How to Understand and Complete a Value Stream Map

Value Chain Competitiveness (VCC)

Version: 2

February 2020

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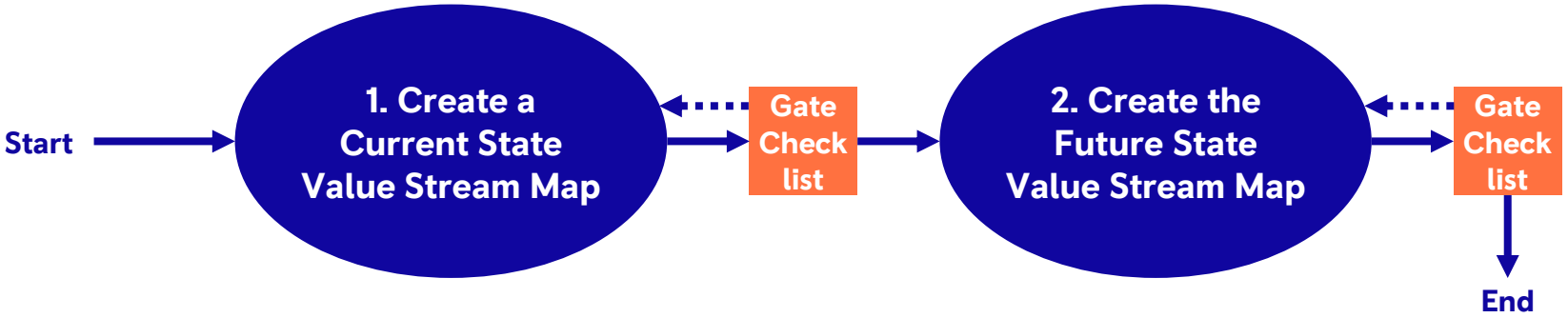
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How to Understand and Complete a Value Stream Map

BACK Map NEXT

Scope

Objectives & Principles



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Scope

This 'How To' will enable you to:

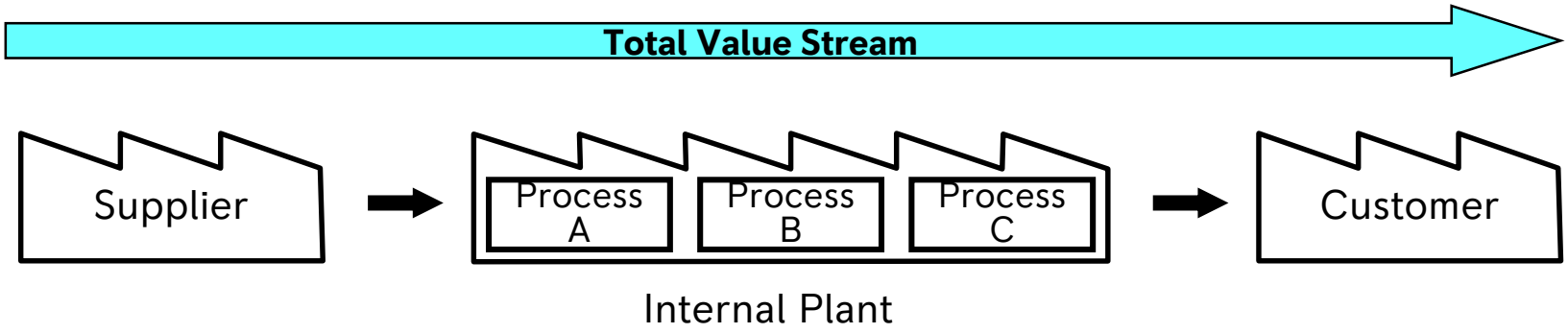
- Understand the principles behind and reasons for using a Value Stream Map
- Improve knowledge as to why there is often a need to align our processes to Value Streams
- Complete a Current State Map for a process in an operations or office environment
- Visually identify opportunities to improve the current state
- Complete a Future State Map for a process in an operations or office environment
- Make an action plan to achieve the Future State

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Objective and Principles

Value Stream Mapping – A Definition

- A *process* of mapping the complete Value Stream from the start of the process, to the delivery of a finished product



- A ***Value Stream*** includes all of the steps required to bring a product or service from raw input to finished condition, for example:
  - Forging….. → Manufacturing & Assembly……. → Customer
  - Design Idea → Design, Stress Analysis…… → Design Drawing

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Objective and Principles

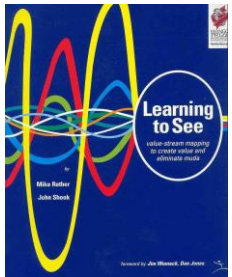
Value Stream Mapping – What is it?

- A visual method of representing the whole process – the big picture !
- A "snap shot" in time of the current system – where the value-add is
- A tool to give visibility to:
  - All of the steps in a process (starting at the customer end)
  - Physical material flow through processes towards the customer
  - Information flow to each process
  - The connection between information and material flow, and vice versa
  - The amount of value in a process
  - The lead-time to produce what the customer requires
- A visual representation of the wastes in a system, along with opportunities to eliminate in the future
- A tool to assist in generating an improvement roadmap

"Whenever there is a product for a customer, there is a value stream.

The challenge lies in seeing it !"

Learning to See – Shook & Rother



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Objective and Principles

Value Stream Mapping – Why do it?

