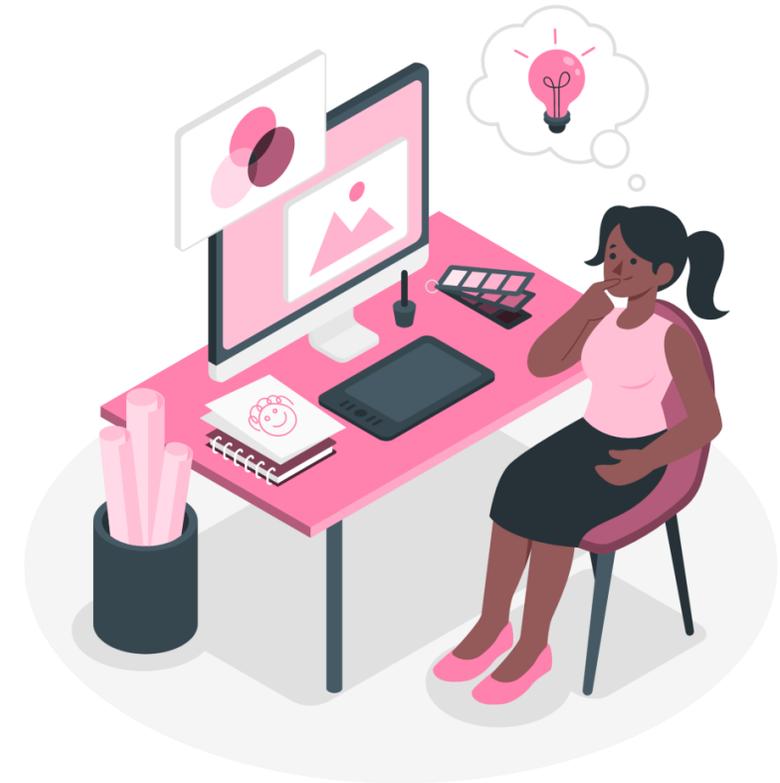
- Increased productivity and quality
- Increased employee satisfaction which leads to lower rates of turnover
- Shows that you are able to keep up with the ever changing world outside of the organization
- Decrease in costs caused from defects or errors in products or processes



# Continuous Improvement Best Practice:



It is important for any organization to weigh up the options of what type of improvement they want to introduce.

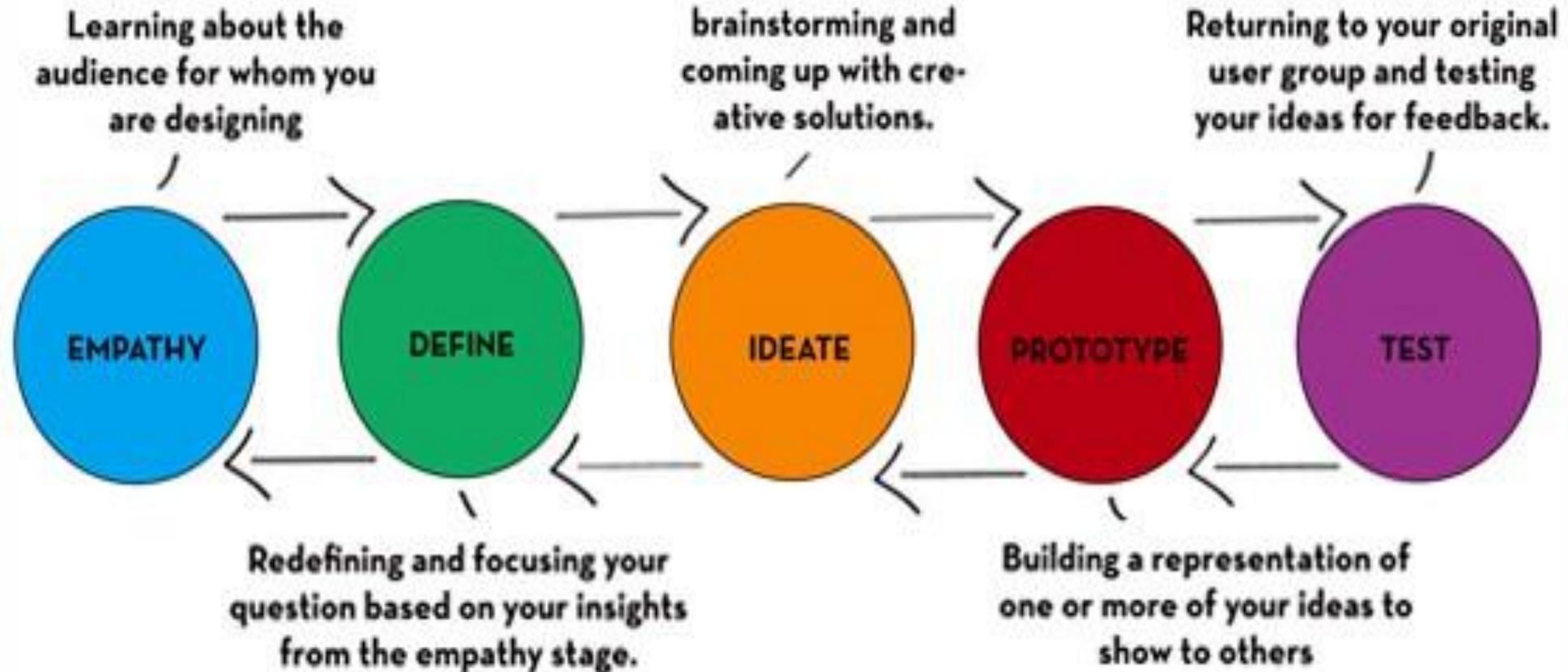


If the need for change is not so urgent, and may create some disturbances for the employees, it may be more suitable to use an incremental approach. On the other hand, if the change being implemented is due to a crisis, particularly one involving customers or the wider society at large, a breakthrough improvement is likely going to be necessary.



# A3 Problem Solving Template

# Design Thinking Process



Design Thinking Process

A3 problem solving is a structured problem-solving and continuous-improvement approach, first employed at Toyota and typically used by lean manufacturing practitioners. It provides a simple and strict procedure that guides problem solving by workers.



# Steps of the A3 Process



Step 1: Identify a problem or need.

Step 2: Conduct research to understand the current situation.

Step 3: Conduct root cause analysis.

Step 4: Devise countermeasures to address root causes.

Step 5: Develop a target state.

Step 6: Create an implementation plan.

Step 7: Discuss plans with all affected parties

Step 8: Obtain approval for implementation

Step 9: Implement plans

Step 10: Evaluate the results

Note that the A3 process is rooted in the more basic PDCA cycle. Steps 1–8 are the Plan step (with step 5 planning the Do step and step 6 planning the Check step). Step 9 is the Do step, and step 10 is the Check step. Based on the evaluation, another problem may be identified and the A3 process starts again (Act).



