



How to Understand and Complete a Value Stream Map

Value Chain Competitiveness (VCC)

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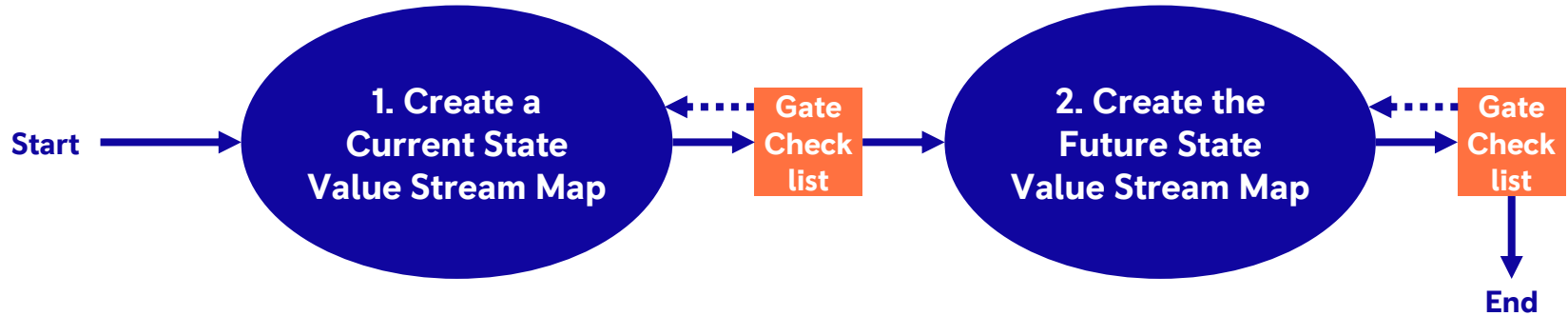


How to Understand and Complete a Value Stream Map



Scope

Objectives & Principles

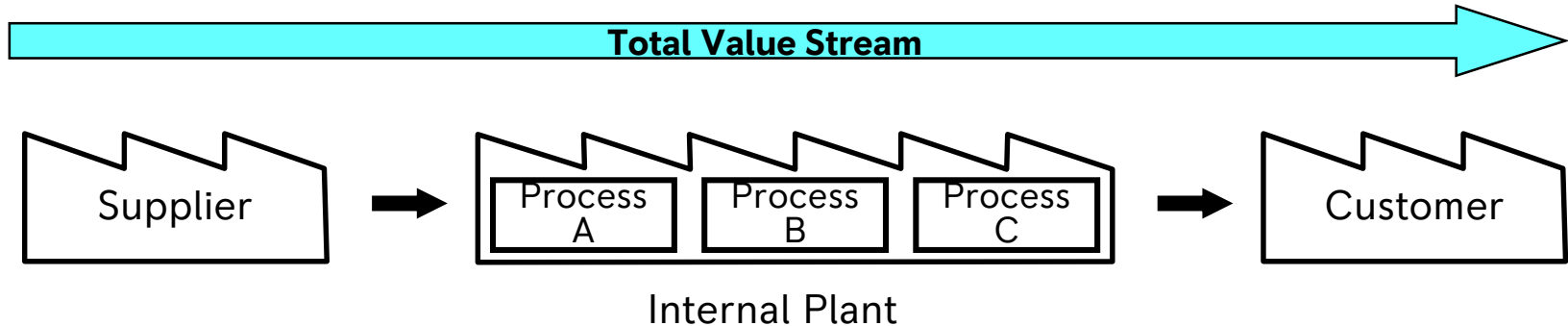


This 'How To' will enable you to:

- 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

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



Objective and Principles



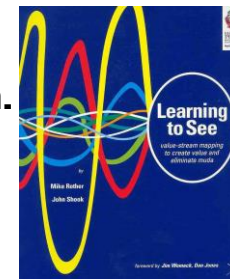
Value Stream Mapping – What is it?

