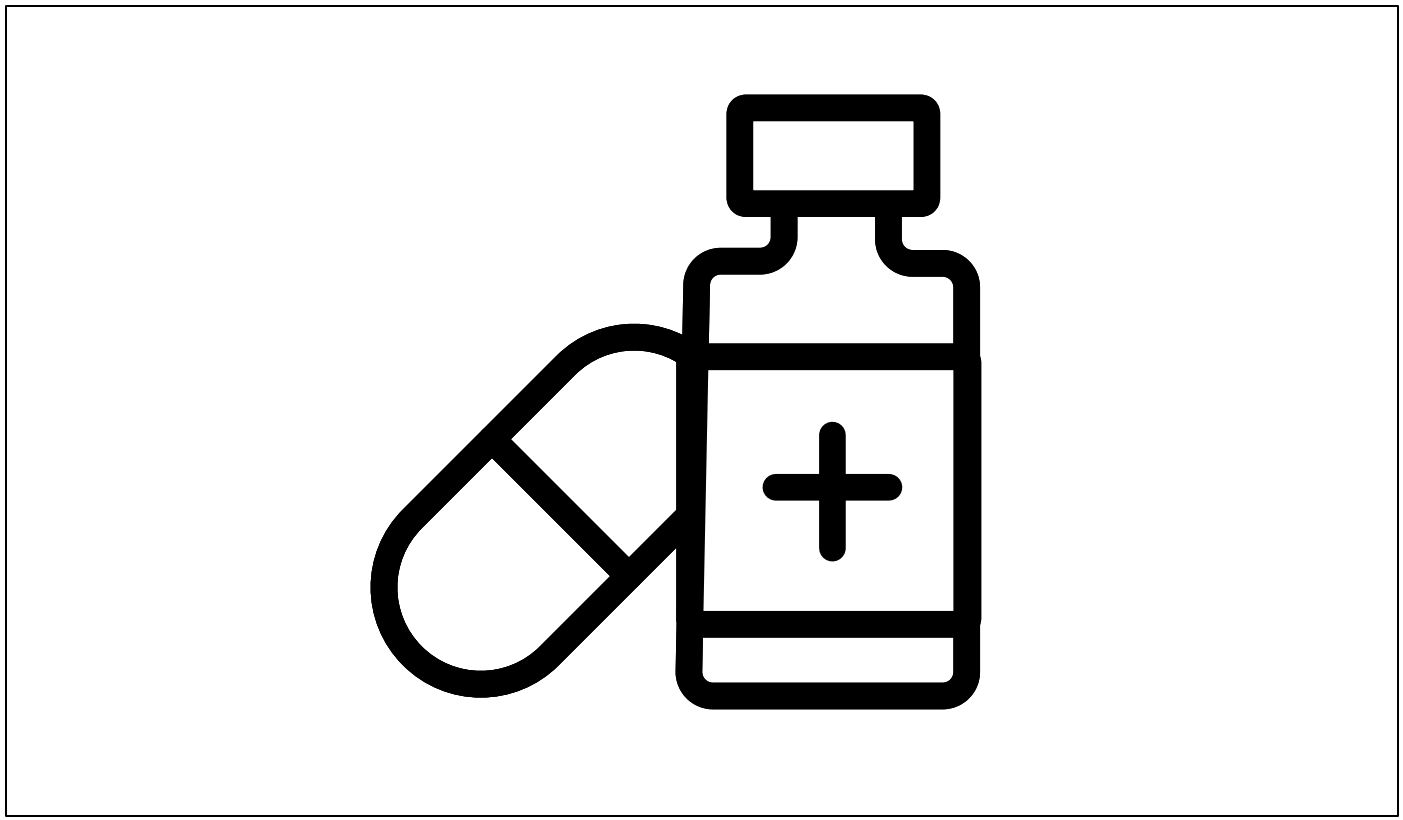
Quick Pharma VSM

Learn how to use Pharma VSM application for plant level value stream mapping of pharmaceutical production that has upstream fermentation and downstream extraction phases.



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How to Use this File

This file contains the reading materials and the exercise pages from the course (title on previous page). While the course can only be taken on a computer, this booklet can be useful for note taking and later for refresher training.

This booklet is designed for on-screen and print use. For on-screen use, we recommend Acrobat Reader with the page display set to "Single Page View".

For hardcopy use, print the file on 8.5x11 or A4, and bind along the long edge.