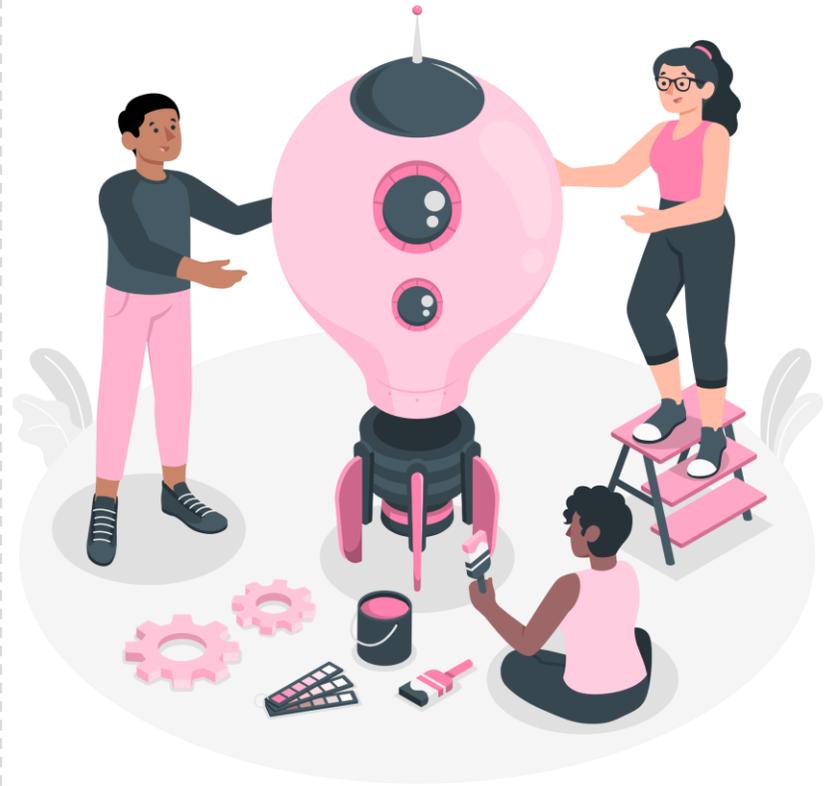
# A3 Thinking



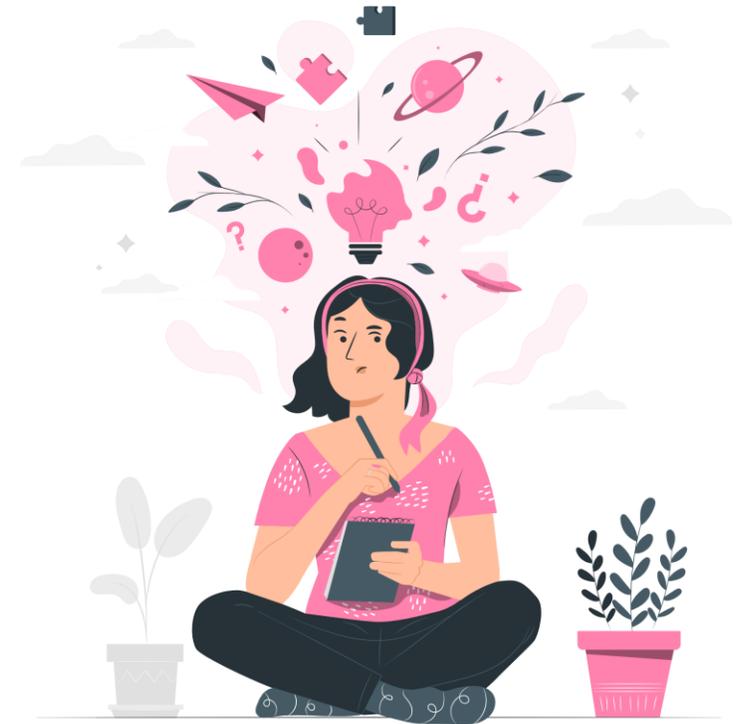
A3 Thinking is a logical and structured approach to problem solving adopted by Lean organizations around the world. It allows to focus on the real issues while helping the team collaborate to gain deeper insight into problems. It is aligned with and supports the PDCA management philosophy.



The A3 Template provides a simple and consistent approach to problem solving using the logical thinking process. It is composed of a sequence of sections that fit together on the standard A3-size papers. This will make the problem solving progress visible to the entire team while allowing the lessons to be learned by others.



his template comes in two different variations; one that is simple and user friendly, and another that requires to provide more detailed information. If you have any difficulties customizing this template or you lack time to do so, we will be happy to perform the customization for you.



