GRUNDFOS
BUSINESS SYSTEM

Flowcharts Explained

Full explanation of the tool and guidelines on how to use it

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Author Hajnalka Tátrai
Owner Gustavo de Arriba

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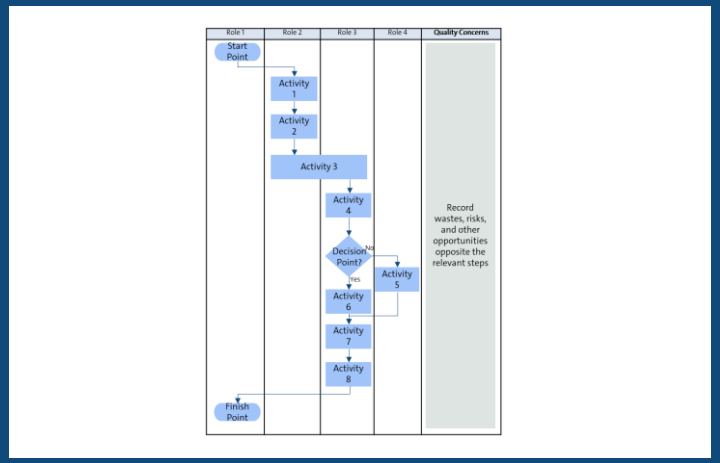
GRUNDFOS

Possibility in every drop

Flowchart

Template for visualising a process from start to finish including quality concerns and in the case of an integrated Flowchart also the role who is responsible for each step



The Flowchart is an excellent tool for providing a more detailed view of a process!

What is a Flowchart?

A Flowchart is a visualisation of the key activities we do. Sometimes called a "process map", it is a series of connected steps with defined start and end points, as well as key decisions.

Why use it?

A Flowchart outlines a clear, agreed definition of a process and its outcomes. We use it to understand how the work is done, who for (customers), who is responsible for its design and development, for its execution, and who supplies essential inputs.

When to use it?

A Flowchart is a tool to help us learn about our processes. Flowcharts may be used:

- To gain a shared understanding of how a process currently works, or could work in the future
- To help us standardise the way we work within our teams
- To provide the basis for process control

How to use it?

1. Observe and discuss the process with those who operate it (Process Operators)
2. Identify the key tasks, decisions and activities
3. Determine roles and responsibilities – and remember some roles or responsibilities might lie outside of your own team

How does it link to other tools?

Flowcharts are a crucial step in the journey to standardising the process, and the quality concerns we identify within them can be used to develop "**Quick Wins**" that can improve quality, customer experience, and engagement of those who operate the process. The scope is often set in advance with a **SIPOC**.

Flowcharts – Core Principles

Process Excellence Tools Help you to Think Differently

Flowcharts Overview

It is our processes that create (or damage) value for our organisation's Customers. To manage and improve our value, we need to manage and improve our processes. It is difficult to manage and improve something that cannot be easily seen. Flowcharts create a simple, easy-to-read way of making our processes visible. Flowcharts are a common type of process map where we are interested in the sequence of activities from a specific start point to a specific end point, the decision points that can disrupt the flow, the responsible process roles (in the Swimlane Flowchart), and where the waste in the process can be found.

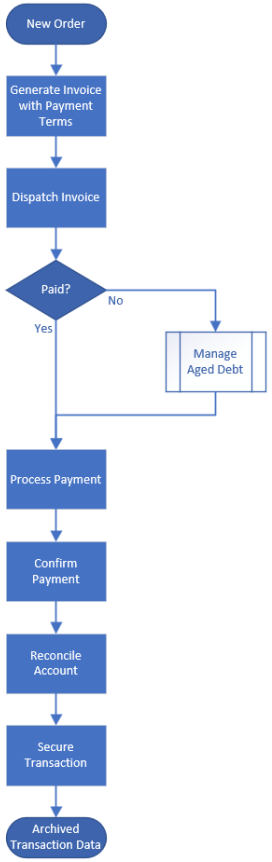
Benefits

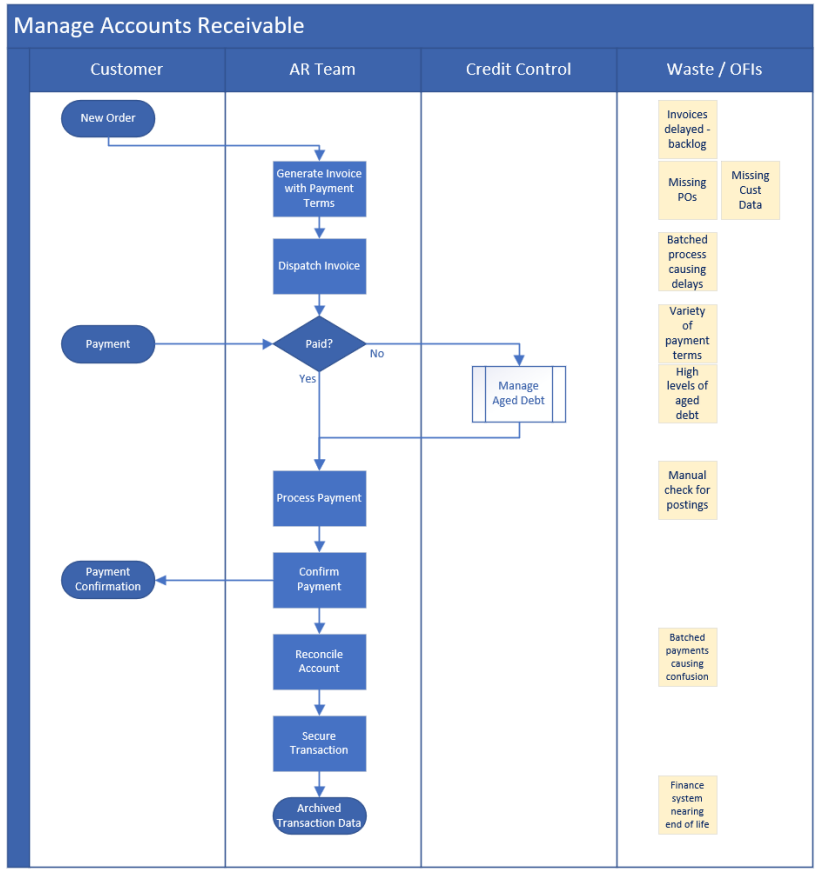
Creating a Flowchart has many beneficial uses, including:

- It helps team members to understand differences in they way they work, to seek alignment
- It helps people to communicate and develop understanding of upstream and downstream processes to aid collaboration
- It creates an easy way to demonstrate to the management team where Opportunities for Improvement (OFIs) can be found
- It can be developed into a "To Be" map to explore safely any changes to the process before implementation
- It can be integrated into specialist software for analysing process performance or simulating future process performance
- It is an essential step for any Business Process Automation (BPA) designs
- Can support maintaining various Certifications e.g. ISO9001

First and foremost, Flowcharts should be seen as a key tool in helping teams to define and agree the "Best-Known Way" to operate the process. This is the basis for Continuous Improvement.

Examples: Linear and Swimlane – "Manage Accounts Receivable"

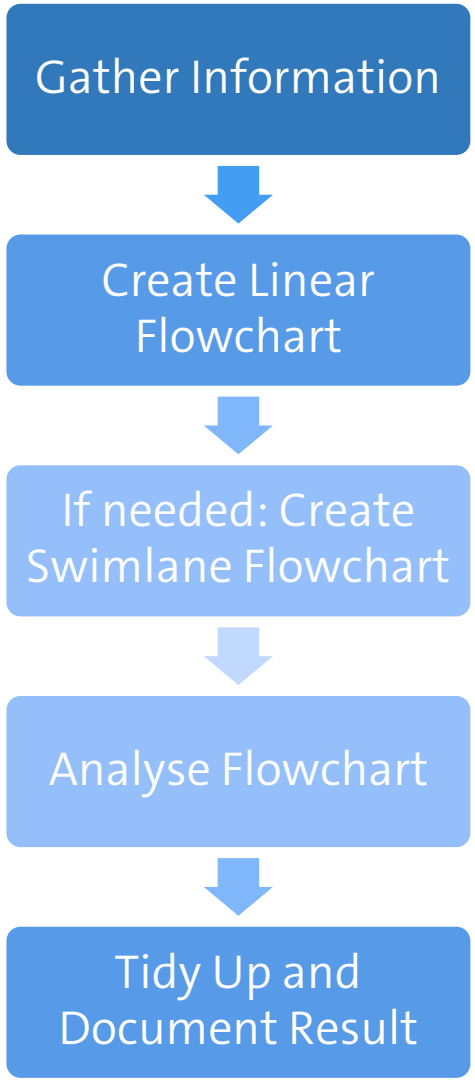




Flowcharts – Summary Process

The Main Activities for Creating your Flowcharts

Overview of "Create Flowcharts"



There are three main sources of information for mapping your "As Is" current state: 1) Observe the Process, 2) Interview people who do the work, 3) Review existing documentation. All are valid and will give you different insights.

Start with the core question: "What is the main sequence of activities that join the start point to the finish point?", and if the process splits at all, what are the main loops we need to operate?

If your process crosses between different Process Roles, then it can help to map out the linear flow chart adding on the responsible and supporting roles. It also helps identify the dangerous "hand-off points" and other process risks.

While mapping you will identify sources of waste and variation. Maybe you will find some innovation opportunities, etc. The analysis phase formalises this learning, and generates an important checklist of potential process improvement needs.

The mapping process can be very messy, once completed it is useful to work with the team to agree "this is our current best way to operate the process". This can help the team to align and support each other with sharing expertise, process hacks etc.

Flowcharts – Mapping Conventions

The Symbols and Methods to create a consistent language

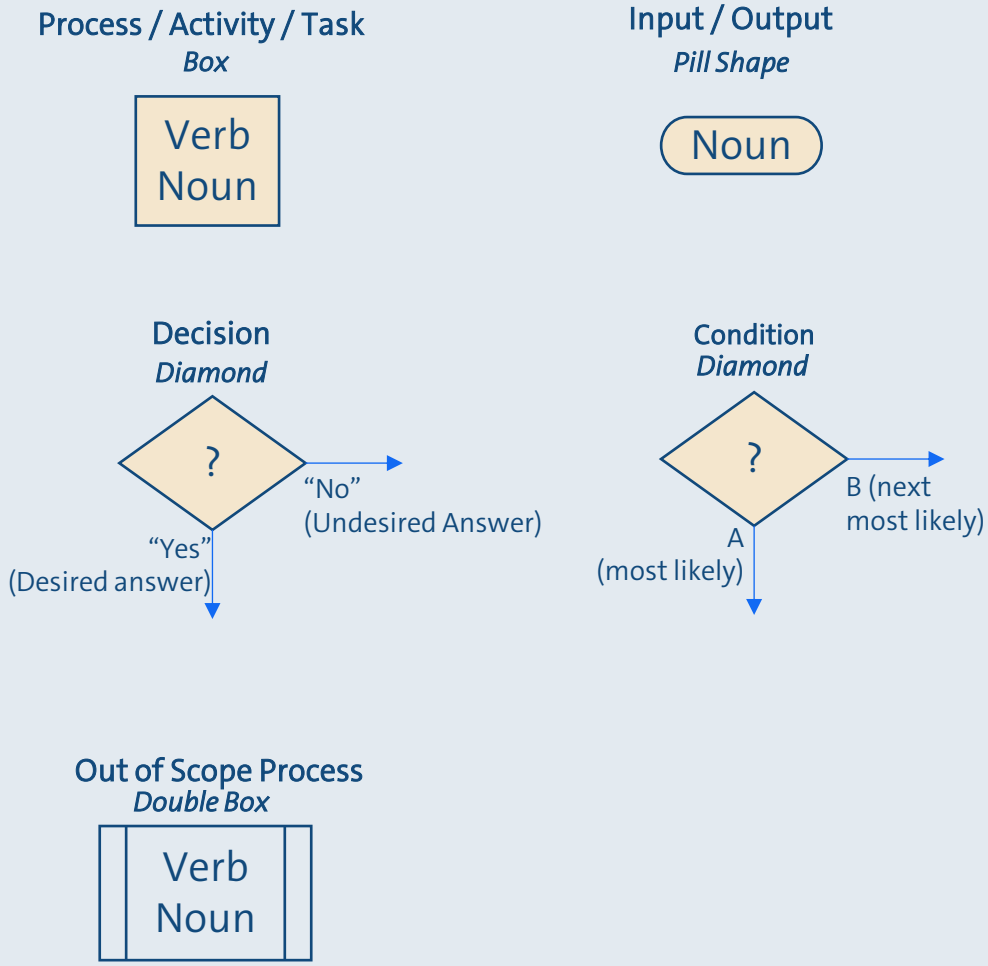
Mapping Conventions Create a Common Language for Describing What We Do