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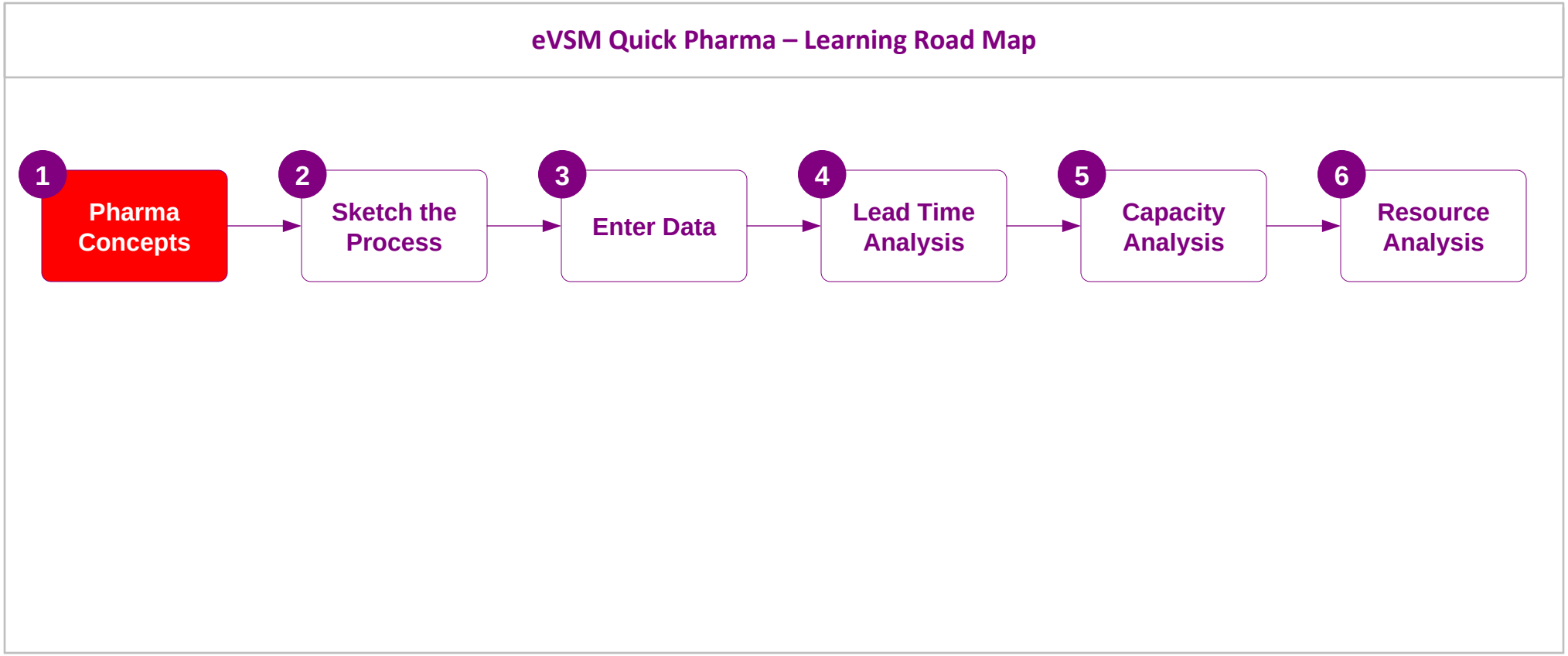
Introduction to Pharmaceutical Production Concepts