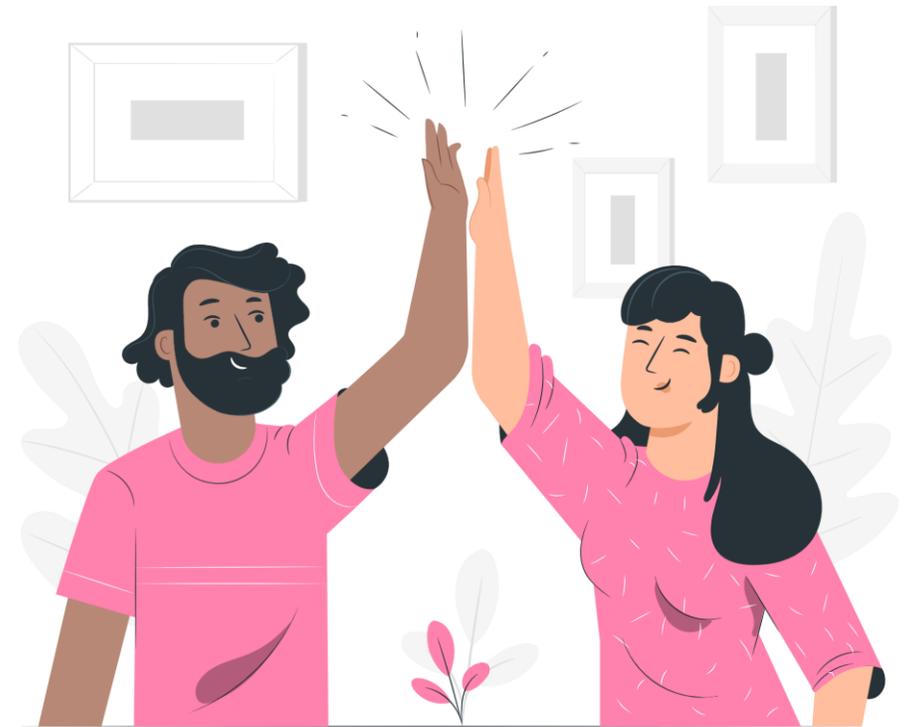


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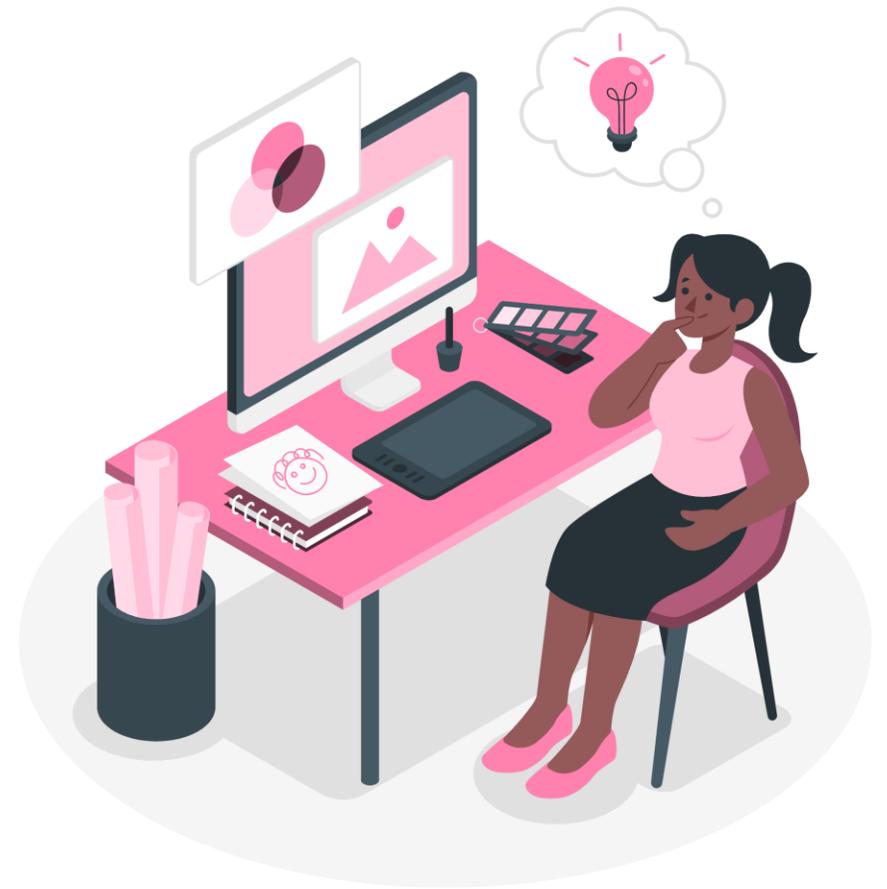


This template is a Microsoft Excel spreadsheet that you can use and modify to meet your specific needs. It can easily be modified to include additional sections if needed.

For example, you may increase the number of rows and thus the size of the implementation plan or the follow-up plan. You may also modify headers and spacing as needed.



This template is a Microsoft Excel spreadsheet that you can use and modify to meet your specific needs. It can easily be modified to include additional sections if needed.



# Step 0: Identify Problem or Need



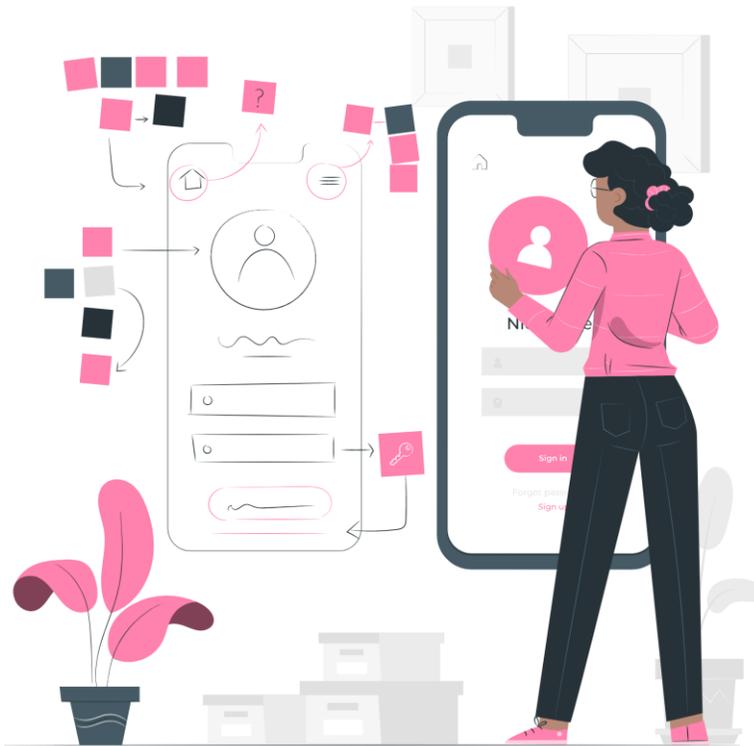
Whenever the way work happens is not ideal, or when a goal or objective is not being met, you have a problem (or, if you prefer, a need). The best problems to work on are those that arise in day-to-day work and prevent you from doing your best.



## Example:

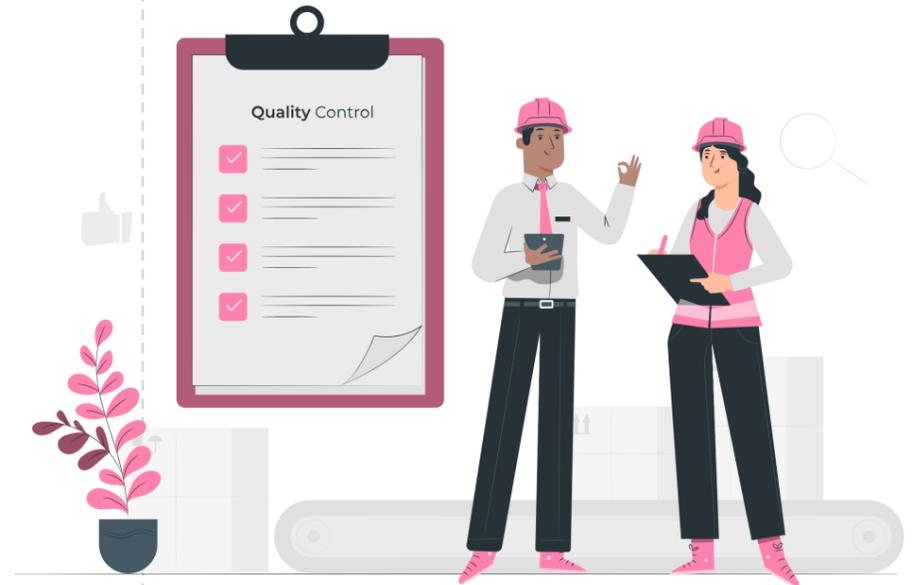
Patients in a hospital were not arriving to the diagnostic departments during their allotted time. Because the patients were late, the diagnostic departments were getting backed up. Thus the problem to be addressed was: reducing patient back-ups in the hospital's diagnostic departments due to late arriving patients.