Naming Conventions

- Processes, Activities, and Tasks: **Verb + Noun** e.g. Raise Invoice, Maintain Machinery, Pick Components
- Inputs, and Outputs: **Noun** e.g. Customer Order, Last Friday of Month, Pump Motor, ISO Regulation
- Decisions: **Question** ideally phrased so that "Yes" is the answer you want e.g. Component available? Passes check? Alternatively, a **Choice** e.g. Standard Delivery or Expedited? Bring the most frequent path out in the main direction of flow (down in a vertical map)

Symbols

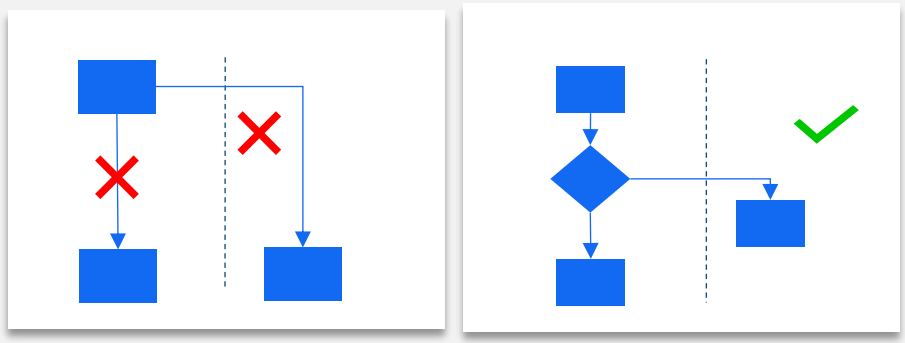
- Box, usually in the form of a physical or digital sticky note: Use for Processes, Activities, and Tasks
- Pill shape: Use for inputs to and outputs from the process
- Diamond – Desired answer / Undesired answer
- Diamond – Neutral choice A or B
- Double Box – Another process that is out of scope for you to map at this time, but needs to be reflected on your own map



Mapping Conventions Create a Common Language for Describing What We Do... continued

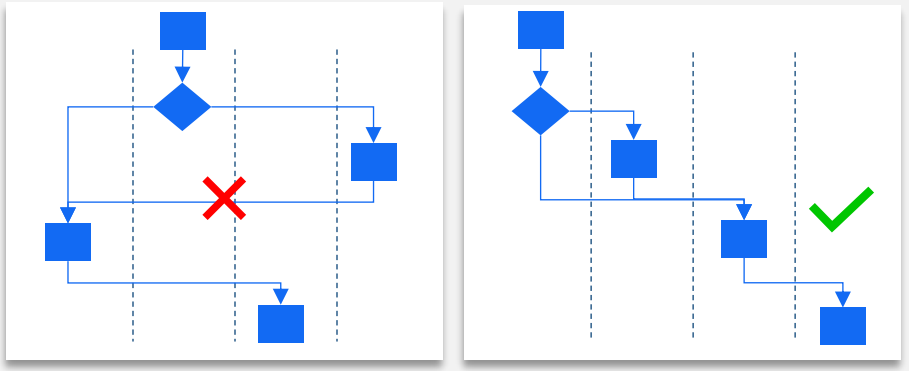
Connecting Arrows

1. The direction of arrows represents the flow (including physical or digital transportation) of the work from one activity or task to the next.
2. Arrows should come out of the bottom of the previous box and into the top of the next box (Vertical Charts) or out of right side, into left side (Horizontal Charts).
3. In the case of the flow splitting, then use the diamond to represent the cause of the split, then the undesired or less common path should come out from the side as shown on the previous slide.
4. Following the arrow conventions makes it easy for people to trace the path of value and where that path can be disrupted.



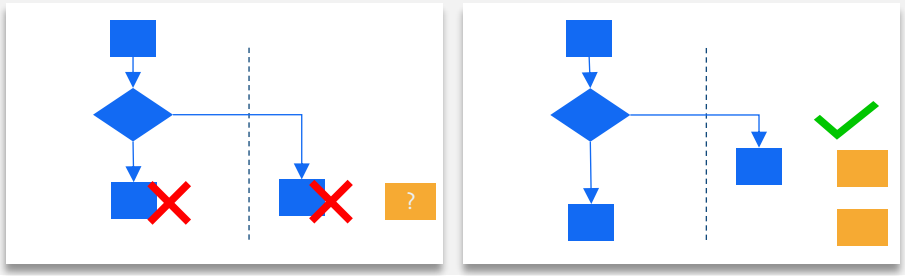
Direction of Flow

1. Some mapping environments work better with vertical (top to bottom) Flowcharts, others with horizontal (left to right). Just be consistent!
2. In the case of the Swimlane Flowchart the flow should start at the top left and cascade like a waterfall, from top left to bottom right . In the case of processes initiated by the customer, this usually means the customer is the first swim lane, and the final output usually ends back in the customer column.