- 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





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



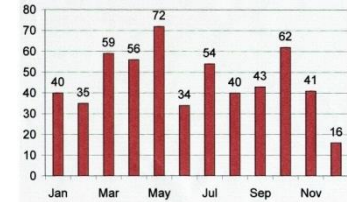
1. Create a Current State Value Stream Map



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



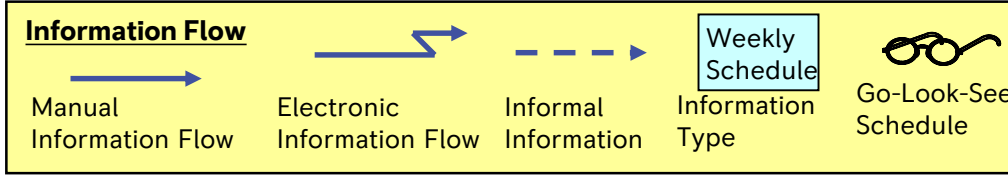
1. Create a Current State Value Stream Map



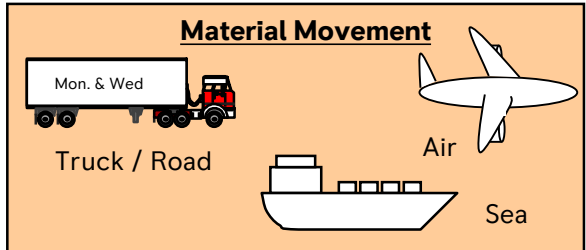
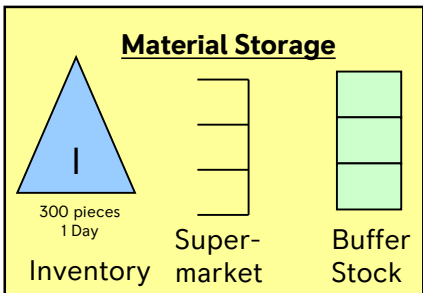
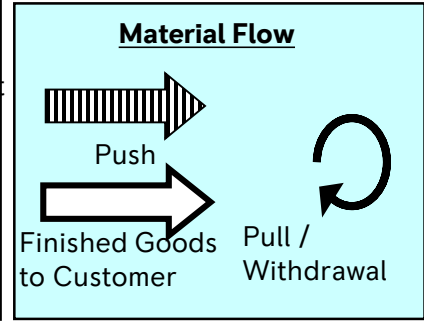
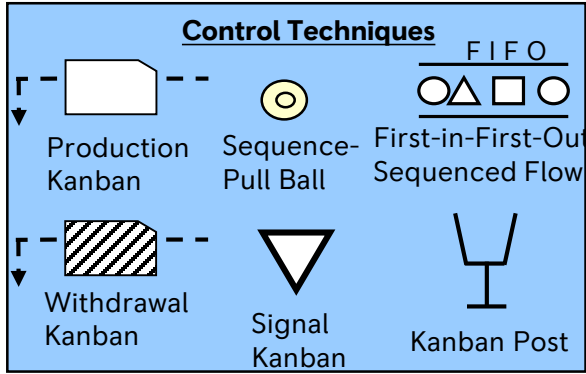
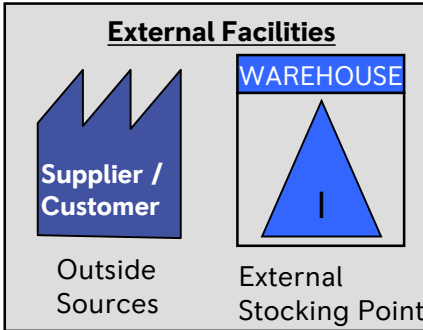
Define the scope, data required and mapping icons

Example:

Create the map on a large sheet of paper



Process Steps	Data Box
Process	Cycle Time = 45s
	Set-up = 30 min
	3 Shifts
	2% Scrap