# Step 1: Understand Current Situation

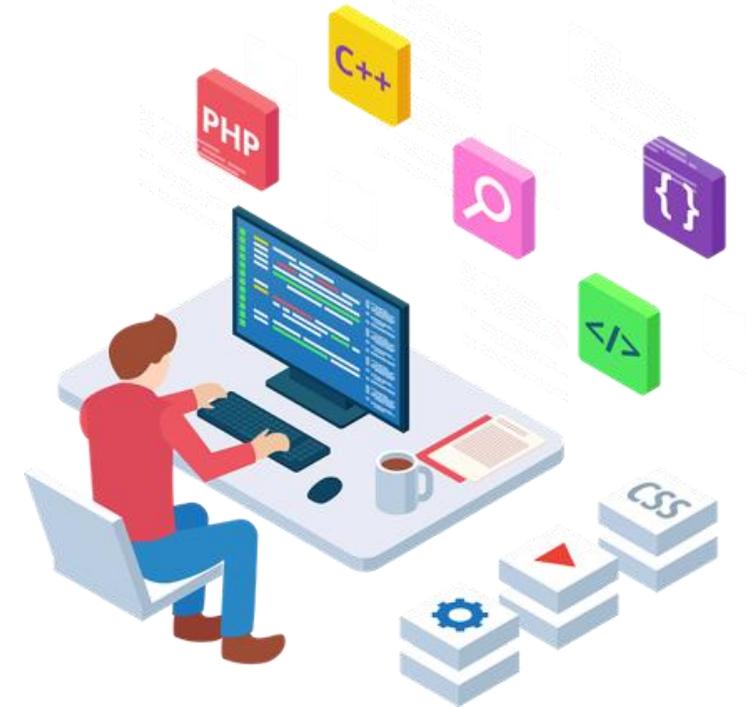


Before a problem can be properly addressed, one must have a firm grasp of the current situation. To do this, Toyota suggests that problem-solvers:

- Observe the work processes first hand, and document one's observations.
- Create a diagram that shows how the work is currently done. Any number of formal process charting or mapping tools can be used, but often simple stick figures and arrows will do the trick.

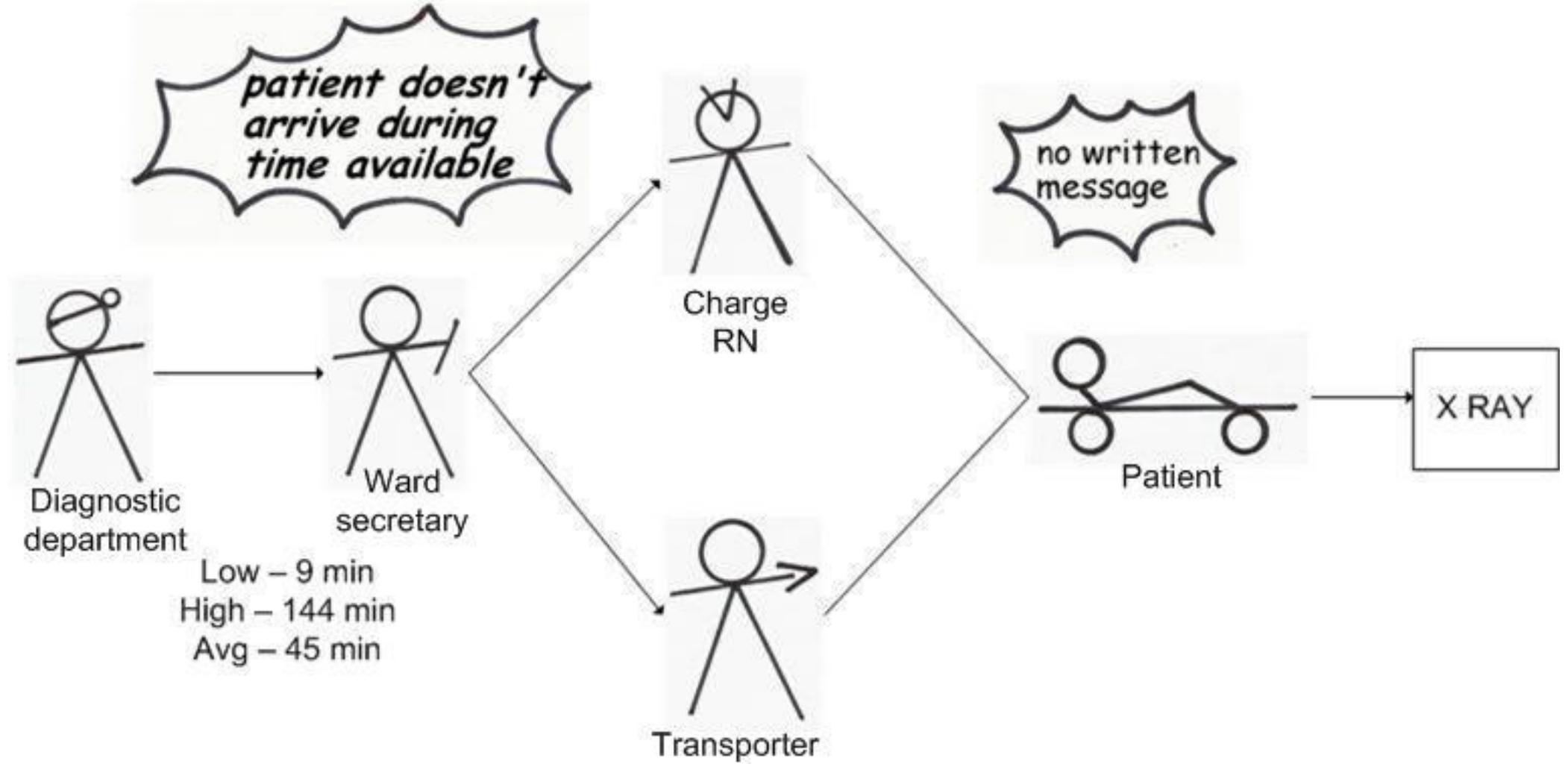


- Quantify the magnitude of the problem (e.g., % of customer deliveries that are late, # of stock outs in a month, # of errors reported per quarter, % of work time that is value-added); if possible, represent the data graphically.



## Example:

Below is an example of the diagram representing the current condition of patient transport in a hospital, showing how transporters are contacted to transport patients with mobility difficulties to their appointments in the diagnostic departments. The storm bursts call out problems with the current situation. The data indicate the ranges and averages of patient delivery time.