- Creates a standard on which to document the *whole* process
  - Leads to a “total cost” thinking, for the *entire value stream*
- Visualises the *actual* system or future process vision, making it easy for *all* to understand
  - How it *really* operates *today*, not how it was designed to operate
  - A simple, visual method of organising data and shows where data is missing
  - How the optimised process could operate in the *future*
- Exposes waste – allows *everyone* to see the improvement opportunities
  - Shows the value-added and non-value-added activities: excessive changeovers, under-utilised equipment, poor quality, duplicated processes, bottlenecks, etc.
- Allows us to focus improvement activities on areas that really need the support
  - Generates a blue-print for improvement to achieve a future vision or goal
- Starts to connect many “lean” tools (Pull, SMED, Standardisation, etc.)
  - Helps to synchronise production with customer demand
- Provides a benchmark to look back at
  - Chart our progress on the journey
  - Helps to remind us of exactly what we have achieved so far

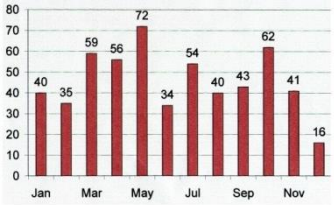
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1. Create a Current State Value Stream Map

Define the scope, data required and mapping icons

Scope of the map

- "High Level" – view of whole process at the enterprise level
  - Not too much detail; generic process
- "Low Level" – detailed around a specific number of parts / processes
  - Allows detailed data gathering at each process to focus waste reduction activity
- What is being mapped?
  - A representative part or item? / A group of parts (product family)?



Agree what data to gather

- What data is most relevant?
- What measure are you trying to improve and what information impacts on this measure?
- Gather only key data for the product family or representative part (too much data makes analysis more difficult)
- If there is much variation? - gather data over time and calculate an average
- Ensure the same data is gathered throughout the whole map

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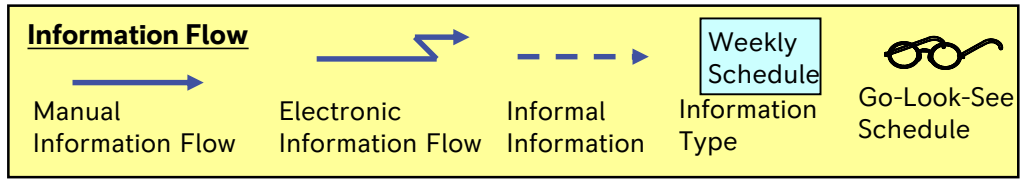
1. Create a Current State Value Stream Map

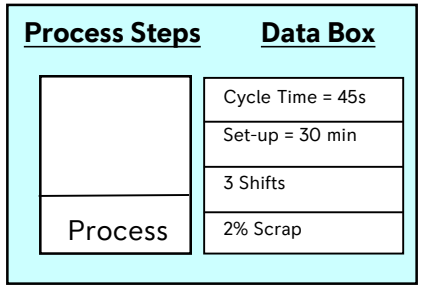
BACK Map NEXT

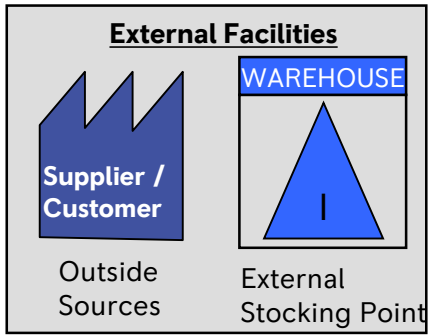
Define the scope, data required and mapping icons

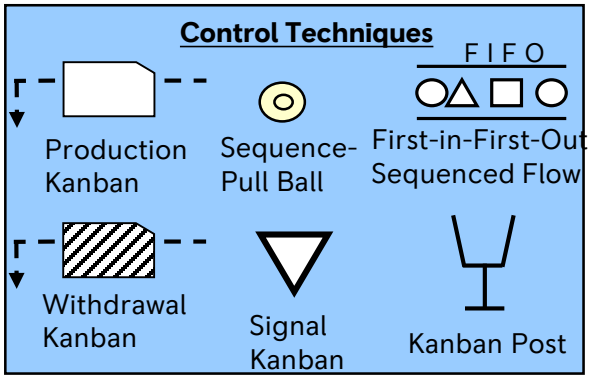
Example:

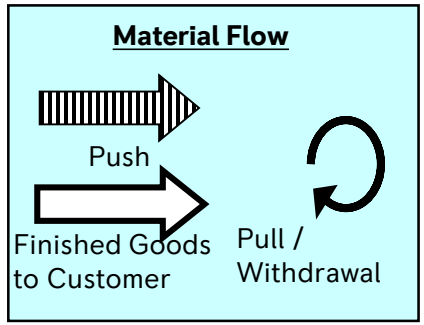
Create the map on a large sheet of paper

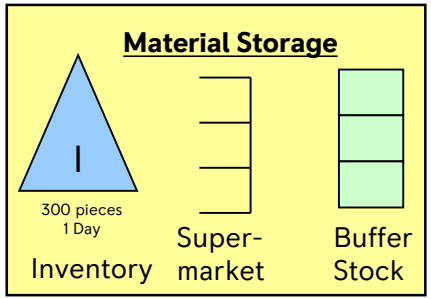


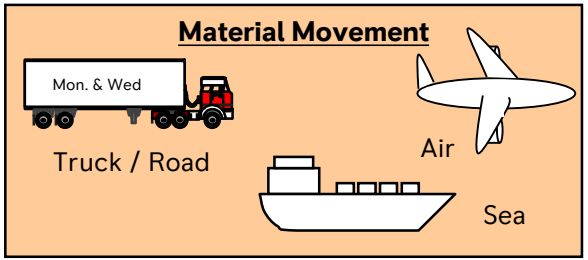


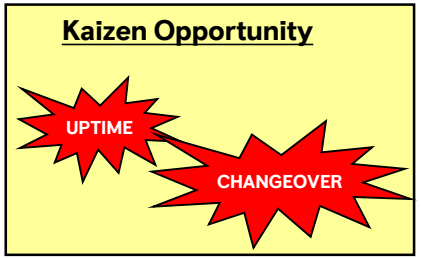












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1. Create a Current State Value Stream Map

Identify & map customer requirements

What does the process produce and who needs it?