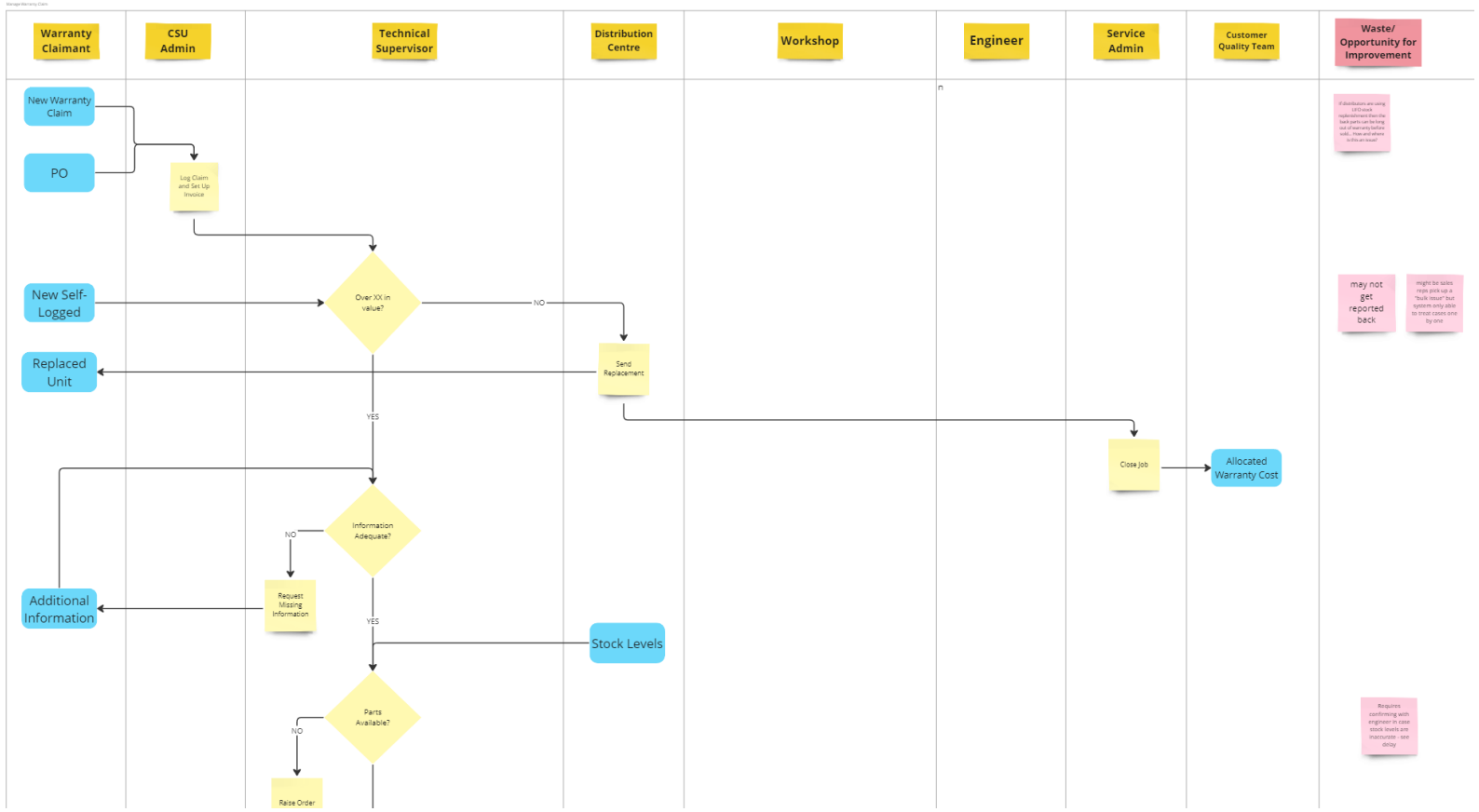


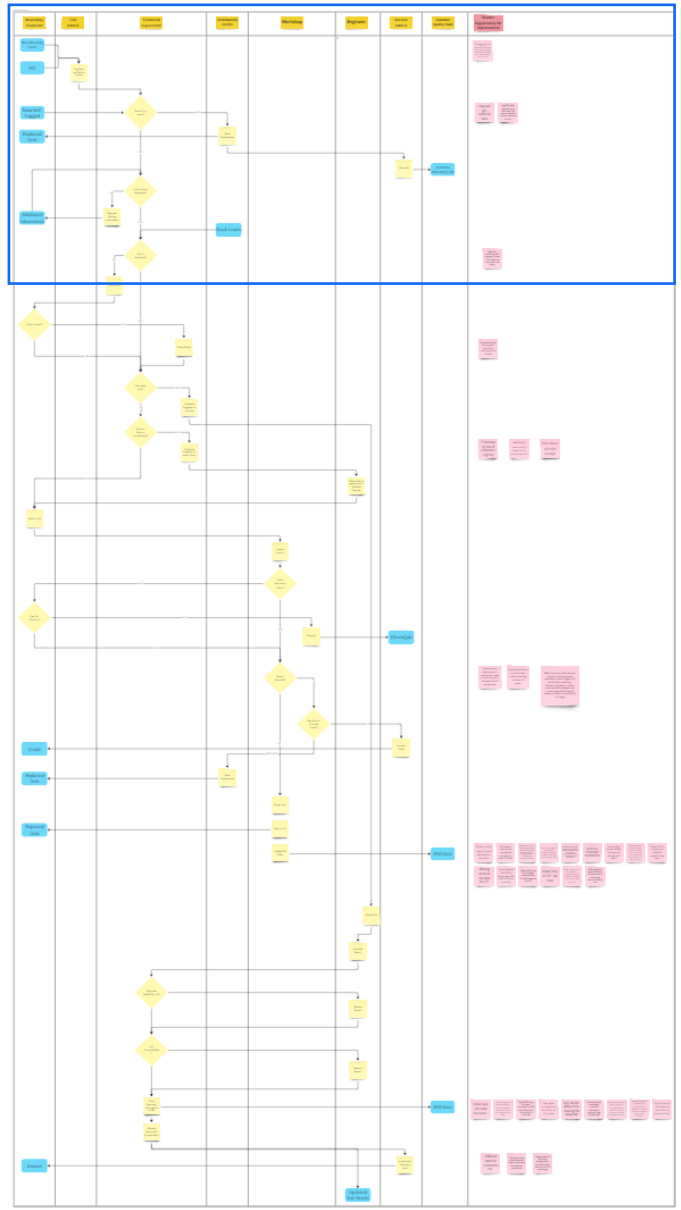
Spacing of Elements

1. Make sure that when finished the boxes and diamonds do not overlap. This allows you to tag your waste and Opportunities for Improvement (OFIs) directly opposite the relevant part of the process.