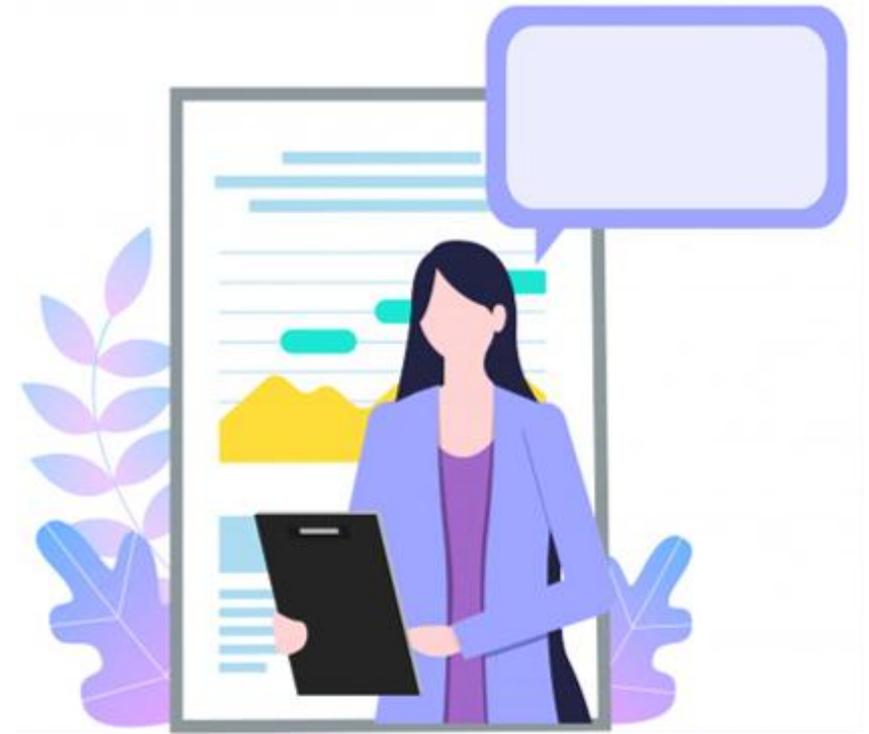
# Step 2: Root Cause Analysis



Once you have a good understanding of how the process (i.e., the one that needs to be fixed) currently works, it's time to figure out what the root causes are to the errors or inefficiency. To accomplish this, first make a list of the main problem(s).



Next, ask the appropriate "why?" questions until you reach the root cause. A good rule-of-thumb is that you haven't reached the root cause until you've asked "why?" at least five times in series.



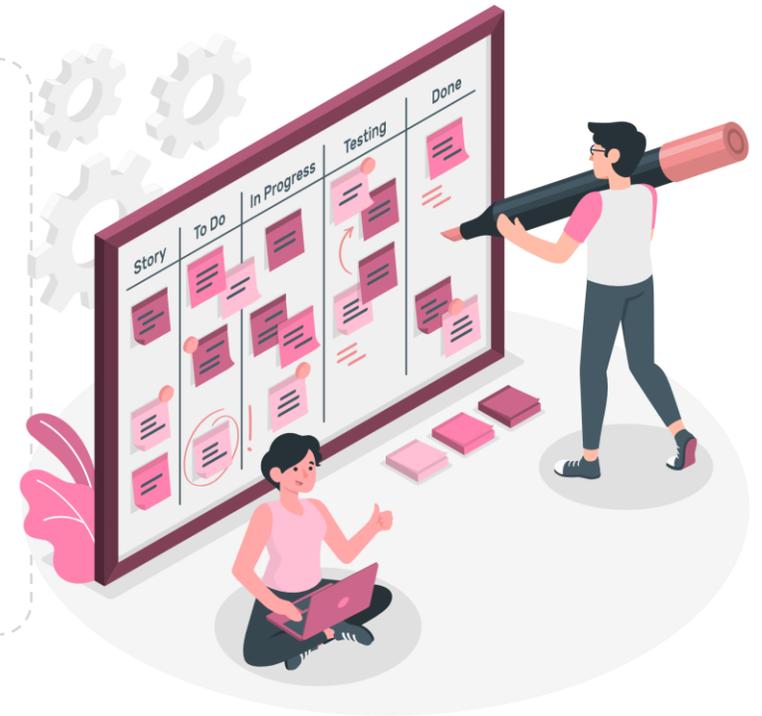
## Example:

A team trying to improve patient transport processes recognized that the main problem was that patients were not arriving on time for their diagnostic procedures, causing severe back ups in the diagnostic departments.



In this case, three causes to patients arriving late were identified by observation, and each was pursued to a root cause, as shown below.

**Problem:** Backups in diagnostic departments.



## Why?:

- Patients arriving late
- Transporter not called on time
- Ward secretaries are busy and often forget
- No written message
- No protocol
- Transport unable to locate patient
- Page does not include patient location (name only)
- No standard protocol for transport paging
- Patient not ready for transport
- Nurses unaware of prescribed test
- No mechanism to inform RN of scheduled procedure

The root cause analysis revealed that patients were arriving late because the hospital had no procedure for notifying appropriate personnel of a transportation need, and that transporters and RN's were not contacted directly by the requesting department.



# Step 3: Countermeasures



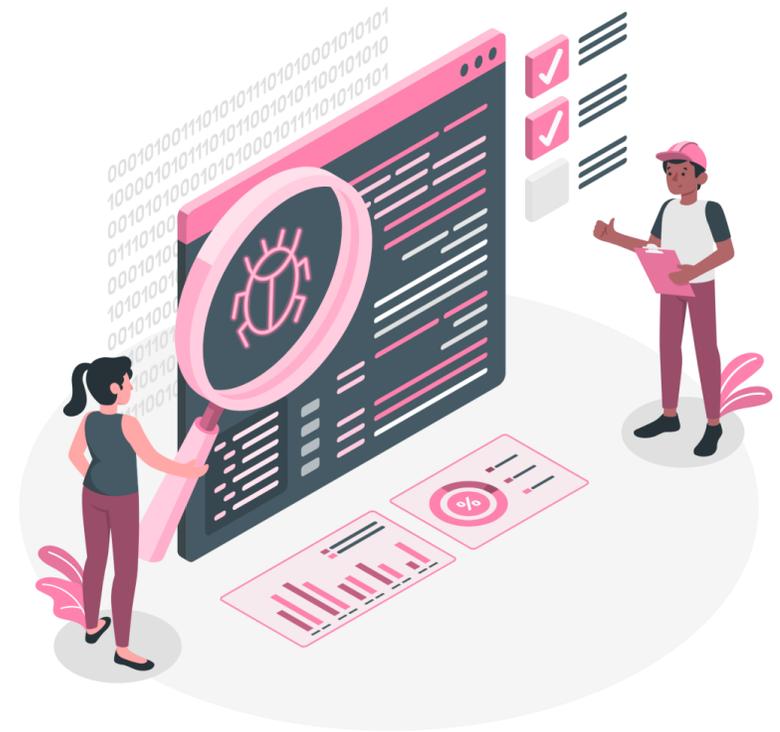
Once the current situation is fully understood and the root cause(s) for the main problem(s) has been unveiled, it's time to devise some countermeasures. Countermeasures are the changes to be made to the work processes that will move the organization closer to ideal, or make the process more efficient, by addressing root causes.

Generally speaking, we recommend that countermeasures help the process conform to three “rules” borrowed from Steven Spear and Kent Bowen<sup>1</sup> and slightly expanded:

- Specify the outcome, content, sequence, and task of work activities
- Create clear, direct connections between requestors and suppliers of goods and services
- Eliminate loops, workarounds, and delays

## Example:

The team investigating delayed transport of patients to diagnostic departments discovered that the root cause was lack of clear protocol for communicating between the diagnostic department, RN of the clinical department, and the transporter.