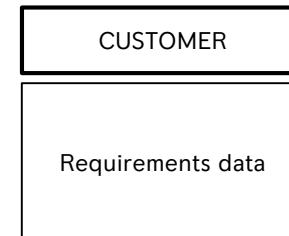
1. Create a Current State Value Stream Map



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
- 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



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

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

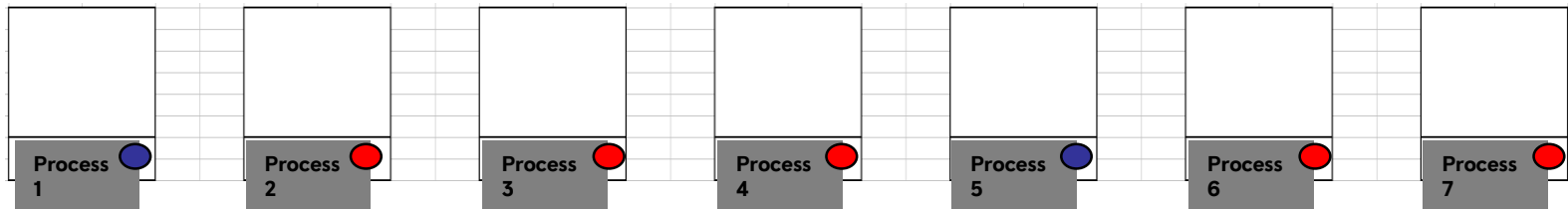


1. Create a Current State Value Stream Map



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”)





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	

	Process 1	Process 2	Process 3	Process 4	Process 5	Process 6	Process 7
C/Time min	20.0	7.0	7.5	120.0	15.0	13.0	
C/O Time min	300.0	5.0	0.0	0.0	0.0	0.0	
Uptime %	75	90	90	80	80	100	
OK Rate %	95	100	99	100	100	100	
Rework %	2	0	15	0	15	0	
Batch Size	12	12	12	24	12	12	
No. Machines	2	1	1	2	2	1	



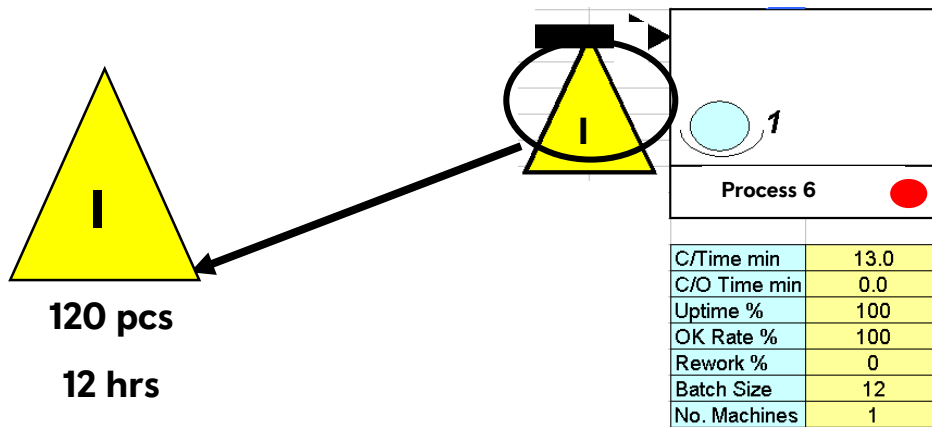
1. Create a Current State Value Stream Map

[BACK](#)
[Map](#)
[NEXT](#)

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!