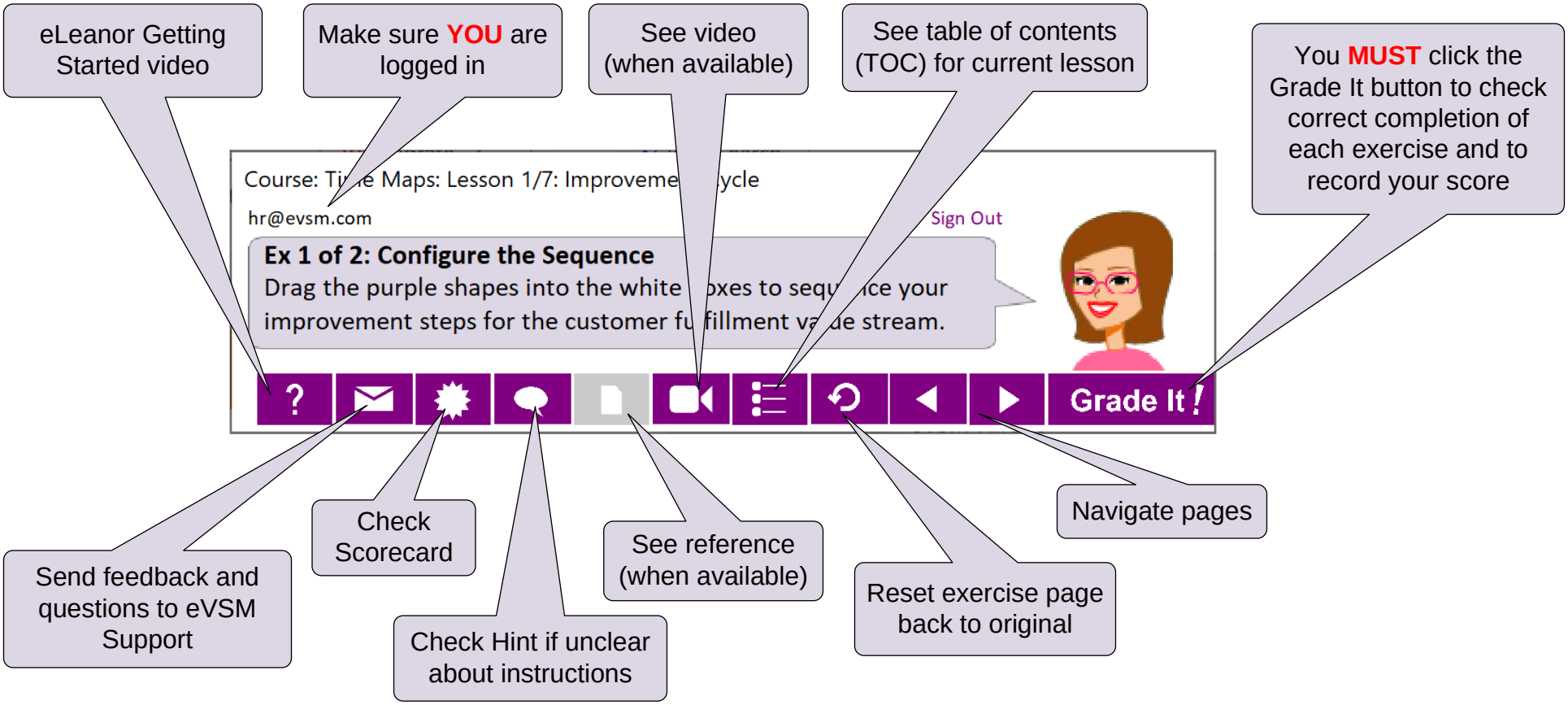
The Quick Pharma application is used for plant level value stream mapping of pharmaceutical API production. The value stream starts with a vial of cell culture and ends with the active pharmaceutical ingredient (API). The application standardizes the variables, shapes, equations and charts used in such maps.

This first lesson covers some or the base concepts for Pharma value stream mapping.



NOTE: You must have eVSM v11.39 or later to run this course. If you have an older version, please contact support@evsm.com for information on how to upgrade.

Working with the eLeanor Control Panel



Important Notes

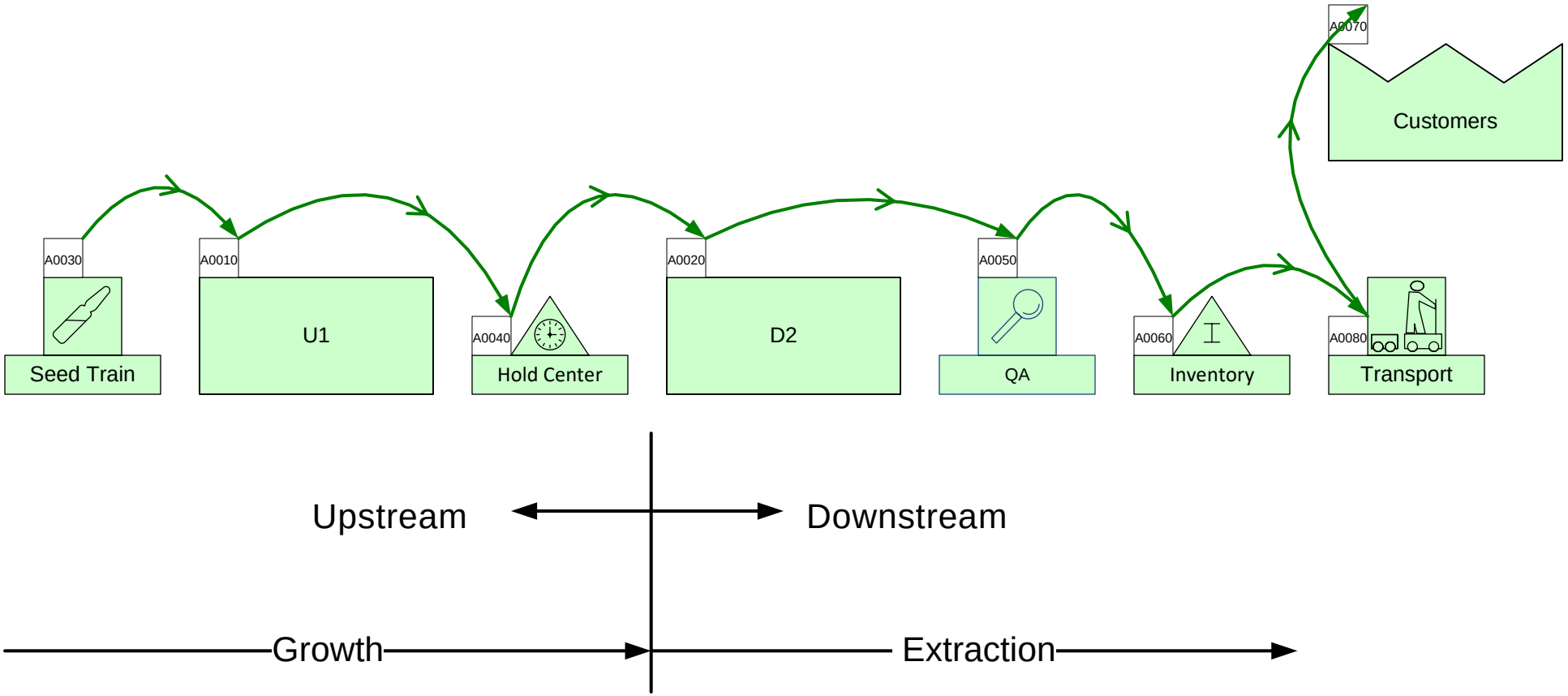
1. Make sure you have a good eLeanor environment: large screen PC, 1280x720 resolution minimum, physical mouse with scroll wheel
2. When you complete an exercise, you MUST click the “Grade It” button
3. You WILL lose points if you get an exercise wrong the first time
4. If you are stuck on an exercise, check the Hint. If that does not help, go back and review the preceding Readme pages. If you are still unsure, click the Feedback button in the eLeanor panel and ask your question.