To fix this problem, they came up with some countermeasures that included:

- A new protocol where the diagnostic department pages the charge RN and the transporter at the same time (thus eliminating the ward secretary as an intermediary)
- Specified information content of pages
- New patient preparation procedures involving both the RN (or technician designated by the RN) and the transporter

# Step 4: Develop the Target State



The countermeasure(s) addressing the root cause(s) of the problem will lead to new ways of getting the work done, what we call the target condition or target state. It describes how the work will get done with the proposed countermeasures in place.

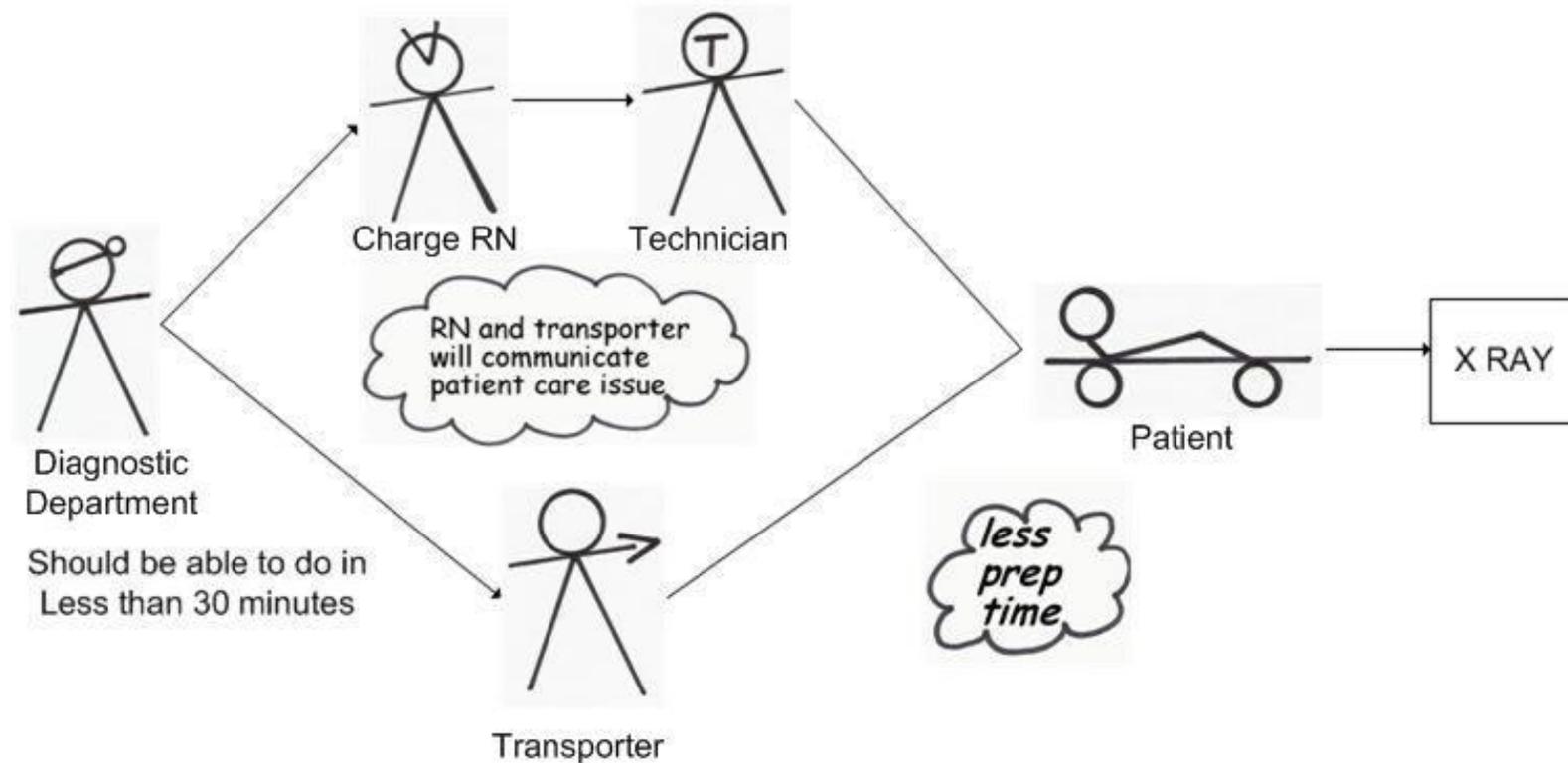


In the A3 report, the target condition should be a diagram (similar to the current condition) that illustrates how the new proposed process will work. The specific countermeasures should be noted or listed, and the expected improvement should be predicted specifically and quantitatively.



## Example:

A target condition for a revamped patient transportation process is depicted below.



# Step 5: Implementation Plan



In order to reach the target state, one needs a well thought-out and workable implementation plan. The implementation plan should include a list of the actions that need to be done to get the countermeasures in place and realize the target condition, along with the individual responsible for each task and a due date. Other relevant items, such as cost, may also be added.

## Example:

An example of a simple implementation plan is below. Note that the task, the person responsible, deadlines and the outcome of the tasks are all specified.

WHAT?	WHO?	WHEN?	OUTCOME
group page	Joe Bob	3/3/2006	clear signal
meet with charge RNs	manager	3/15/2006	educate and gain feedback
tracking sheet	Jane Doe	3/15/2006	always know location of patient
cheat sheet	manager	3/15/2006	pager #'s for different departments

# Step 6: Follow-up Plan



A critical step in the learning process of problem-solvers is to verify whether they truly understood the current condition well enough to improve it. Therefore, a follow-up plan becomes a critical step in process improvement to make sure the implementation plan was executed, the target condition realized, and the expected results achieved. You can state the predicted outcome here rather than in the target condition, if you prefer.

