

Sample tools and techniques for use in plant layout analysis and design

Everything we do is a process, whether it is documented or not, and in each area or function of an organisation there are many processes taking place. These processes interact with other processes throughout an organisation, as outputs from one process form the inputs to another. Each process is therefore part of a larger process and organisations large and small can be seen as complex networks of interconnecting processes, the highest level being the organisation itself. Whereas the outputs of an organisation go to its “external customers”, the outputs of internal processes of the organisation go to “internal customers”, this is where understanding processes and flow between processes becomes a key element of good plant layout.

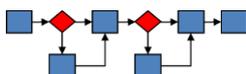
A process is the combination of people, machines, materials and procedures in planned and organised activities. They are therefore the fundamental building blocks of all organisations, and both process understanding and process improvement form the lifeblood of excellent organisations. Processes transform inputs, which can include actions, methods and operations, into outputs- they are the steps by which we add value for our customers.

Process diagrams are a pictorial representation of the process broken down into a chronological sequence of sub-processes and steps. In process improvement there are different approaches to depict and analyse processes, these include:

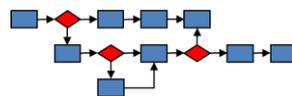
- **SIPOC** diagram is a high level tool that summarises the inputs and outputs of one or more processes in table form. The acronym **SIPOC** stands for suppliers, inputs, process, outputs, and customers.
- **Swim-lane** diagram is a type of flowchart that depicts cross functional processes using the metaphor of lanes in a pool. When complete the diagram is a process map that separates process into lanes representing different functions, departments or individuals allowing you to document hand-offs (queue / wait time) between process roles / steps.
- **Value Stream Mapping** depicts end-to-end processes, identifying product / service and information flows, this helps visualise the steps needed to progress from product / service creation to delivery to the end-customer. It can help you to better understand your business, analysis and process improvement.
- **Flow Charts** depict work flow, key steps and decision points in the process providing a high level view of flow.

Whatever approach you use to be beneficial you must map what is really happening – to do this you **MUST** follow the process.

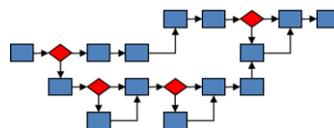
What we think the process is:



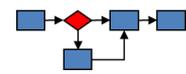
What the process should be:



What the process really is:



What the process could be:



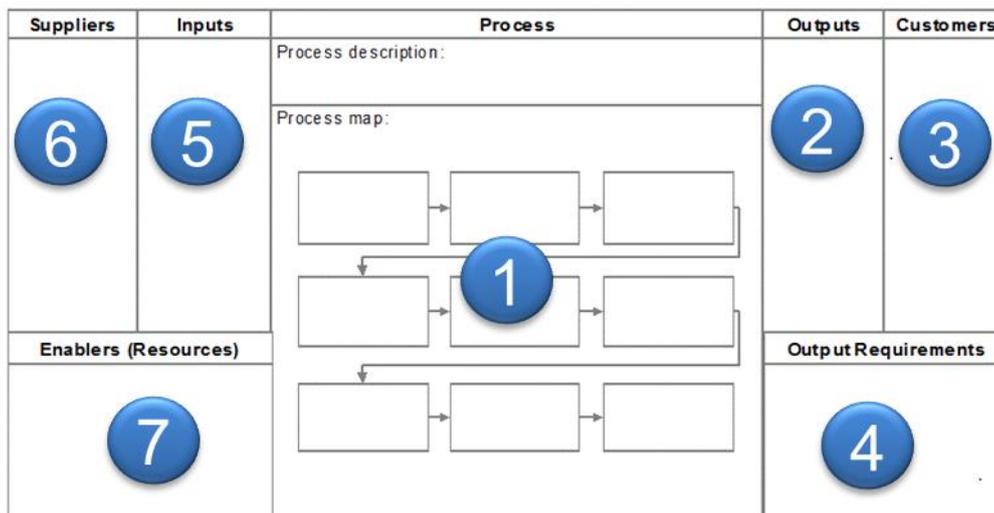
Creating a SIPOC diagram

A SIPOC diagram is a tool used by the team to identify all relevant elements of a process improvement project before work begins. It helps define a complex project that may not be well scoped, identifying the high-level picture of the components of a process and clarifying the relationships with key customers and suppliers. The SIPOC is a good way to determine the boundaries or scope of a project and provides a structured way to discuss and get consensus on a project before beginning work on it.