Basic Pharma API Production Map

Let's use a simple map to discuss some of the Pharma API (Active Pharmaceutical Ingredient) production concepts.

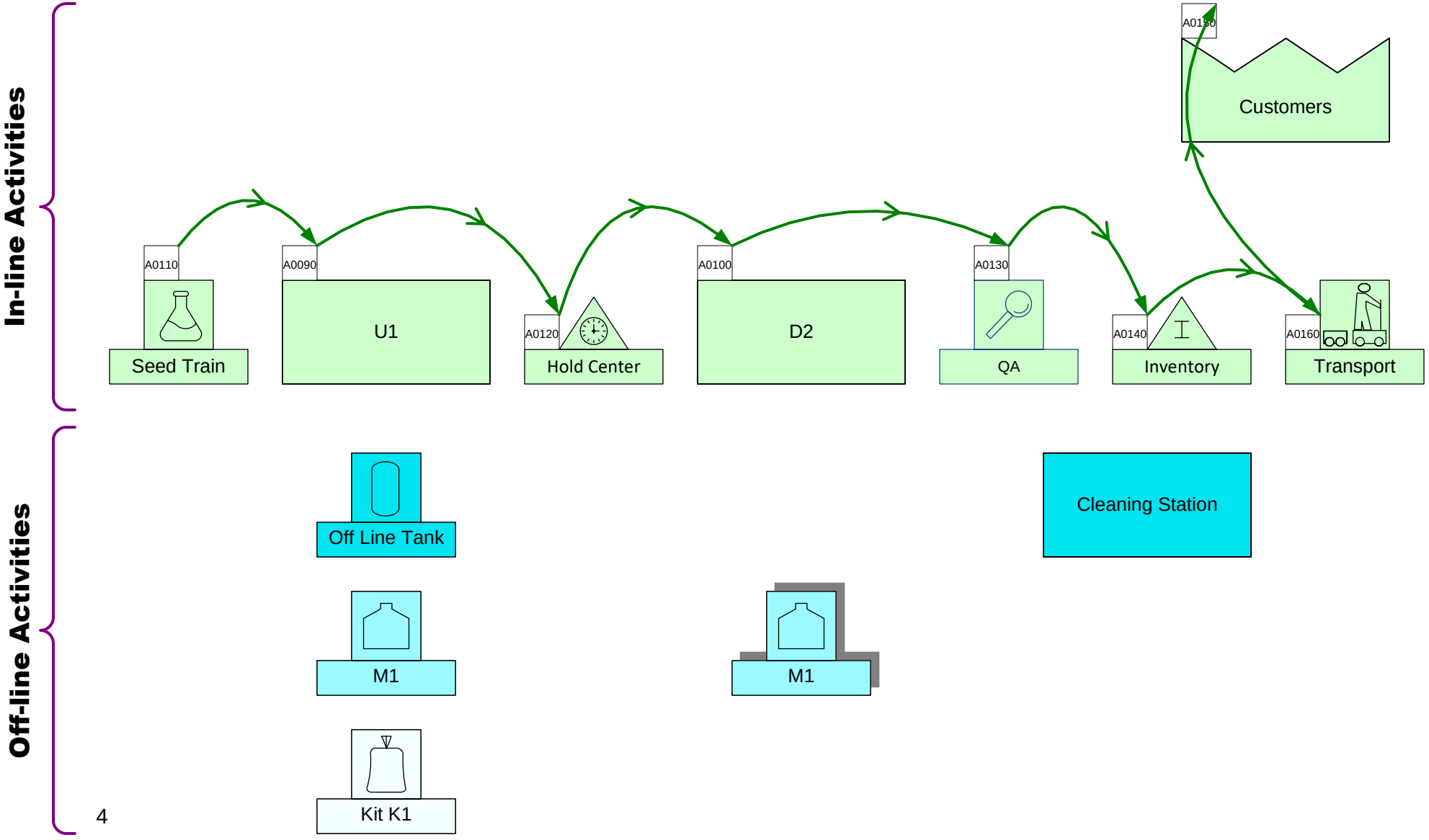
Let's look at a Bio API where Production starts with an ampoule containing the cells and the growth of these in the "Seed Train" using flasks, wave bags, and tanks as the volume increases. This is all part of the upstream operation and can be mapped with one or more seed train shapes and one or more in-line activity shapes like U1, below.