Example Swimlane Flowchart for Manage Warranty Claim – draft version





Flowcharts – Step-by-Step Guide

Step 1 | Gather Information

What?

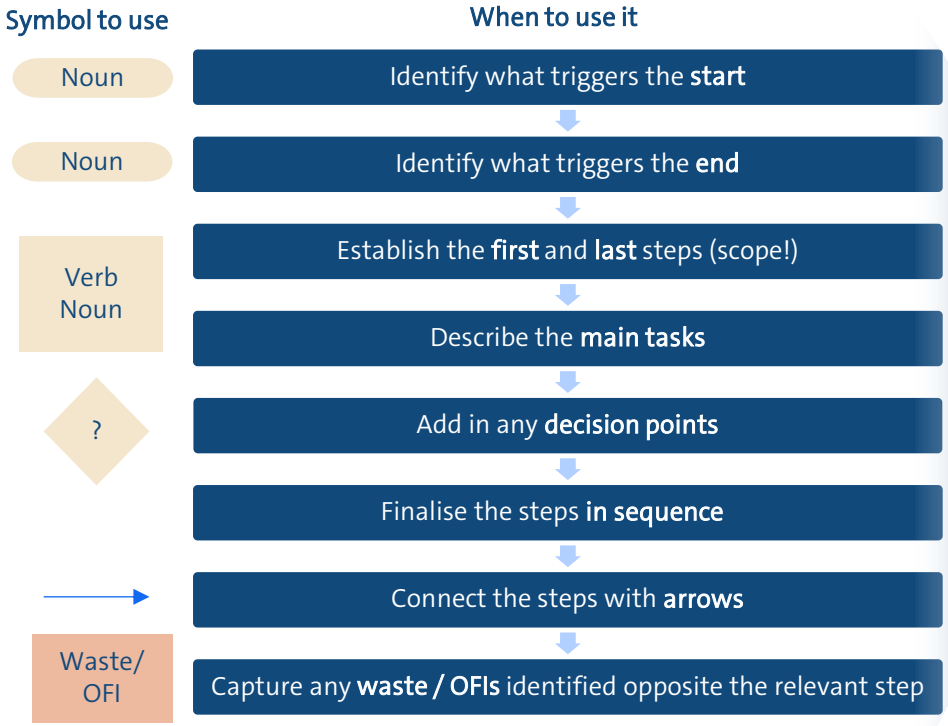
For a Flowchart to be at its most valuable it needs to reflect how the work currently works. Gathering different types of observational data will give you a rounded picture, because no one method on its own will properly represent 'reality'.

How?

1. Arrange to observe the process in real time with existing Process Operators. Depending on the process either follow one piece of work through to completion, or for slower moving processes, watch the activities for work in progress at each stage of the process.
2. Bring a sample of Process Operators together from across the Process Roles involved in the work. Ask them to summarise their tasks in sequence, noting waste and OFIs as they describe their work. Make sure you clarify how they deal with work that goes wrong.
3. Review any existing documentation. If process maps: Do the maps reflect the current reality or are they more of a theoretical ideal? If regulations / standards do the requirements say what people think they do, or has unnecessary complexity been added in?
4. Organise this data in a list of tasks one-by-one using "Verb + Noun" for each task. Add on the role that does this task if multiple roles are involved. Use the mapping conventions to draft the initial view of the process as a Flowchart.

STEP	WHAT TO DO WHEN GATHERING INFORMATION	ACTIVITY	OUTPUT	AWARENESS POINTS
1	Build a strong understanding of how the work is done now – the "As Is" or "Current" Condition. Your initial map should reflect reality, not "how it is meant to be".	Take some time to watch the process operating in real time. Follow up with involving people who do the work to generalise the findings. Review any existing documentation and relevant regulations.	Initial view of the As Is / Current Condition	Even if you have been involved in the process for many years, put yourself in "eye for improvement mode". For everything you see or hear, ask "how does this add value to the customer?"

Step 2 | Create Linear Flowchart



What?

This is the process of taking all your data and organising it into a simplified diagram that contains all the key information to understand how the work works, including the most important decision / break points. It summarises the detail and becomes a powerful aid.

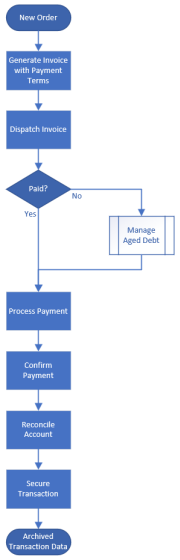
How?

1. Review your initial Flowchart and look for places where you can summarise sets of tasks together without losing meaning.
2. Follow the more detailed steps shown to the left.
3. Aim to get the full Flowchart down to about 8-12 tasks long following the "happy path" i.e. if everything goes as it should!
4. Review if there are any key deviations in the process based on experience or individual differences. Is it possible to extract and agree "the best way" from the team? Update the map to reflect this if agreement is achieved.
5. If your process involved multiple roles and/or functions go to Step 3, otherwise go to Step 4.