1. Create a Current State Value Stream Map

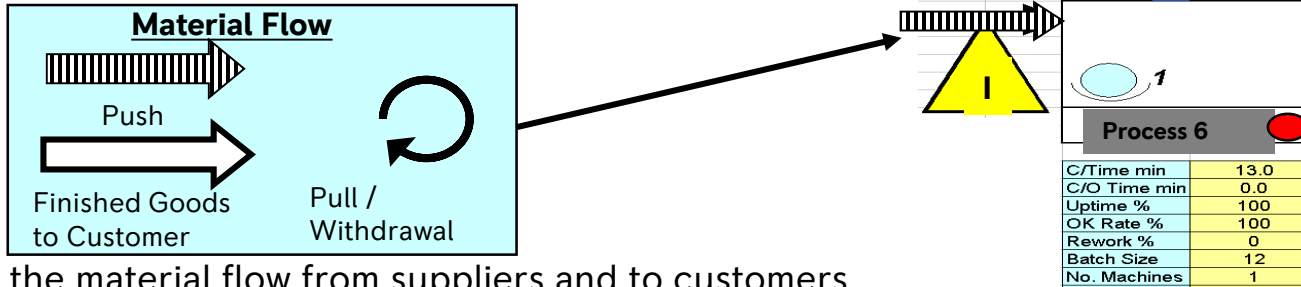
BACK

Map

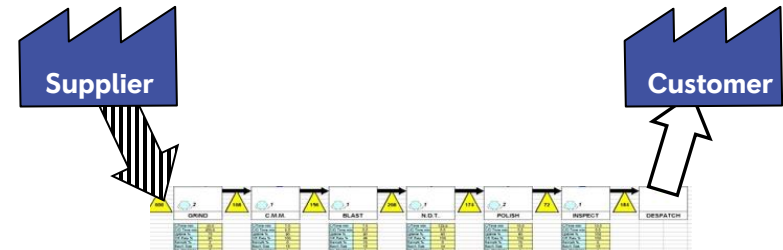
NEXT

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?



1. Create a Current State Value Stream Map

BACK

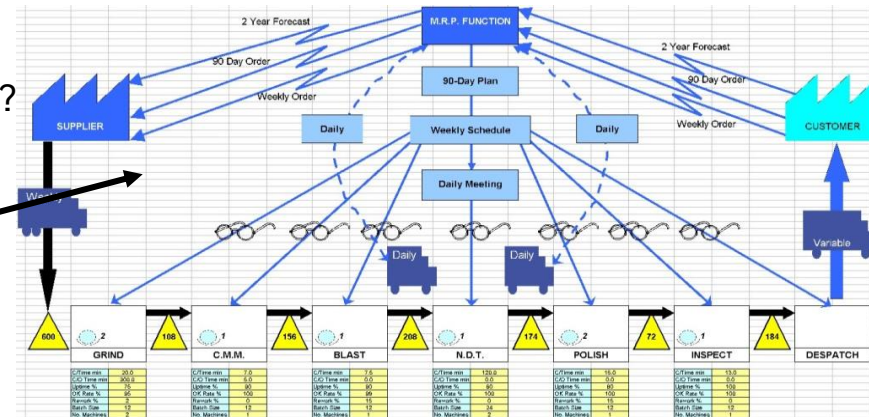
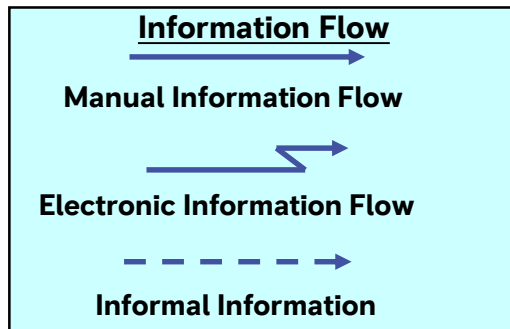
Map

NEXT

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 ?