The resulting materials after the growth phase is put in a holding tank from which batches are withdrawn as needed for the downstream extraction phase. Each batch created down stream is termed a "run".



Basic Pharma API Production Map (Contd.)

The in-Line activities track the main pharma product from cell culture through to finished goods and include cell growth, extraction and in-line hold and quality checks. The In-Line activities impact the overall lead time from cell culture to released product. The off-line activities like media creation, storage in tanks are important but are assumed to not delay the in-line activities or impact lead time. The off-line activities are just placed visually where they directly support the in-line activities (like the kit, media, tank below) or off to the side where they are supporting the line in general (like the cleaning station below)



Which of the following is true for "Off-Line" activities?
Select all that are true.

- ☐ They support the in-line activities
- ☐ They are assumed to be managed so they don't slow the in-line activities
- ☐ They consume resource
- ☐ They contribute to the in-line lead time calculation

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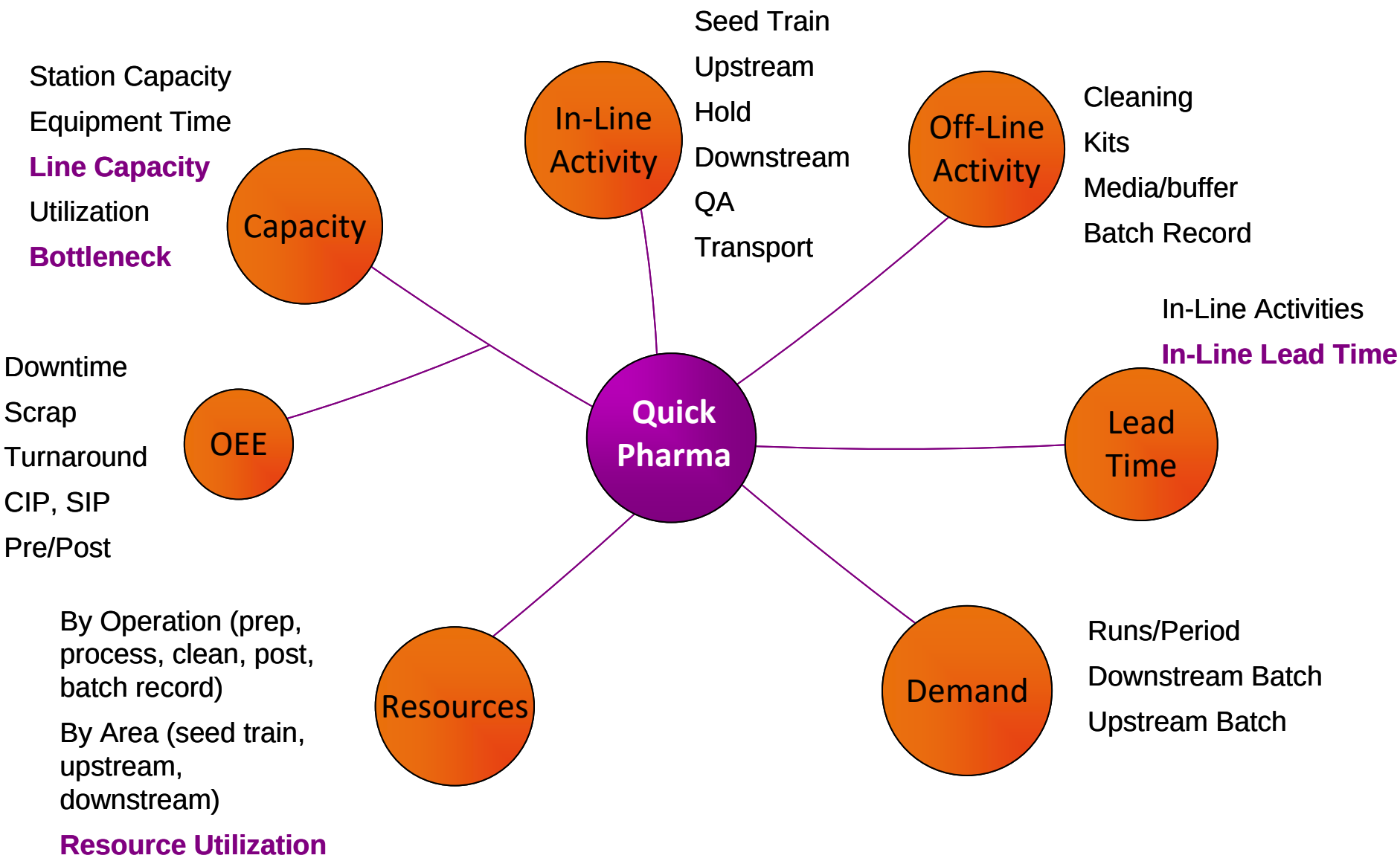
Quick Pharma Concepts