SIPOC is an acronym for:

- **Suppliers:** People and entities providing inputs
- **Inputs:** Items used to generate outputs, plus item requirements
- **Process:** Steps you perform (at a high level)
- **Outputs:** Results of the process steps, plus output requirements
- **Customers:** People and entities who receive and use the outputs

A team completes a SIPOC by walking through each of the letters in the name, starting not at the beginning, but at the letter P. The following shows the steps to be completed in order:

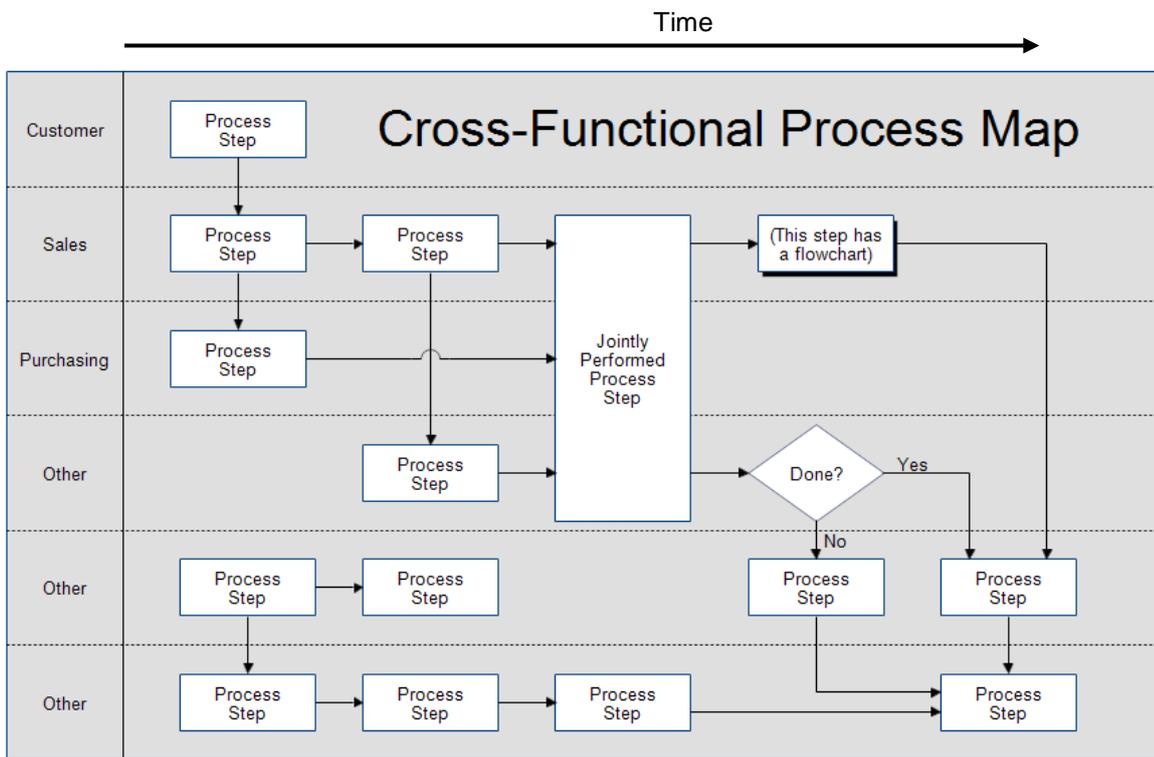


1. Provide a brief process description.
List beginning and ending process steps to identify process boundaries.
List the high-level steps between the process boundaries to create a process map.
2. List the key outputs from the process.
3. List customers (users) of the outputs from the process.
4. Identify the requirements that are critical to the quality of the process outputs. You may have to verify this information later through data collection.
5. List key inputs to the process.
6. List suppliers (providers) of the key process inputs.
7. Identify requirements (enablers / resources) that are critical to the quality of the inputs.
You may have to verify this information later through data collection

Creating a Swim Lane Diagram

A swim lane diagram is a type of flowchart that is divided into a number of horizontal or vertical 'swim lanes'. It is so called because the diagram or map resembles a pool with lanes identifying the different process groups. Like a flowchart, it details a process from start to finish, but it also divides these steps into categories to help distinguish which roles, departments / functions, or individuals are responsible for each set of actions. It allows you to document hand-offs between process roles / steps, identify hand-off wastes as well as providing a high level look at lead time.