- Find out who the customer is and talk to them!
- Document information about their requirements including things like:
  - Expectations for Performance
  - Quality, condition of supply
  - Service Level Agreements (SLA)
  - Contractual obligations
  - Takt time
  - Working hours
  - Delivery system
  - Key issues
- Confirm the “supplier’s” understanding of these requirements
- Confirm the “stakeholder’s” expectations of the map

CUSTOMER

Requirements data



- Takt is the “drum beat” rate that the customer requires the product at
  - It focuses the pace of work to be synchronised with customer demand
  - The “heart beat” of the process
  - Every beat, a finished product should reach the customer

Takt Time = $\frac{\text{Loading Time}}{\text{Customer Requirement (units)}}$ = 1 piece every “X” minutes or hours

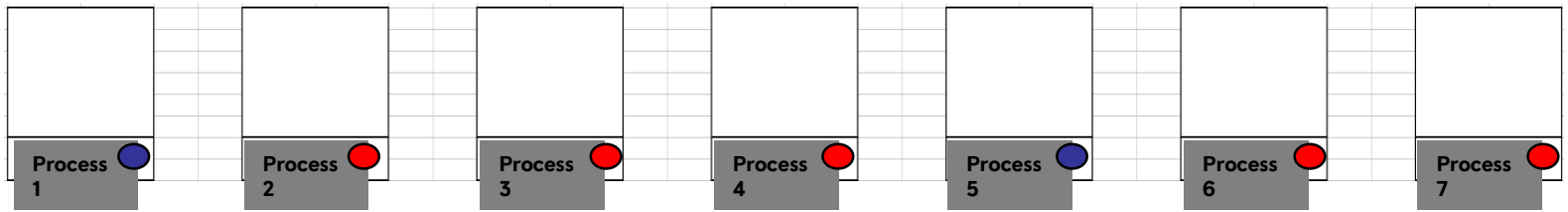
  - Remember to use the same units (eg. working time per day and customer requirement per day)
  - Loading Time = Total hours – planned stoppages

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1. Create a Current State Value Stream Map

Identify & map process steps

- Write the process sequence descriptions on a note pad from route cards or similar
- Confirm the actual process against the above list by walking the value stream
- Post a process box for each confirmed process onto a large continuous paper roll
  - Ideally, build the process backwards from the customer
- Colour the boxes green if it adds value for the customer, or red if it adds no value (or use different colour post-it notes)
- (Value-Add can generally be defined as “anything that changes fit, form or function”)



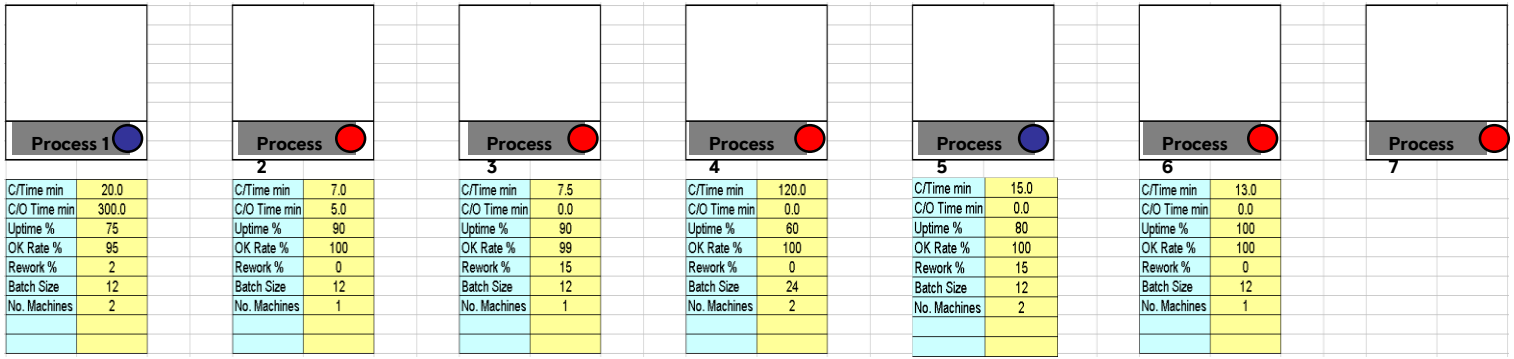
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1. Create a Current State Value Stream Map

Identify & map process data

- Communicate and engage with the process personnel prior to gathering data (share with them the purpose of your activity as well as summarising what you have seen)
- Gather actual data at each stage by walking the value stream (Go-Look-See)
  - Challenge the data – count yourself, ask to see – don't rely on system data
- Pencil the data into the data boxes beneath each process

Cycle Time	13.0 min
Setup Time	0 min
Uptime %	100
OK Rate %	100
Rework %	0
Batch Size	12
No. Machines	1
Observations	