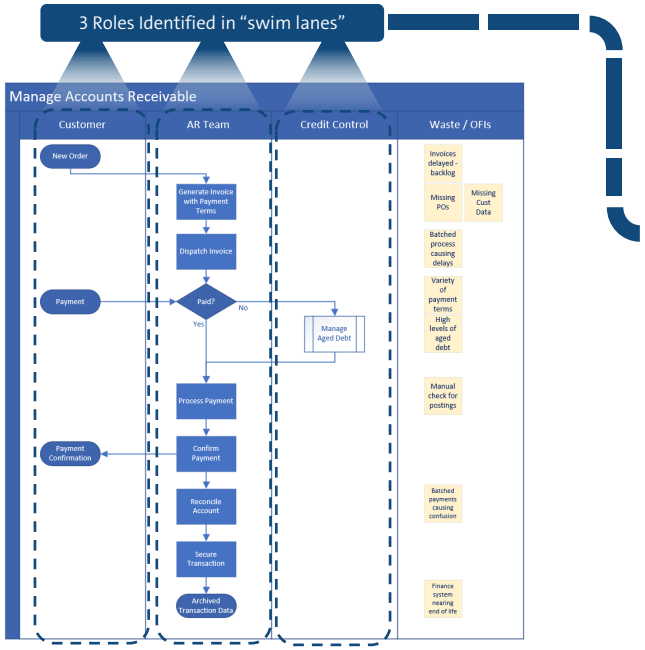
STEP	WHAT TO DO WHEN CREATING A LINEAR FLOWCHART	ACTIVITY	OUTPUT	AWARENESS POINTS
2	Work with the team to create the simplest description of the flow possible, without missing any key information about how the work occurs or what needs to be done if the flow breaks for any reason.	Take all the data from your information gathering step and simplify it down to show only the key tasks and decision points. Review the finished map and step-by-step analyse it for the **8-wastes**. You may find this process can lead to some **Quick Win** being identified. Take action!	An agreed "As Is" Linear Flowchart Waste Analysis. Potential for Quick Wins.	When summarising tasks together use the one role, one time, one place guide. If several tasks are all done by the same person, in one sitting, in the same location, create a summary note for that set. Keep the original data, you may need to drill down to the detail at a later point. Do arrows last, they are very painful to keep moving!

Step 3 | Create Swimlane Flowchart

Linear flowchart



Swimlane flowchart



What?

The Swimlane Flowchart adds the information about who is Responsible for doing each task. This seemingly simple question often brings to a head long-term confusions and difficulties at the hand-over points between roles/functions. Every hand-over is opportunity for delay and error.

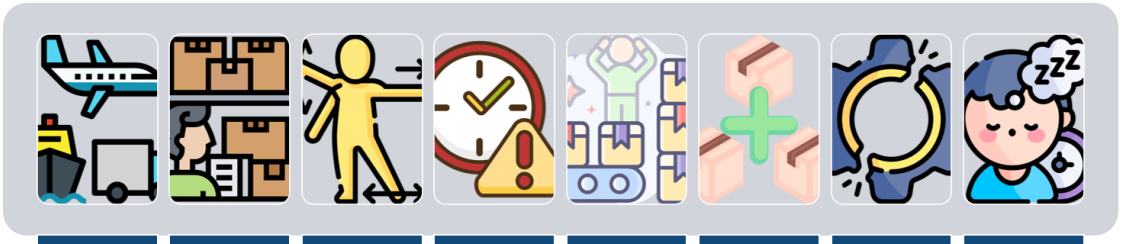
How?

1. Ensure you've already created the linear flowchart. If you have kept notes on who is responsible for each task, then it is easy to see how many swim lanes you will need.
2. Place the swim lanes in the order the roles appear along the Flowchart. If you have not done the Linear first, then you will have to make your best guess as to number of roles and the order to put them in. You may wish to create an initial draft and then refine it with the team through further discussion.
3. Take the activities you identified in the linear flowchart, then move them one-by-one into the correct swim lane to indicate which role is responsible.
4. Where multiple roles are required for one activity, spread that activity's box to cover each of the appropriate swim lanes.
5. You may wish to increase the number of activities, adding slightly more detail, as there is more space on the swim lane flowchart than there was on the linear flowchart. Still, do not include more than a total of 15 activities.

STEP	WHAT TO DO WHEN CREATING A SWIMLANE FLOWCHART	ACTIVITY	OUTPUT	AWARENESS POINTS
3	Extend our understanding of the process to include how the responsibility for the work is organized. The Swimlane makes clear the hand-off points (risk!) in the process and can lead to resolving any existing issues with responsibility.	Create a copy of your Linear Flowchart, set up your swimlanes, one for each responsible role, then move the Linear activities over into the appropriate columns. Highlight any issues where it is not clear who is responsible for a task.	An agreed "As Is" Swimlane Flowchart Waste Analysis. Potential for Quick Wins.	Some people jump straight to the Swimlane Flowchart, and sometimes that can work. Most commonly though, building the Linear first allows you to focus on Value, then add in the complexity of organisation after. Usually, it will save you time and give you a better result to begin with a linear flowchart.

Step 4 | Analyse Flowchart

Step 4 – Summary of the 8-Wastes: TIMWOODS



Transport	Inventory	Motion	Waiting (Delay)	Over-Production	Over-Processing	Defects	Skills (Non-utilised talent)
Unnecessary movement of the product, service or information	Stocks or work in progress in excess of what is required to meet customer demand	Needless movements by people, robots or machines	Delays between process steps stopping the work from moving forwards	Producing more than is needed, or too early, or non-priority outputs	Additional processing that adds no value to the result	Outputs not conforming to customers' needs	Not engaging people with talents that could help or using skilled people on unskilled tasks

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Note: Another common acronym exists – DOWNTIME. It is the same list except Over-processing becomes Excessive processing, and Skills becomes Non-utilised talent

What?

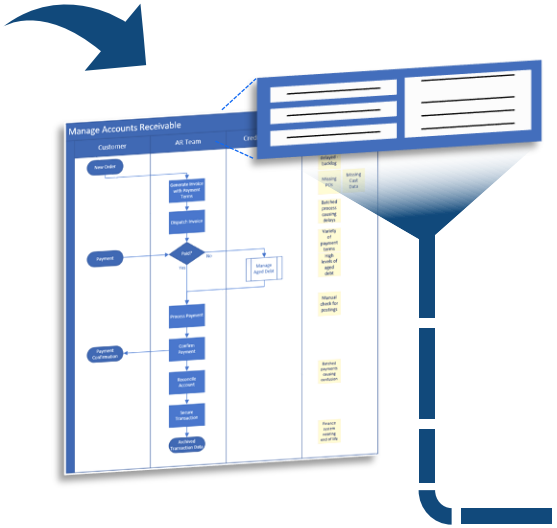
A flowchart is more than a document. It is a tool to help us learn about our process, and to put us in a position to continually improve it as a team. Now that we have a shared understanding of the process, we must analyze the flowchart to identify Waste and Opportunities for Improvement (OFIs)

How?