The lanes are columns that keep actions visually separated from others making responsibilities more clear than a regular flowchart. When looking to improve processes, knowing which department is responsible for what can help speed up the process of correcting inefficiencies and eliminating delays.



How to create a swim-lane diagram:

1. Create the swim lanes: Identify roles / functions / departments / individuals involved in the process.
2. Start your diagram: Define the starting point of the process. Add a rounded rectangle to the top (start) of the appropriate swim lane to indicate its starting point and label it.
3. Add process steps: Each step should be identified in the order (time-line) it occurs.
4. Connect each step: Each step should be connected to the one before it with a line. To draw steps in the same swim lane, draw from top to bottom. To add a step in another division go from left to right. With each step, describe what it represents until you reach the end of the process. The arrows between the steps indicate the transfer of information or flow.
5. Repeat this until you reach the finishing point of the process.
6. Identify a timeline for the process flow.
7. Identify wastes, handovers, issues etc.

Creating a Value Stream Map

A value stream map is a tool to visually represent the flow of material and information and stop people from dwelling on individual processes:

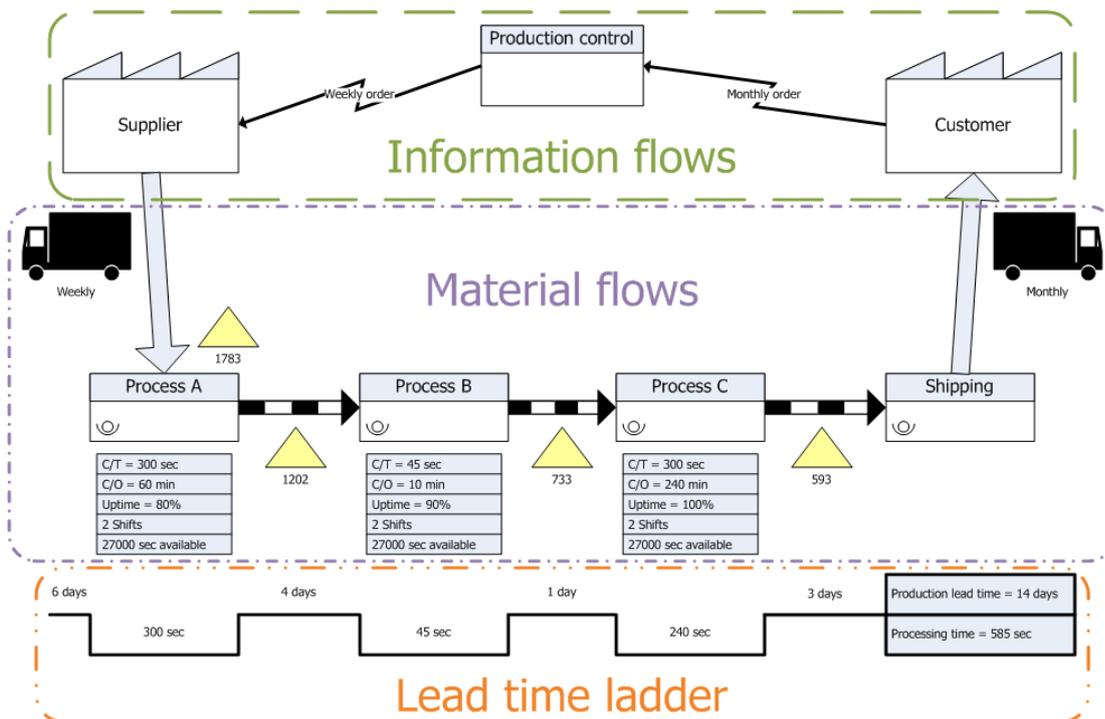
- Increases understanding of the work sequence.
- Allows you to visualise work as a 'System'.

- Activities, Pathways, Linkages.