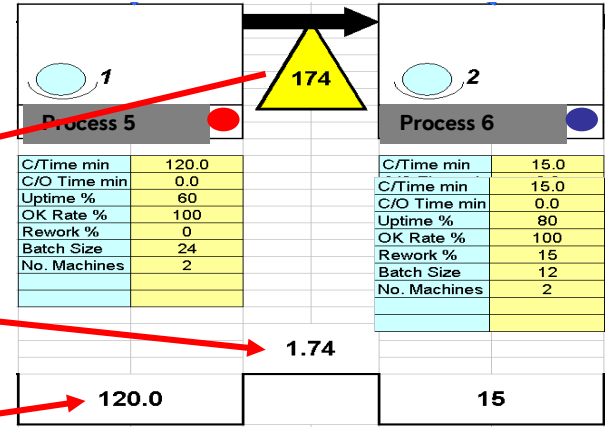


1. Create a Current State Value Stream Map



Add process time and lead-time

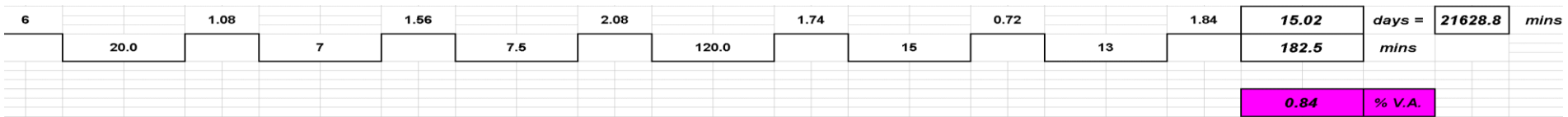
- Inventory can be used to calculate the lead-time profile - convert inventory into “days-worth” of stock, based on customer demand



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

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

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



1. Create a Current State Value Stream Map

BACK

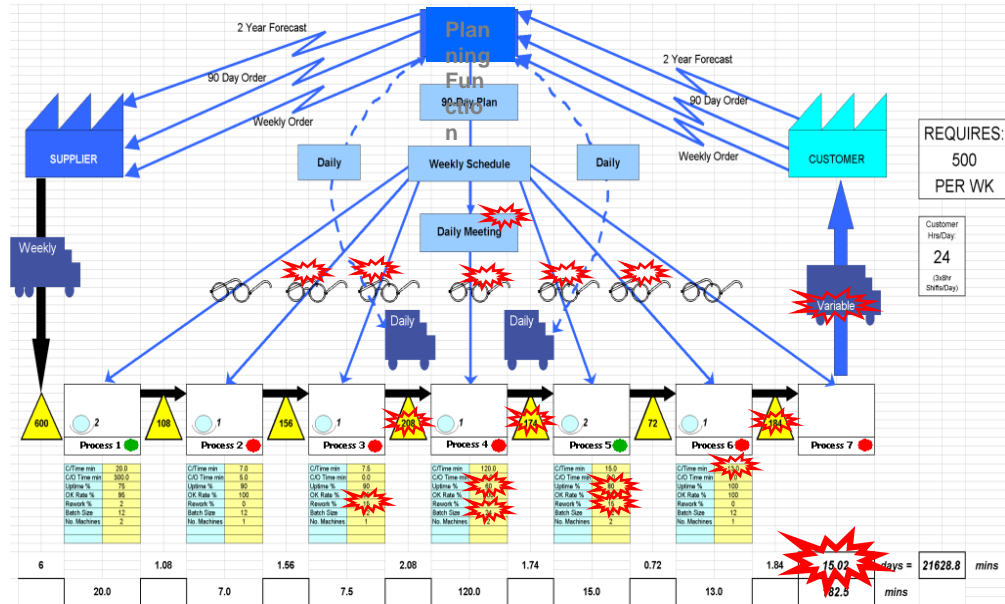
Map

NEXT

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 ?