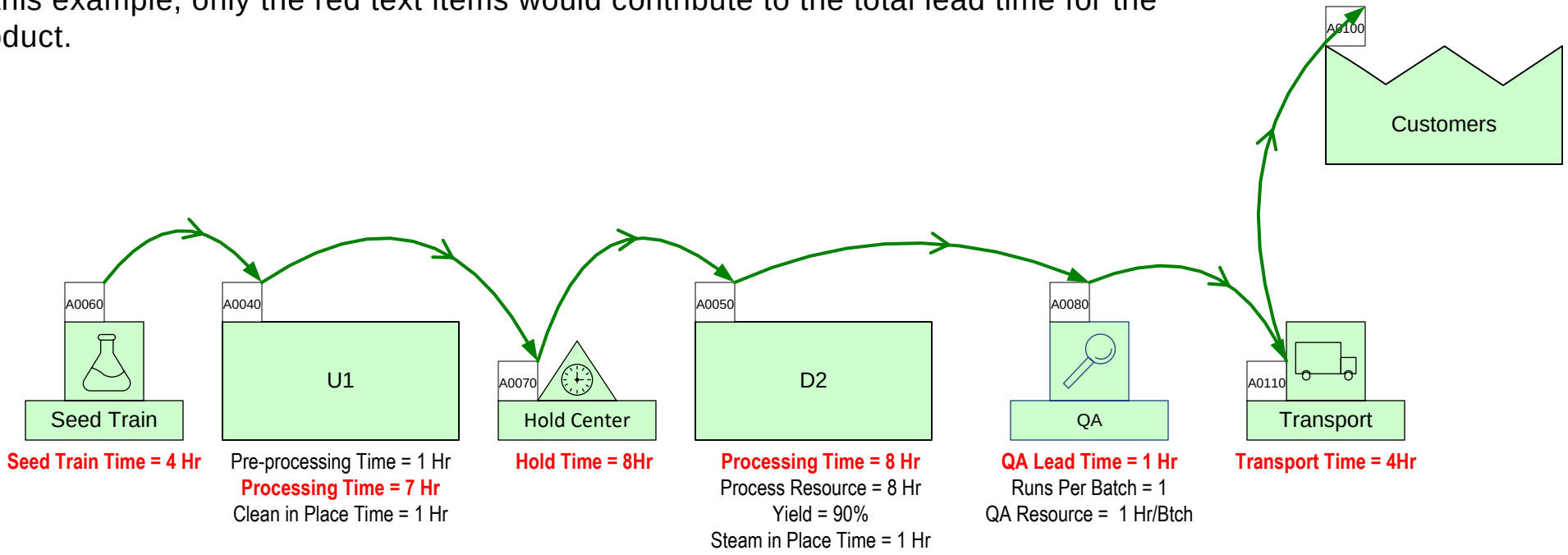


Lead Time

Lead time is one of the many calculations that Quick Pharma is capable of computing. The calculation is simply the time it takes to create a product from the start to the end of the process.

Lead Time is the time required for the product to go through the process. It does not include equipment time (pre-process setup, or post strip-down, cleaning, etc.) or people resource time.