- Identifies problems (from a system perspective)
- Provides understanding of resource utilisation.
- Exposes waste – TIMWOODS.
- Highlights information flow.
- Increases staff awareness:

– Value Add & Non-Value Add activities

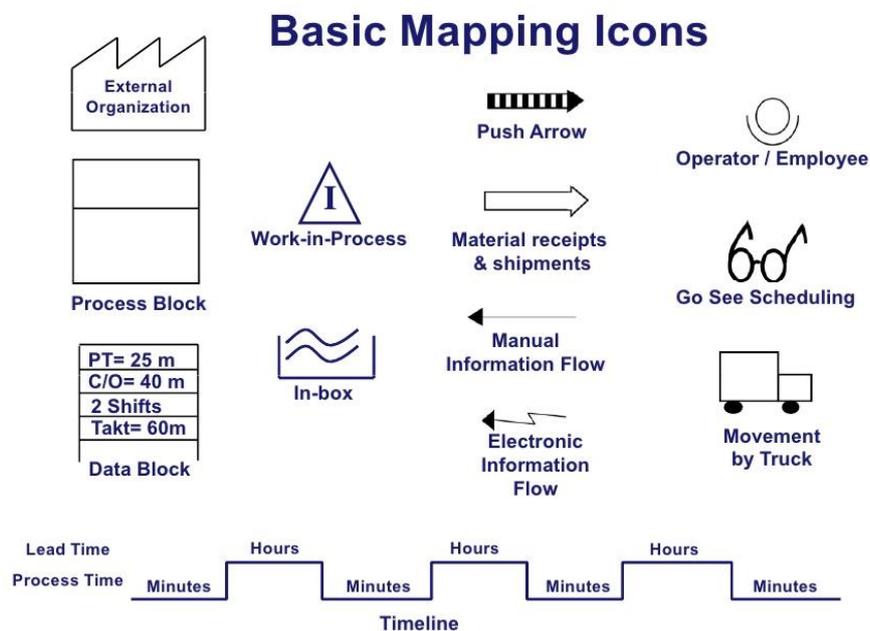
- Focuses direction – so the system benefits as a whole.
- Not to examine a specific function / department, but the material and information flow that cuts across functions and departments.



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How to create a Value Stream Map

1. Identify Product or Service “group” to be mapped
2. Draw customer demand details at top right (centre for Service)
3. Draw process step boxes along the bottom
4. Show Inventory / Delays between each step
5. Draw supplier (not on Service)
6. Add data, e.g. cycle time, setup, batch size
7. Draw process flow, e.g. push, pull,
8. Draw information flow i.e. Production Control & schedule info
9. Develop time line i.e. value add / non value add and lead time
Identify problems / issues / improvement opportunities
10. Develop Future State Map



Creating a Flow Chart

A flow chart adds to the pictorial representation of a process diagram using standard flow symbols. Areas where non-value adding steps or processes exist can be targeted for improvement.

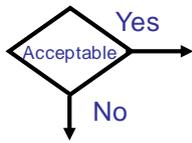
Symbols



Stop and - start. This circle shows the start or end of a process.



Activity. This rectangle reflects a single process step. You briefly describe the step inside the diamond in the form of a question. Each alternative path or branch is labelled with a possible answer. The answer determines the path or branch to the next step.



Decision. This diamond signifies that a decision is made here. It indicates a branch point. The nature of the decision is written inside



Wait. This symbol signifies a delay or waiting period.



Arrows. These point out the direction of flow from one activity to the next.

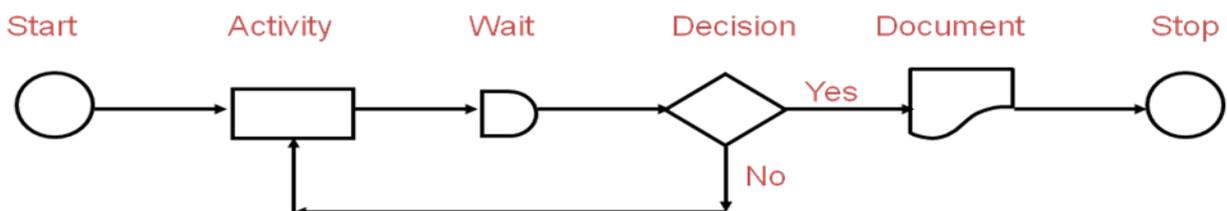


Document. This symbol signifies the need to document an activity.



Data. This symbol signifies the need to collect data.

Here is how they typically flow into one another



Tips

- Involve the right people in creating the flowchart, include those who actually do the work, suppliers to the process, customers of the process and those (managers) involved in its control.
- Many processes have many steps, use many sheets of paper or Post It notes, so that you can move them around.
- When investigating a complicated process, first do a crude flow chart that includes only the major steps and then break all the major steps down into subsets.
- It may take a substantial amount of time to create a flow chart, often more than one sitting. Remind yourself that it is worth the effort because data collection and problem solving will rely on your flow chart's accuracy and thoroughness.