Gate checklist 1: Create a Current State Value Stream Map



- 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



2. Create the Future State Value Stream Map

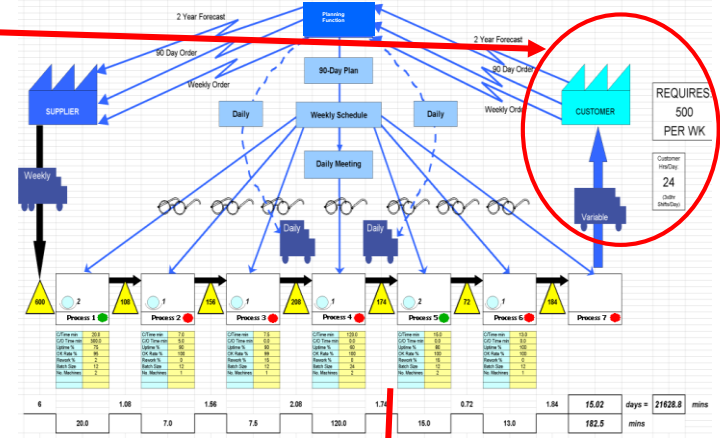


Confirm customer requirements & identify opportunities for continuous flow

Reconfirm the customer requirement

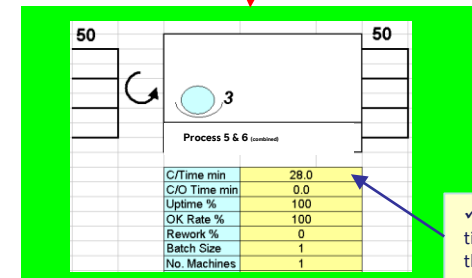
Look for any possibilities for continuous flow