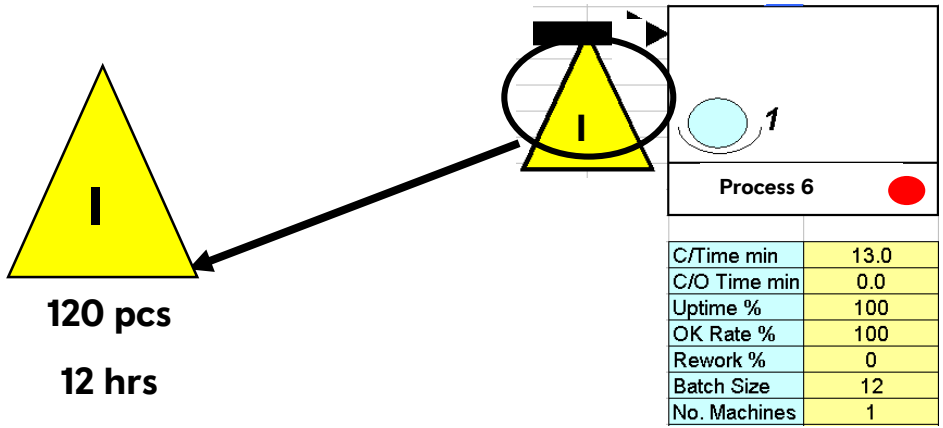
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1. Create a Current State Value Stream Map

Identify & map inventory

- Count the actual inventory at each stage of the process - walk the value stream
  - Raw material and finished goods inventory should be counted
  - Write the 'inventory' in terms of quantity and / or time (based on the customer consumption rate)

In this specific example, there are 120 pcs - with the customer requiring 10 per hour, there are effectively 12 hrs of stock queued at the process!

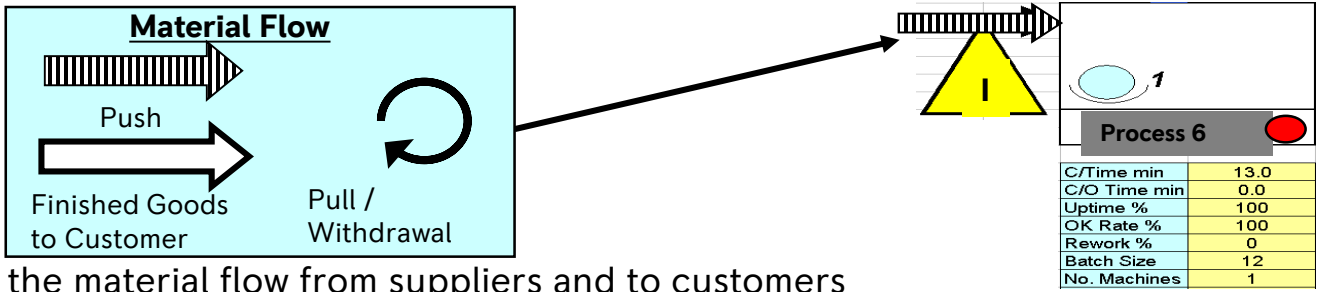


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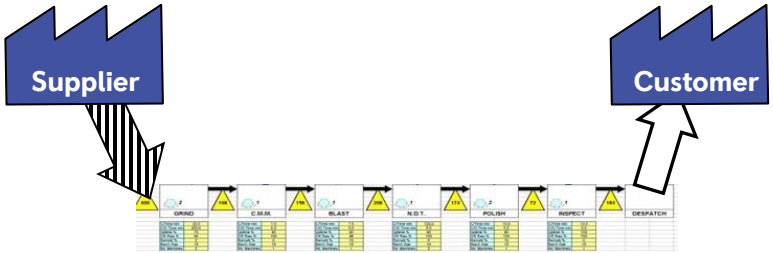
1. Create a Current State Value Stream Map

Map material flow

- Understand **how and when** the process knows when to produce 'material'
- **"Push"** means that a process makes something regardless of customer signal
- **"Pull"** means that items are only produced or moved when a customer signal is received. Mark the material flow on the map, using the corresponding symbol



- Add in the material flow from suppliers and to customers
- Who are the suppliers?
  - What and how do they supply?
  - In what volumes?
  - What are the issues?
- Who are our customers/
  - How do we deliver to them?
  - What do we deliver & at what frequency?
  - What are the issues?



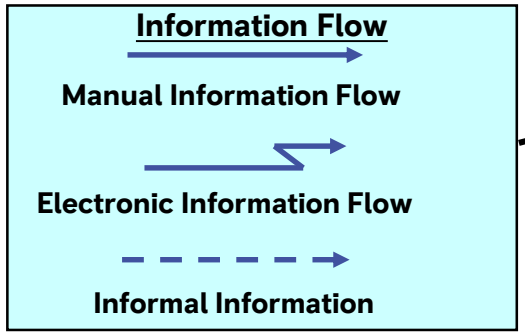
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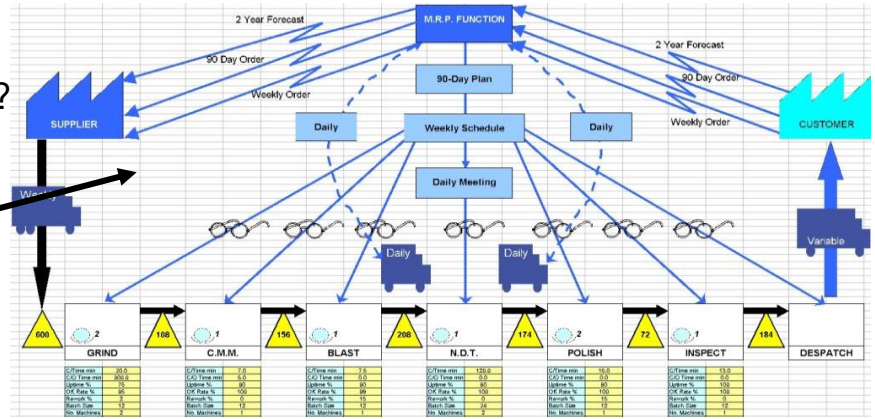
1. Create a Current State Value Stream Map

Map information flow

What systems control the processes or trigger actions within the flow?