1) Schedule time with the core team responsible for the operation of the process. Give yourself ample time (at least 90 minutes, but perhaps longer).
2) Ensure that it is possible to display a large version of the process flowchart and any other relevant information either using screens or print-outs.
3) Review the process step by step, discussing any concerns we have about the activities and how things work today. Use the TIMWOODS framework at each point of the process, asking the question "do we observe any of these wastes within this activity?"
4) Identify critical "hand-off" points – places in the process where we pass work between individuals or teams, and where this hand-off is likely to be an opportunity to improve.
5) Keep a written record of all the Wastes and Opportunities for Improvement that the team discuss.

STEP	WHAT TO DO WHEN ANALYSING A FLOWCHART	ACTIVITY	OUTPUT	AWARENESS POINTS
4	Work hard as a team to search out as much waste and Opportunity for Improvement (OFI) as you can. You can't improve what you can't see. There is no need to feel pressure to solve everything, that is impossible. Just aim to create a shared sense of responsibility for Continuously Improving over time. Then use the **Quick Wins** method to get started.	Review each step, arrow, and handover point (Swimlane only) on your Flowchart. Answer "which wastes or OFIs can I spot"? Put your answers opposite the relevant part of the map. Review: are any potentials for **Quick Wins**? Are there business critical issues that need escalating?	A checklist of waste and OFIs Shared understanding of the process and its issues	The better you and your team get at identifying the waste in processes the more opportunities you have for finding ways to improve the process. Skill with this step is, quite simply, the bottleneck on an organisation's ability to improve and innovate. Remind the team frequently that we are assessing the process, not the individuals who contribute to the process. This helps us collaborate and avoid a blame culture.

Step 5 | Tidy Up and Document Result



What?

To get the most out of your Flowcharts, they need to be both accurate and easy to use. This step is about making sure your work can be reused by yourselves and others to save time and effort later. This means tidying up the outputs into a structured format which is then saved in an appropriate location for the team.

How?

1. For both the Linear and, if completed, the Swimlane Flowchart:
   i. Create a fresh space* near to where you have built your existing Flowcharts.
   ii. One-by-one copy the Sticky-notes over to the new space making sure that they are clearly labelled in the correct format.
   iii. Line them carefully so the main flow is always in a straight line, so branches are clearly visible as breaks in the flow.
   iv. Make sure that no items overlap others, so it is easy to see what any waste/OFIs are relating to when placed opposite.
   v. Copy over the main wastes/OFIs that the team feel are the most important to resolve (but don't forget to capture the full list mapped to the process step as advised in Step 4).
   vi. Add in the arrows last following the arrow conventions.
   vii. Review with the team and confirm "is this an accurate representation of the current state?" And, "Even if we can see lots of room for improvement, is this our best definition of how to run the process now?"
2. Add in the key tagging information: Process Name, Direct Customers, Purpose, Process Owner (if known), Date of Drawing.

STEP	WHAT TO DO WHEN TIDYING UP AND DOCUMENTING THE RESULT	ACTIVITY	OUTPUT	AWARENESS POINTS
5	You are aiming to create a tool that you can use with your team as part of Continuous Improvement and with other relevant stakeholders for escalating process issues. Taking that little extra time to get it into a neat shareable form will save you time and energy in the long run.	Create a neat, properly laid out version of the Flowchart(s), with the waste and OFIs collected into a table or a visual management space for managing your improvement work.	A clean, shared and stored copy of the Flowchart(s)	Do not postpose this step – it should be done while your knowledge and understanding of the process is strongest immediately after the discussions you've had with the team.

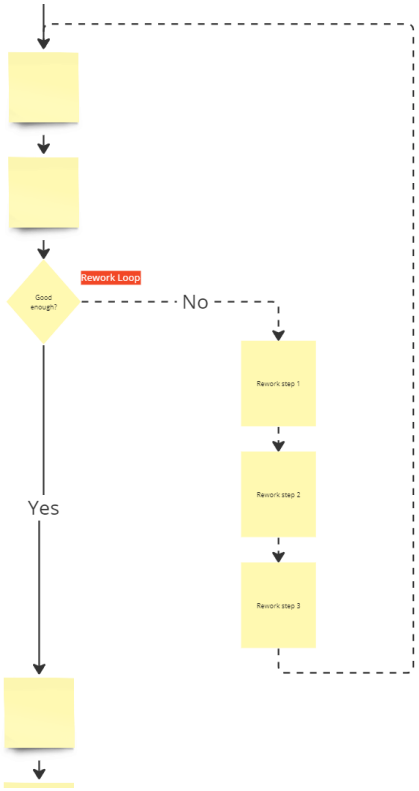
**Note: we will be releasing guidance shortly about where to store process documentation –once it has been finalised.*

Flowcharting – Pro-tips

Mapping is a trickier that it first appears. Here’s some tips to boost your learning.

Examples of How to Map Common Process Loops

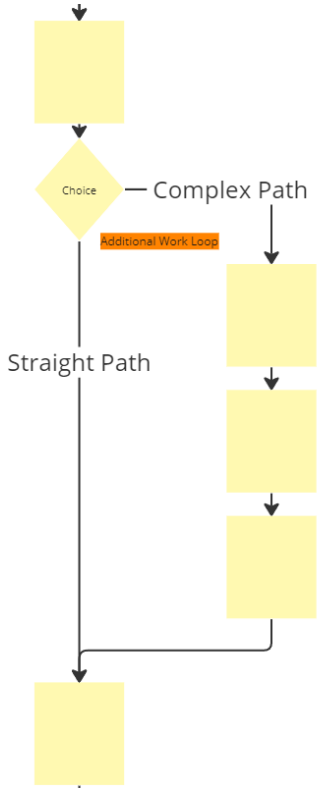
The Rework Loop



Rework loops are clearly visible waste: The flow breaks, incurs extra work then goes back up the process flow to be reprocessed. 100% cost for no additional value. Goal: eliminate the % routing down this path, by eliminating Root Cause(s) of fail.

Example: redoing an order due to errors on the original quote.