- 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



Future VSM

Combine operations



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

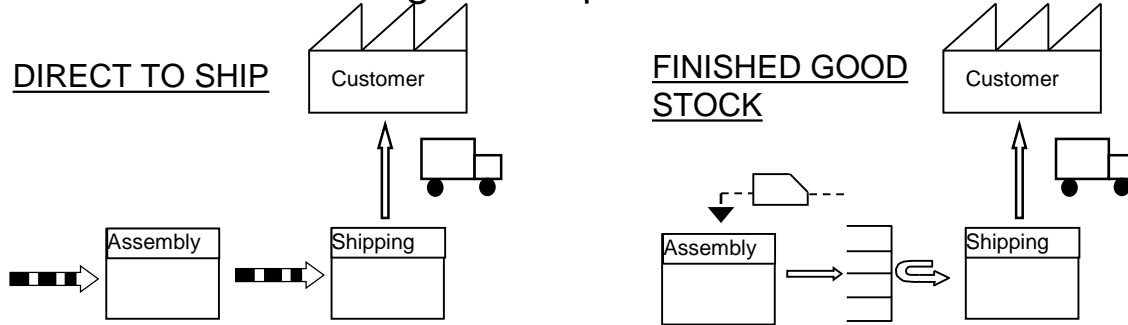
✓ Cycle time less than takt

2. Create the Future State Value Stream Map

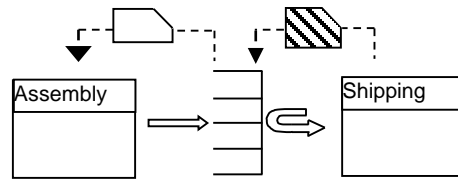
Map

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

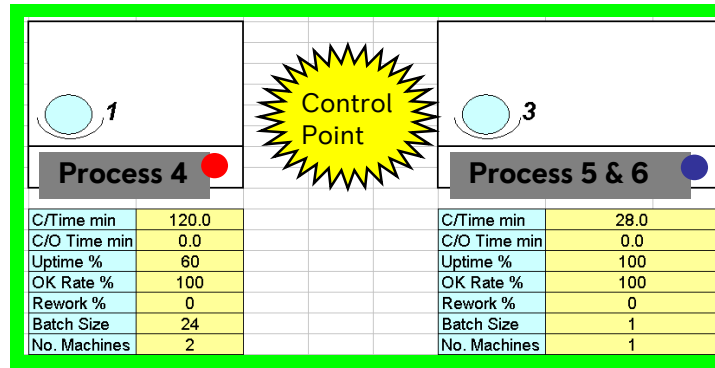


2. Create the Future State Value Stream Map



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

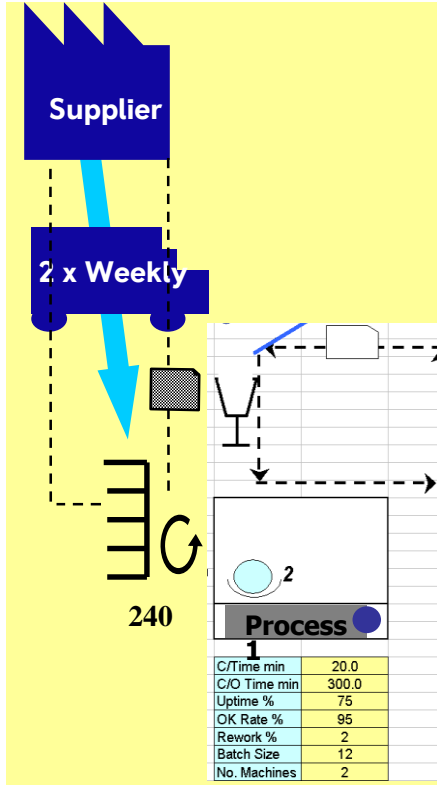




2. Create the Future State Value Stream Map



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



2. Create the Future State Value Stream Map

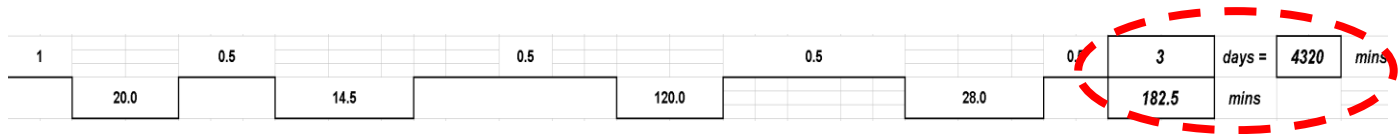
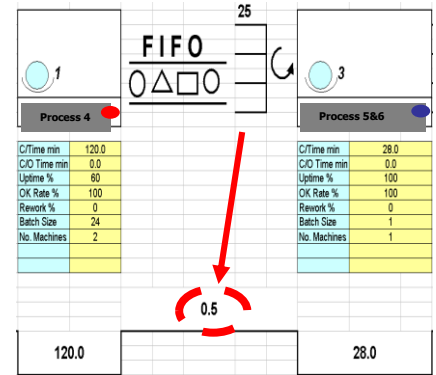


Calculate the Lead-Time profile and Value-Added Ratio

- 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 = $\frac{\text{Inventory}}{\text{Customer requirement}} = \frac{25}{50} = 0.5 \text{ day}$



Value Added Ratio (%) = $\frac{\text{Total Cycle Time} \times 100}{\text{Lead Time 'Totals'}} = \frac{182.5 \text{ mins}}{4,320 \text{ mins}} \times 100 = 4.22\%$