- Record any type of information that establishes how each step of the process knows what to work on next – go and ask the individuals
  - Schedules, Meetings, Boards, System data, people knowledge, etc.
- Understand how the information is received (manually, electronically, informally) and add this information flow to the map using the standard icons
  - Key people or systems involved ?
  - What planning processes are utilised ?
  - How is information received from the customer ?





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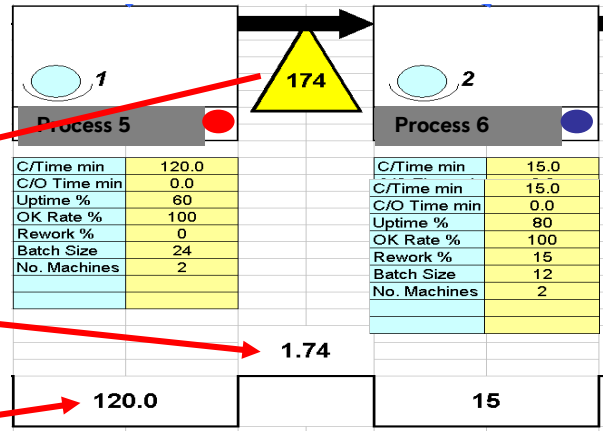
1. Create a Current State Value Stream Map

Add process time and lead-time

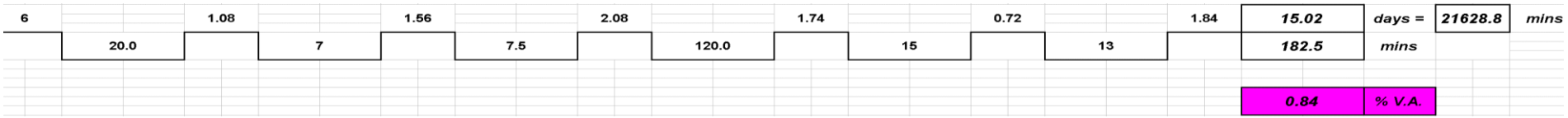
- Inventory can be used to calculate the lead-time profile - convert inventory into “days-worth” of stock, based on customer demand

In this example,
Customer requirement = 100 per day
In-process inventory = 174

$$\text{Lead Time} = \frac{\text{Inventory}}{\text{Customer Daily requirement}} = \frac{174}{100} = 1.74 \text{ days}$$



- Processing time is the work content of the process step
- Sum the total processing time and lead-time and add to the map



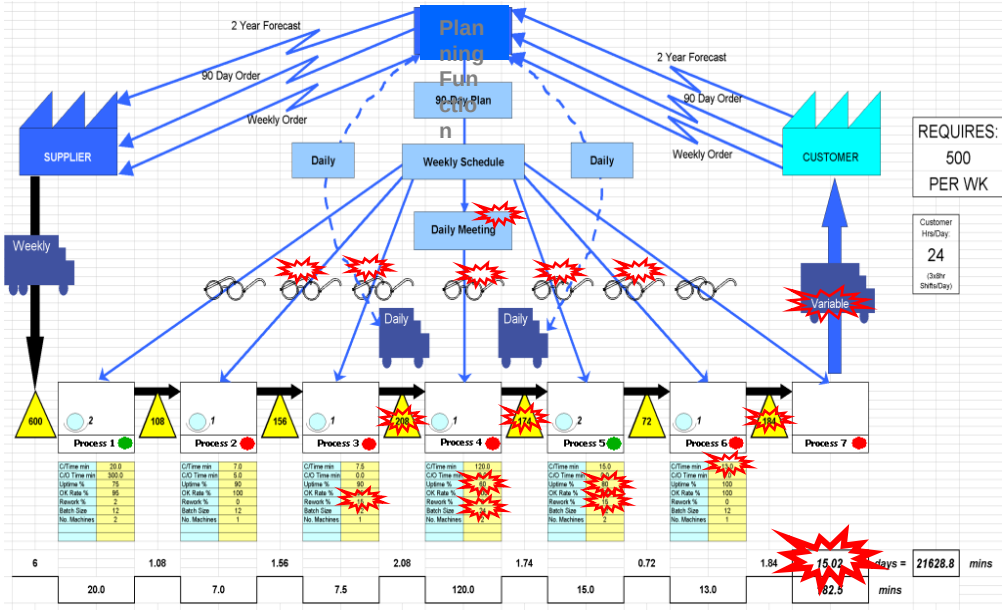
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1. Create a Current State Value Stream Map

Highlight issues and opportunities for improvement

Identify opportunities for improvement using “Lightning Bursts”

- Check each process capacity to supply the demand – process time vs. Takt
- Highlight areas of obvious waste or issues, eg. high changeover times, poor quality or performance
- Mis-matches in data between supplying / receiving processes
- Lack of standardisation
- Large batch sizes or inventory (causes queuing)
- Poor process sequencing causing delays or other non value-adding activity
- What exactly does the internal / external “customer” want ?