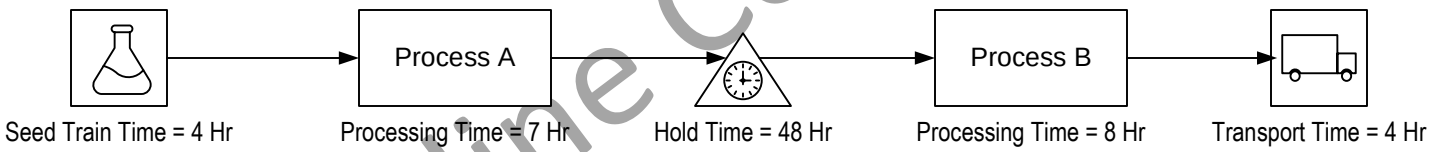
In this example, only the red text items would contribute to the total lead time for the product.



Lead time = 4 + 7 + 8 + 8 + 1 + 4 = 32 Hr

What is the Lead Time for the Process below?

- ◎ 50 Hr
- ◎ 25 Hr
- ◎ 71 Hr
- ◎ 15 Hr



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Lead Time Components

Let's imagine a batch going through one station (an in-line activity). The associated times are shown via the blocks below:

Pre	Process	Post	CIP	SIP

The station is prepped to receive the batch (Pre step), then it receives and processes the batch (Process step), followed by Post time (Post step), Clean In Pace (CIP) and Steam In Place (SIP).

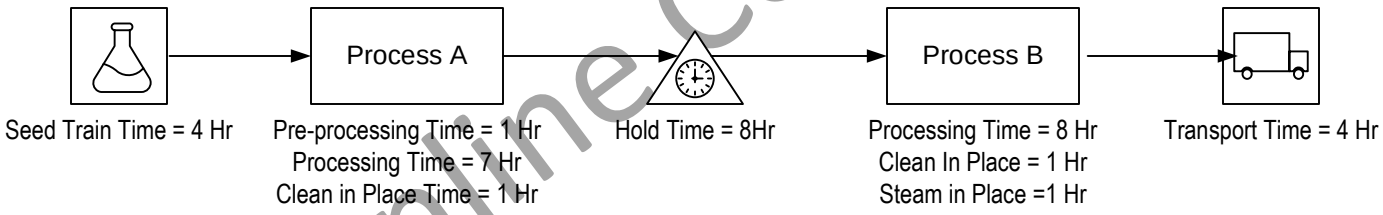
If I imagine a molecule in the batch, it enters the station at the start of the Process step and leaves at the end of the step. So for measuring **lead time** associated with that molecule, we only use the Process time.

In addition to stations that process a batch, other in-line activities that impact the lead time are in-line QA, Transport, Holds and Wait times in Inventory:

Process	In-Line QA	Hold	Transport	Wait in Inventory

What is the Lead Time for this Process?

- ◎ 28 Hr
- ◎ 31 Hr
- ◎ 37 Hr
- ◎ 51 Hr



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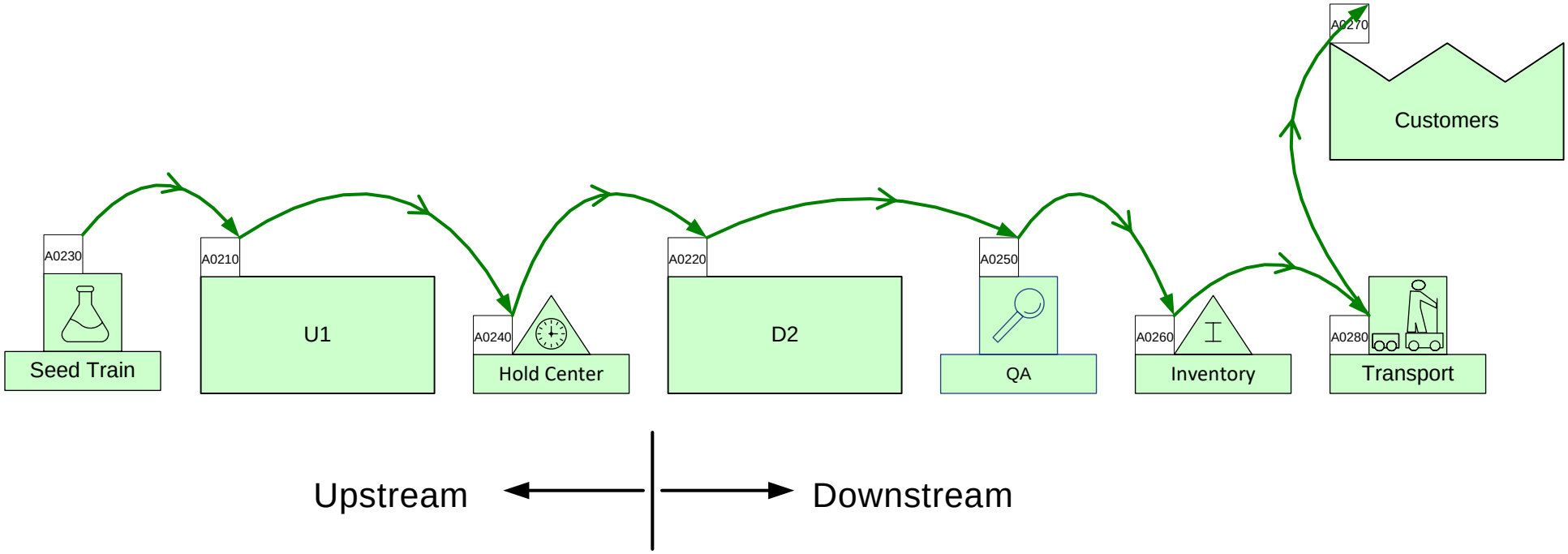
Runs & Batches