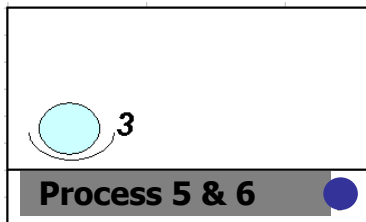


2. Create the Future State Value Stream Map



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



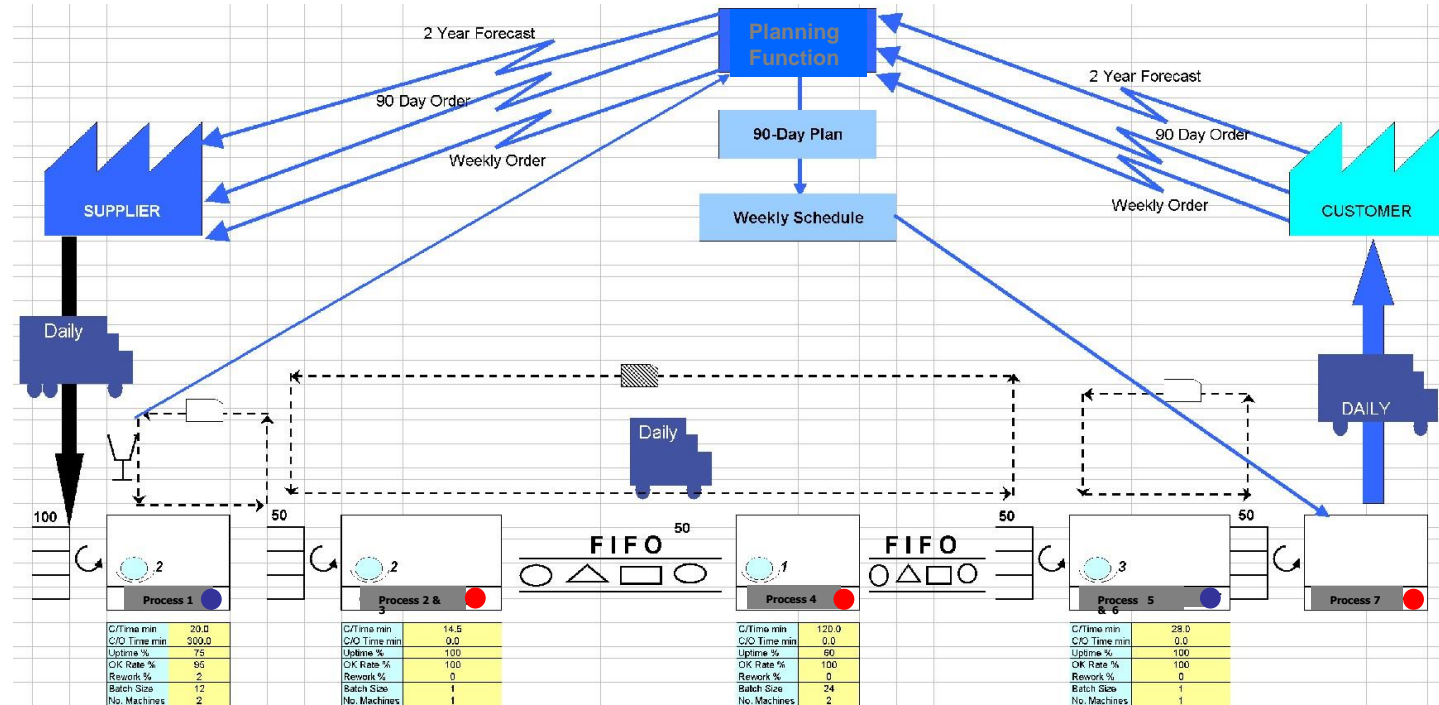


2. Create the Future State Value Stream Map



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



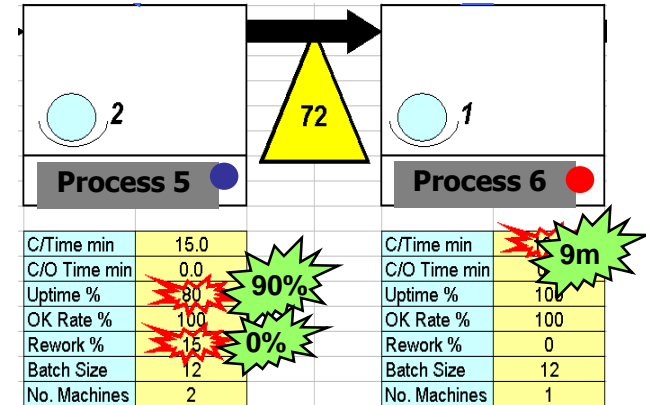


2. Create the Future State Value Stream Map



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





Gate checklist 2: Create the Future State Value Stream 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