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Gate checklist 1: Create a Current State Value Stream Map

BACK Map NEXT

- ☑ The scope of the map (high-level, or detailed) has been agreed
- ☑ The type of data to be gathered has been agreed
- ☑ Mapping icons are understood by the team
- ☑ Customer requirements are understood
- ☑ The process sequence has been mapped
- ☑ The process data has been gathered and captured
- ☑ Inventory data has been gathered and captured
- ☑ Material flow information has been gathered and captured
- ☑ Information flow information has been gathered and captured
- ☑ Process and lead-time data has been added to the map
- ☑ Issues and opportunities have been highlighted on the current state map

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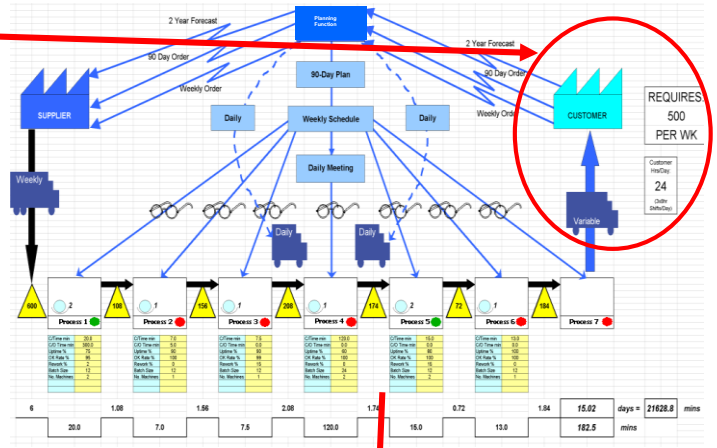
2. Create the Future State Value Stream Map

Confirm customer requirements & identify opportunities for continuous flow

Reconfirm the customer requirement

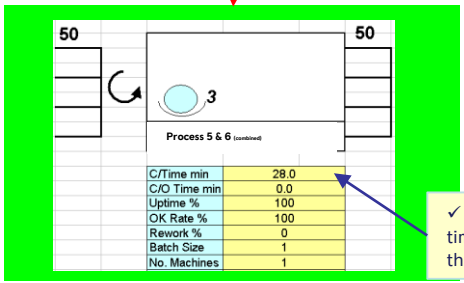
Look for any possibilities for continuous flow

- Work upstream from the customer – focus on the customer requirement
- Can we eliminate processes (does a process really add value)?
- Can we combine processes (if combined cycle times are less than Takt)?
- Is it possible to re-sequence processes to reduce non-value-added activities?
- If it is not possible to combine processes, a break point in the flow is required along with in-process stock
- Locate one process next to the other process and eliminate in-process stock
- Where single piece flow can not be used, identify inventory points or control mechanisms
  - Calculate inventory required, buffer sizes (min/max) and batch sizes



Combine operations

Future VSM



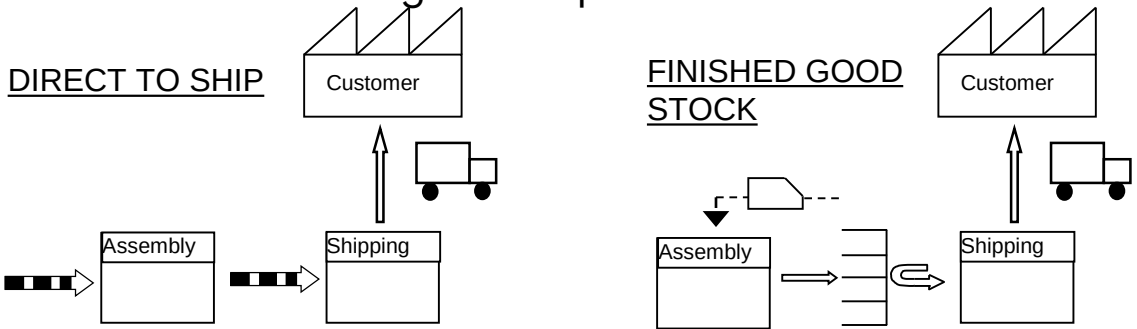
Takt Time = Loading Time / Customer Requirement (units) = 1 piece every "X" minutes or hours

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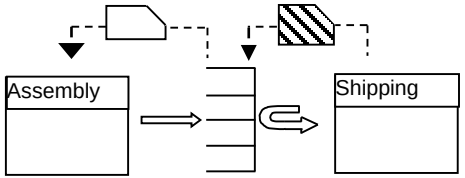
2. Create the Future State Value Stream Map

Identify how material will flow in the future state

- Will the last process deliver finished goods directly to the customer, or will the process have to “deliver” to a finished goods supermarket ?



- Where in the system is flow broken?
  - Where this occurs, what type of supermarket “pull” or signal will be used to replenish?



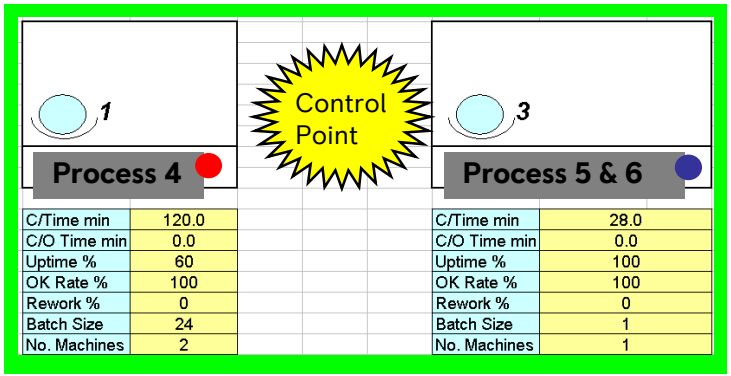
- Identify which process will be the constraint “pace-maker” – this then becomes the process at which scheduling is focused