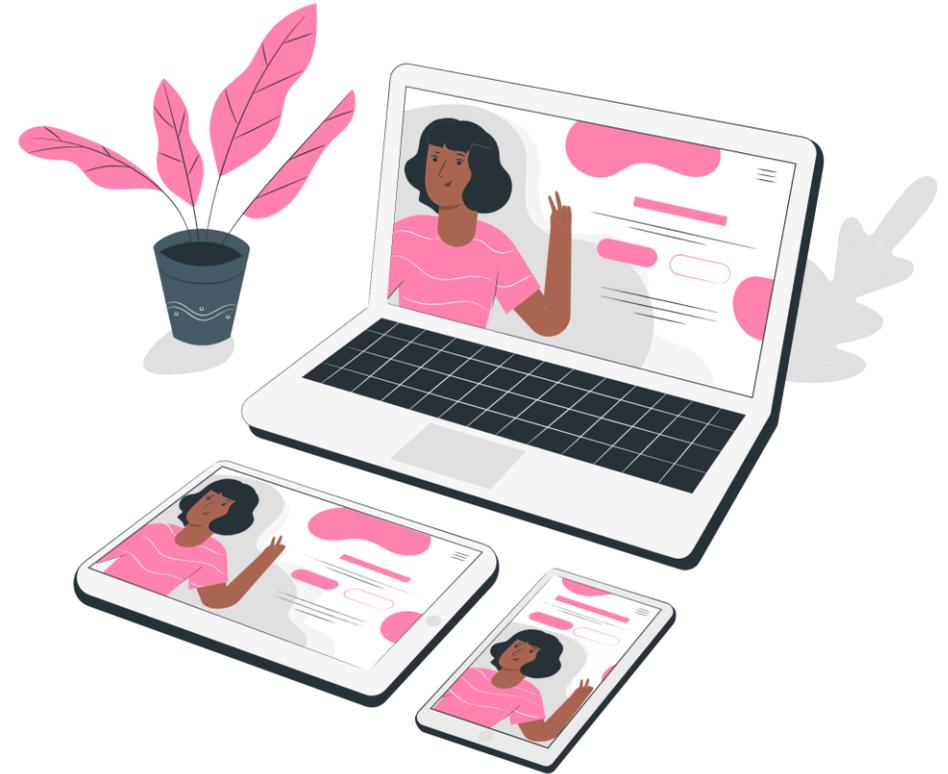
## Example:

The manager of transportation, and head of the A3 process team, set the goal for patient transport time at 30 minutes, maximum. Once a month, for three months after the initial implementation, he would measure a sample of transportation pages, and calculate the average time from transportation page to patient arrival at the diagnostic department.

# Step 7: Discuss With All Affected Parties



It's VITALLY important to communicate with all parties affected by the implementation or target condition, and try to build consensus throughout the process. We have included it as a specific step before approval and implementation to make sure it does not get skipped.



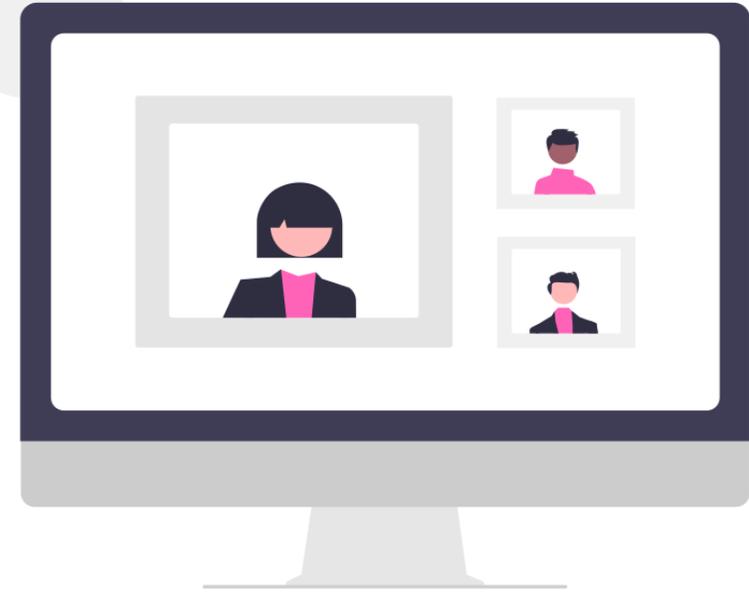
But the most successful process improvement projects we have witnessed do this step at each critical juncture. Concerns raised should be addressed insomuch as possible, and this may involve studying the problem further or reworking the countermeasures, target condition, or implementation plan. The goal is to have everyone affected by the change aware of it and, ideally, in agreement that the organization is best served by the change.

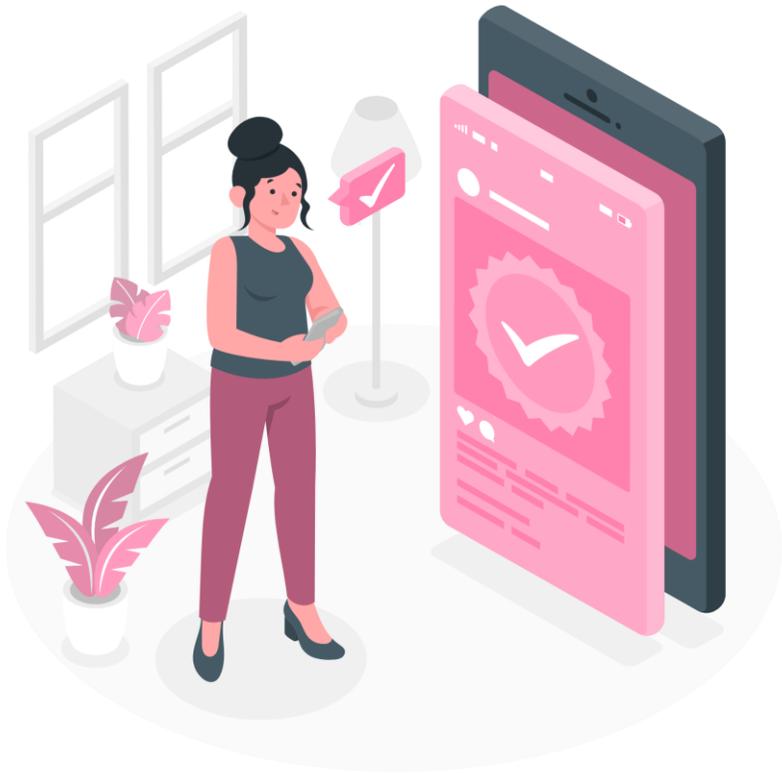
## Example:

To make sure that all affected parties were involved in the process improvement effort, the manager of the transportation first gathered a cross-functional team together to study the problem and come up with countermeasures.



Then, once the countermeasures and target condition were created, he communicated with key representatives of the participating departments to a) solicit their agreement, and b) plan the education and training in the new systems.





In this case, only minor adjustments to the proposed changes were needed. The implementation plan then reflected the outcomes of those meetings.

# Step 8: Get Approval



If the person conducting the A3 process is not a manager, it's imperative to remember the importance of obtaining approval from an authority figure to carry out the proposed plan. The authority figure should verify that the problem has been sufficiently studied and that all affected parties are “on board” with the proposal. The authority figure may then approve the change and allow implementation.

## Example:

The manager of the transportation department was in a position to approve changes to procedures of the transporters, but he had to obtain approval for his changes and implementation from the managers of all of the affected departments. Ideally, his manager would have “approved” the change in order to provide a mentoring opportunity, but this did not happen in this case.