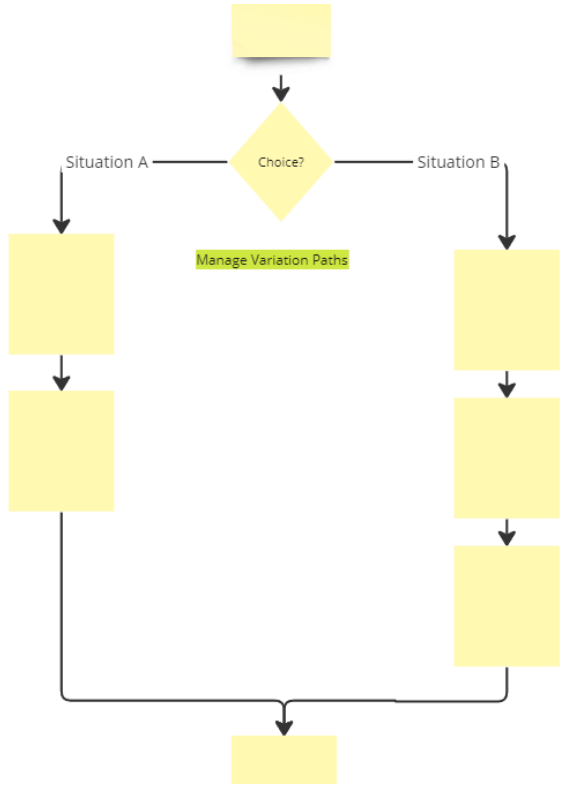
The Additional Work Loop



Additional work loops may or may not be waste. It depends upon the reason for the split. If the customer pays extra for the additional work (e.g. a customised order) then it could be value add. But if the complex path just exists for historical reasons with no defined customer value it is likely to be waste.

Example: some work has been automated, but some remains manual.

The Split and The Parallel Path



Work that follows the Split Path goes down one side only, depending on the decision point criteria. This can be good design, as it increases the processes' ability to handle variety. If the Work goes down both paths at the same time, then that's parallel working and is usually suboptimal process design.

Example: Emergency or Scheduled = Split Path. Send request to Engineering and Production at same time = Parallel.

Capture Waste and Opportunities for Improvement

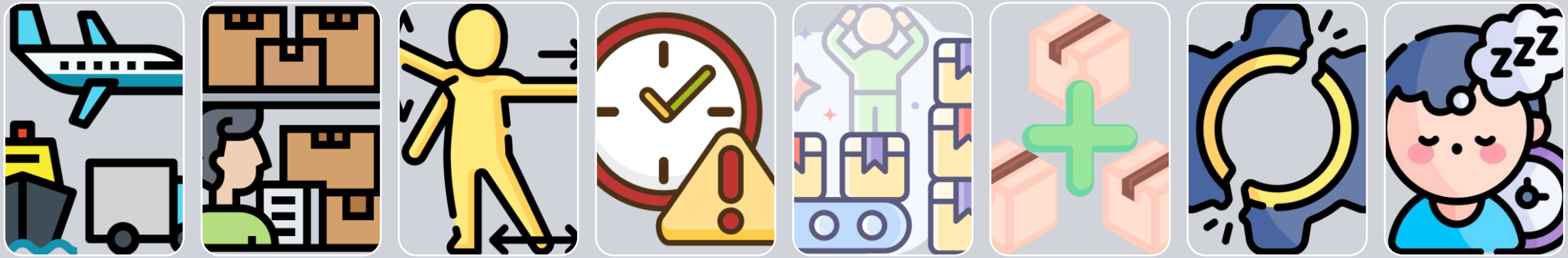
What should we look out for?

- An incident which resulted in a dissatisfied customer
- Anything which causes extra work or rework
- More than one method for performing an activity or task
- A ‘felt’ inefficiency in the process
- Anything which keeps people from doing the best they can

- Duplication
- Unnecessary tasks
- Delays
- Illogical or inefficient sequencing
- Complexity
- Unclear lines of responsibilities
- Opportunities for errors

- Poor quality of supplier work
- Inconsistencies
- Disconnects
- Not understanding internal customer requirements
- Delays or poor decision making
- Standards no longer used

Wallchart Summary of the 8-Wastes: TIMWOODS



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Flowcharting Detail

Tips for Flowchart construction

Flowcharting should start at the highest appropriate level so that the team can see the big picture.

Always consider what you are trying to accomplish before constructing the chart. Decide which is the most appropriate chart and the necessary information to include in the chart. For example, if the flow of the process passes from one organisational unit to another, consider an integrated flowchart.

For clarity on all types of flowcharts

- Label them to identify the process, the activity, author, and date.
- Use defined symbols to depict the steps or events.
- Be sure that the time sequence of the key steps/events follows from top to bottom.
- Use only one connecting line from each box, unless showing a decision or cooperation.
- If possible, the direction of the arrows for Yes/No decisions should be consistent.
- Use only vertical and horizontal lines.
- Keep flowcharts to 8-12 steps, certainly no more than 15. If they exceed 15, they are probably too detailed. An additional chart at a lower level should be considered.
- Start with a broad perspective.
- It is often helpful to include a column on the right side of the chart for comments.
- Keep it simple!

Pro Tips for Drafting a Flowchart with your team

Bring two sticky-note pads: *One yellow for activities, and one pink or red to note wastes and improvement opportunities*

Use positive language/ words – remember it's just as important to talk about the good elements of the process as it is to highlight opportunities to improve.

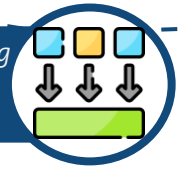
If you think someone is changing their behavior while you're observing the process, treat it as a clue that there's a stress-point in the process

Activities should be things done by one person, at one time, in one place

*If in doubt, **keep it simple!** It's easy to over-complicate by trying to map exceptions and too much detail, which can make the flowchart less useful.*

***Be inclusive**, the more you involve those who operate the process, the more you will learn*

If there's too much detail, try grouping sticky notes all done by the same person and summarizing them



Don't be afraid to ask "silly questions" – all questions are valid if they help you learn about the process

- Observe the process
- Share knowledge Openly
- Document the things that matter
- Describe things clearly
- Start with a draft, then refine

GRUNDFOS
BUSINESS SYSTEM

Version control	Process Excellence
Date of release	26th March 2024
Building Block owner	Gustavo de Arriba
Author	Hajnalka Tátrai gbs_office@grundfos.com
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