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2. Create the Future State Value Stream Map

Identify the control system to maintain flow

- Where Single Piece Flow can't occur, use a mechanism to synchronise production:
  - Controlled buffers to protect the process being supplied
  - Supermarket stock, Kanban, or FIFO
- Identify the constraint (or near constraint) process(es)
  - Plan for a buffer of stock ahead of each process and mark this onto the map
- Is it possible to level-out variation in production demands? What type of control system can help with this ?
- Implement "pull" where physically possible



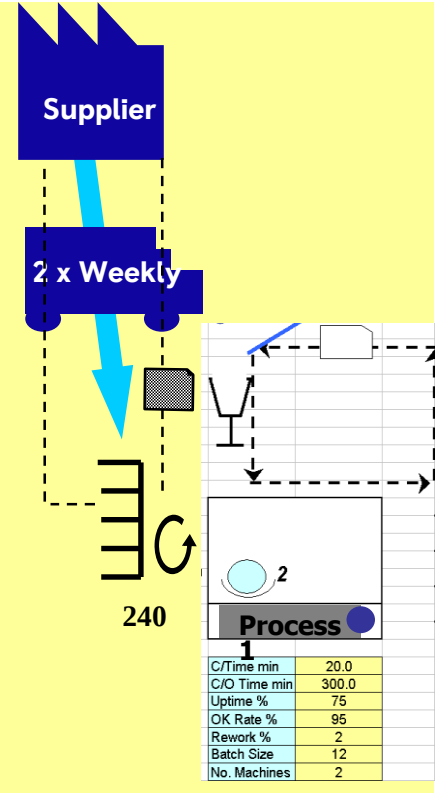
C/Time min	120.0
C/O Time min	0.0
Uptime %	60
OK Rate %	100
Rework %	0
Batch Size	24
No. Machines	2

C/Time min	28.0
C/O Time min	0.0
Uptime %	100
OK Rate %	100
Rework %	0
Batch Size	1
No. Machines	1

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2. Create the Future State Value Stream Map

Understand the replenishment signals required



- What method can be used to connect supplier/customer processes? (FIFO, Kanban, etc.)
- What method is required to connect raw material usage to supply?
- Quantity of stock required is based on the time to replenish, plus some safety stock
- How will information flow to replenish?

AT THIS STAGE IN THE PROCESS, WE ARE NOT LOOKING TO SPECIFY THE PRODUCTION CONTROL SYSTEM IN DETAIL. BUT, WE NEED TO DECIDE:

- WHERE MATERIAL WILL BE HELD
- HOW MUCH WILL HELD
- HOW IT WILL BE MANAGED (FIFO OR FIXED LOCATION)
- WHAT SPACE IS REQUIRED TO BE ALLOCATED.

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2. Create the Future State Value Stream Map

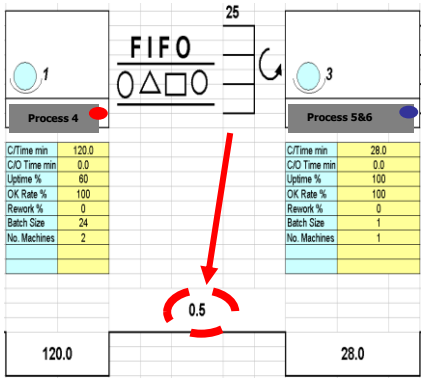
Calculate the Lead-Time profile and Value-Added Ratio

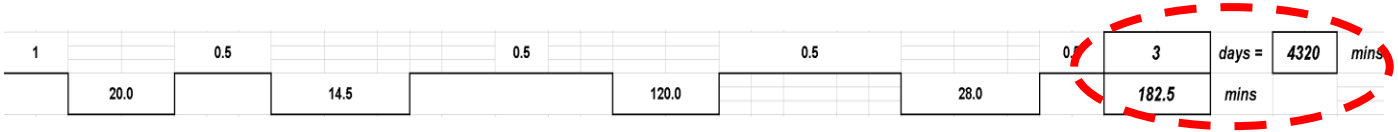
- Estimate the target stock in the system and then calculate the lead-time profile, by converting inventory into "days-worth" of stock, based on customer demand
  - Based on customer "consumption" rate, not based on next process

- Calculate the total process time, lead-time and Value-Added Ratio

For example,
Customer requirement in future state = 50 per day
In-process stock = 25

Lead Time = Inventory / Customer requirement = 25 / 50 = 0.5 day





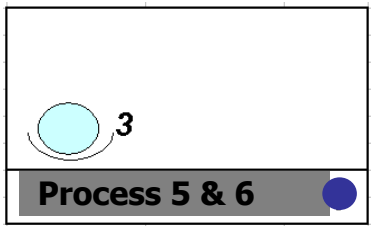
Value Added Ratio (%) = Total Cycle Time x 100 = 182.5 mins x 100 = 4.22%
Lead Time 'Totals' 4,320 mins

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2. Create the Future State Value Stream Map

Identify manning and skills requirements

- Are there sufficient operators with the right skills, capable of running the new process?
  - Consider “new” combined processes – can the operators of the “current state” follow the new standardised process in the future state?
  - In our example, are the operators for process 5 trained to process 6 as well?
- Write down the number of operators required, on the future state map