# Step 9: Implementation

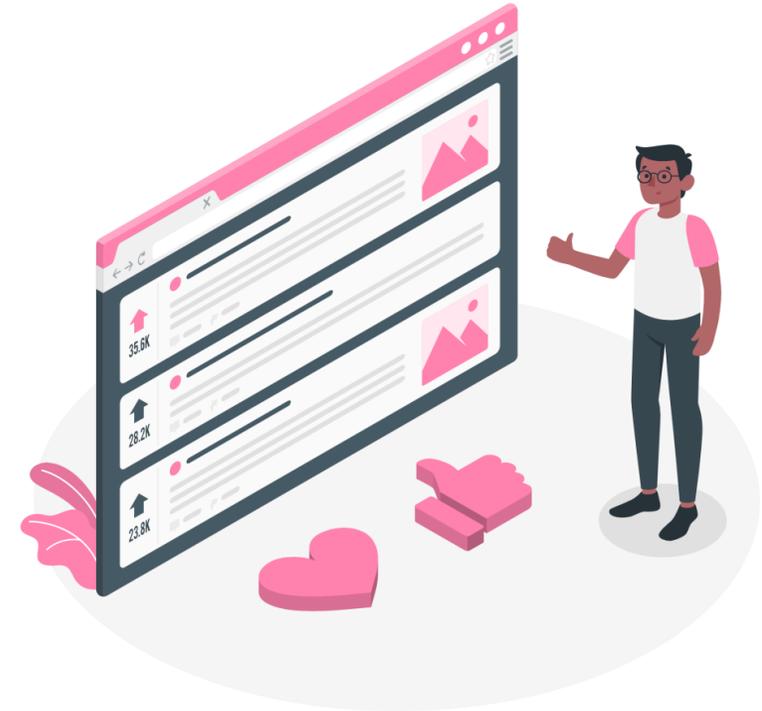


Without implantation, no change occurs. The next step is to execute the implementation plan.



## Example:

The A3 process team had a meeting, charted their specific actions/tasks and deadlines in their implementation plan. once the proper approvals were given, they executed their designated tasks and completed them by the deadlines.



# Step 10: Evaluate the Results



Process improvement should not end with implementation. It is very important to measure the actual results and compare to predicted. If the actual results differ from the predicted ones, research needs to be conducted to figure out why, modify the process and repeat implementation and follow-up (i.e., repeat the A3 process) until the goal is met.

## Example:

The manager of transportation picked specific dates to check the outcome of the countermeasures and implementation plan created by the A3 process team. On three specific dates, he timed twenty patient transports from the initial page to patient arrival at the diagnostic department, and recorded the results with dates on the A3 report. The results were:

- March, 14.7 minutes
- April, 11 minutes
- May, 9.15 minutes

# The A3 Report



<b>Background</b> <ul style="list-style-type: none"><li>- Why do we need to work on this?</li><li>- Context</li><li>- Importance</li></ul>	<b>Future State &amp; Countermeasures</b> <ul style="list-style-type: none"><li>- Actions being taken to address the issue (what, who, when)</li><li>- Quick fixes (Containment actions)</li><li>- To Be process map</li></ul>
<b>Current State</b> <ul style="list-style-type: none"><li>- Problem statement/definition</li><li>- As Is process map</li><li>- Scale of the problem (data)</li></ul>	<b>Impact</b> <ul style="list-style-type: none"><li>- Results achieved</li><li>- Trend graph (before/after)</li></ul>
<b>Objective</b> <ul style="list-style-type: none"><li>- Target level of performance</li><li>- Desired outcome</li></ul>	<b>Follow-up</b> <ul style="list-style-type: none"><li>- Actions still required (what, who, when)</li><li>- Learning points to share</li></ul>
<b>Root Cause Analysis</b> <ul style="list-style-type: none"><li>- Fishbone diagram</li><li>- 5 Whys</li><li>- Data (Pareto, Scatter diagram)</li></ul>	

Title: **What you are talking about.**

**Background**

*Why are you talking about it?*

**Current Situation**

*Where do we stand?*

→What's the problem?

**Goal**     *Where we need to be?*

*What is the specific change you want to accomplish now?*

**Analysis**

*-What is the root cause(s) of the problem?*

-

**Recommendations**

*What is your proposed countermeasure(s)?*

**Plan**

*What activities will be required for implementation and who will be responsible for what and when?*

**Follow - up**

*How we will know if the actions have the impact needed? What remaining issues can be anticipated?*

# Title: What you are talking about

initials

Owner

<b>Background</b>
<p><i>Why you are talking about it.</i></p> <ul style="list-style-type: none"> <li>- <i>What is the business reason for choosing this issue?</i></li> </ul>
<b>Current Conditions</b>
<p>Where things stand today.</p> <ul style="list-style-type: none"> <li>- <i>What's the problem with that, with where we stand?</i></li> <li>- <i>What is the actual symptom that the business feels that requires action?</i></li> </ul> <p>Show visually – pareto charts, graphs, drawings, maps, etc.</p>
<b>Target/Goal(s)</b>
<p>The specific outcome required for the business.</p> <ul style="list-style-type: none"> <li>- <i>What is the specific change you want to accomplish now.?</i></li> <li>- <i>How will you measure success?</i></li> </ul>
<b>Analysis</b>
<p>The root cause(s) of the problem.</p> <ul style="list-style-type: none"> <li>- <i>Why are we experiencing the symptom?</i></li> <li>- <i>What constraints prevent us from the goal?</i></li> </ul> <p>Choose the simplest problem-solving tool for this issue:</p> <ul style="list-style-type: none"> <li>- <i>Five whys</i></li> <li>- <i>Fishbone</i></li> <li>- <i>QC Tools</i></li> <li>- <i>SPC, Six Sigma, Shainen, Kepner Traego, others...</i></li> </ul>

<b>Proposed Countermeasure(s)</b>
<p>Your proposal to reach the future state, the target condition.</p> <ul style="list-style-type: none"> <li>- <i>What alternatives could be considered?</i></li> <li>- <i>How will you choose among the options? What decision criteria?</i></li> </ul> <p>How your recommended countermeasures will impact the root cause to change the current situation and achieve the target.</p>
<b>Plan</b>
<p><i>A Gantt chart or facsimile that shows actions/outcomes, timeline and responsibilities. May include details on the specific means of implementation.</i></p> <ul style="list-style-type: none"> <li>- <i>Who will do what, when and how?</i></li> </ul> <p><i>Indicators of performance, of progress.</i></p> <ul style="list-style-type: none"> <li>- <i>How will we know if the actions have the impact needed?</i></li> <li>- <i>What are the critical few, visual, most natural measures?</i></li> </ul>
<b>Follow-up</b>
<p><i>Remaining issues that can be anticipated.</i></p> <ul style="list-style-type: none"> <li>- <i>Any failure modes to watch out for? Any unintended consequences?</i></li> </ul> <p><i>Ensure ongoing P-D-C-A. Yokoten as needed.</i></p>

Title

Name:  
Coach:

Reason for choosing issue:

Brief  
One or two bullets

Analysis

Visual  
Charts  
QC Tools  
Fishbone  
5 Whys

Current Conditions

Summary  
Visual  
Map?  
Pareto?

Countermeasure Options

1) ??  
2) ???

Problem Statement -

what's the actual pain/symptom  
being felt? Just the facts

Evaluation of Options

Criteria  
2)

Goal/Target Condition

Brief  
One or two bullets