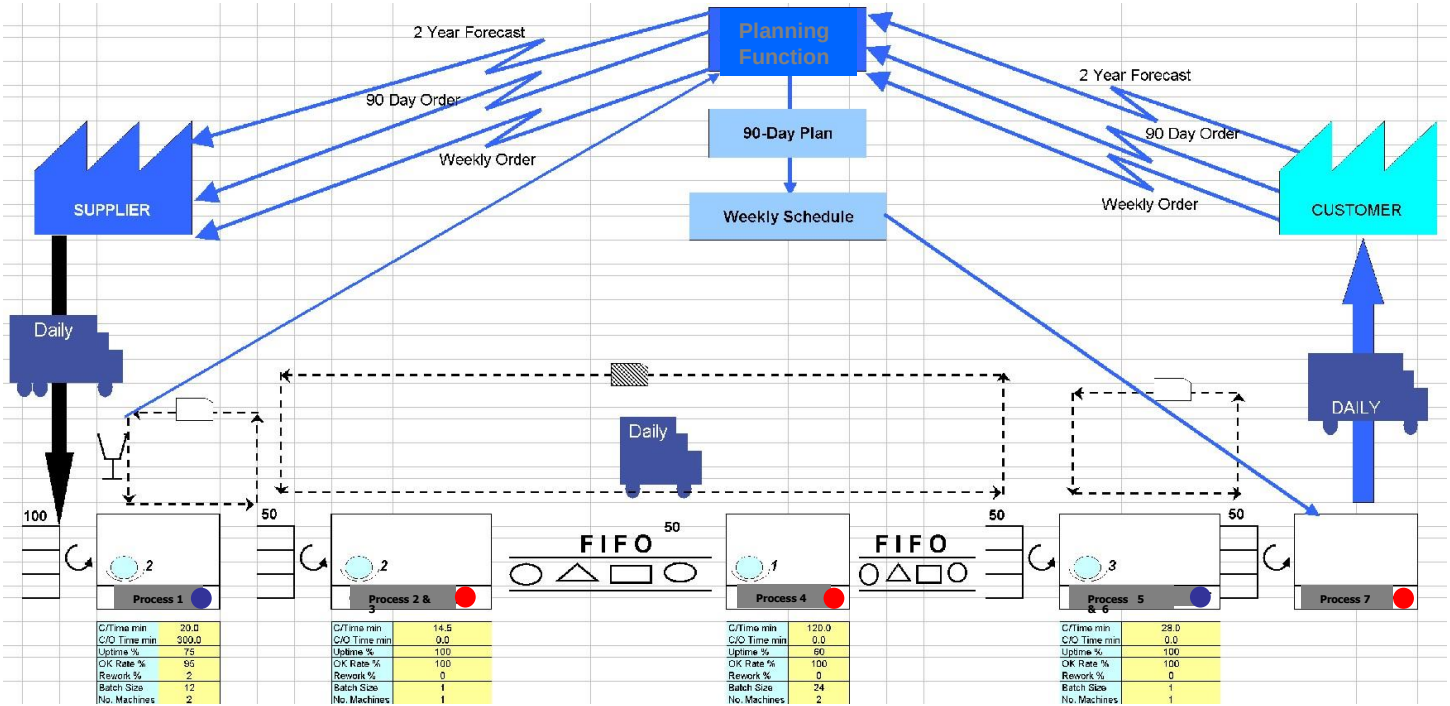


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2. Create the Future State Value Stream Map

Draw the final stages of the Future State Value Stream Map

- Draw on the remaining process boxes and information flow
- Enter all of the new data into the data boxes
- Give visibility to the control system being planned

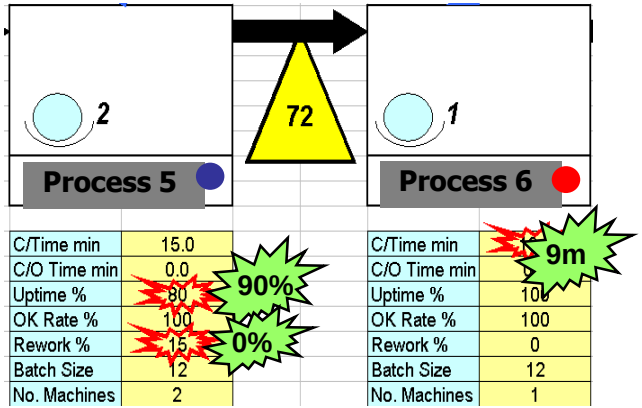


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2. Create the Future State Value Stream Map

Develop targets and action plans to achieve the Future State

- Agree targets for improvements and plans for how turn the vision into reality:
- Highlight targets around your lightning bursts
- Consider every process in the value stream, from the customer perspective of whether or not it really adds-value to the end product.



- Implementation plan needs to identify:
  - What you plan to achieve, when and how this will be done at each phase
  - Quantifiable targets to achieve each phase
  - Gated review points throughout the launch
  - Who is responsible for the implementation
- Consider where to start, either :
  - Start at the pace maker process and work upstream, or
  - Identify an area where knowledge of the process is high, a quick win is likely or the 'biggest bang for the buck' is achievable

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Gate checklist 2: Create the Future State Value Stream Map

BACK Map

- ☑ Customer requirements confirmed and opportunities for continuous flow have been identified on the map
- ☑ How material will flow through the future ideal state has been agreed
- ☑ A concept for the control system to guarantee flow has been developed
- ☑ The material / information replenishment signals have been fully understood
- ☑ The new future state Value-Added Ratio and Lead-Time Profile has been calculated
- ☑ The manning requirements and skills requirements for the new value stream have been fully understood
- ☑ The final stages of the Value Stream Map have been drawn
- ☑ Targets and Action Plans to reach the Future State have been developed

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