A batch of product at the end of the downstream operation is termed a “Run”.

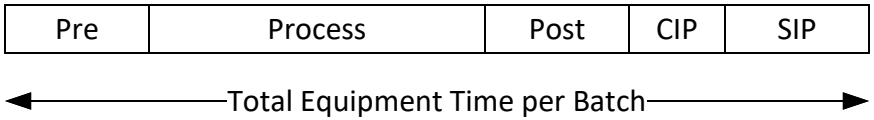
Note that a downstream batch does not always correspond to an upstream batch. The holding tank between upstream and downstream decouples the batch flow.

Similarly off-line media and kits made to support the in-line activities are made in their own batch sizes. Since we think of demand as the number of runs per time period we have to convert between any local batch size and how many runs that batch size will support.

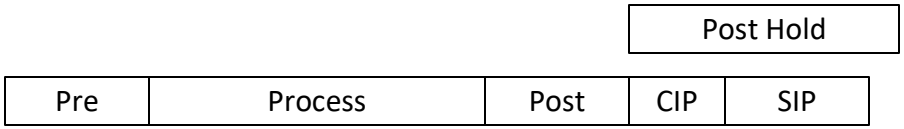
Finally, we have to understand the downstream finished weight per run so we can understand the weight of API produced per period.

Equipment Time

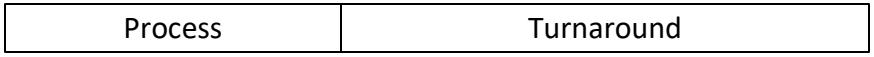
The equipment is tied up from the beginning of the Pre-Step to the end of the SIP step. So for **equipment time** calculation, all the below times are combined together. So this station can process one local batch every combined time interval.



Depending on the station and its usage, some of the time blocks will be unnecessary and there may be some variants. One example is the need for the equipment to be in hold mode for a minimum period after the “Post” step. We call this the “Post Hold” time and it runs in parallel with the CIP and SIP steps. So the equipment time component used is the maximum of Post Hold and CIP+SIP.



Sometimes, its not useful to break out all the steps and instead the concept of Turnaround time is used. This is the time from the end of the Process step until the next Process step.



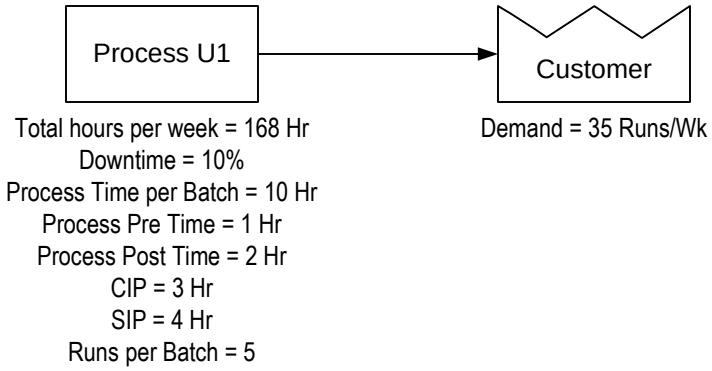
In this case, the equipment time for one local batch is based on the sum of the process time and the turnaround time.

Capacity

The equipment **Capacity** is based on:

- Equipment time per batch
- Available time of the equipment
- Number of runs per batch

Example



Capacity Calculation for Process U1

$$\text{Capacity} = \frac{\text{[Available Time]}}{\text{[Time per Run]}}$$

$$\text{Capacity} = \frac{168 * ((100-10)/100)}{(10 + 1 + 2 + 3 + 4) / 5}$$

$$\text{Capacity} = 37.8 \text{ Runs/Wk}$$

Check each of the following times that impact the capacity of equipment

- ☐ Processing Time
- ☐ Pre Time
- ☐ CIP (Clean in Place)
- ☐ Wait time in inventory
- ☐ Turnaround Time

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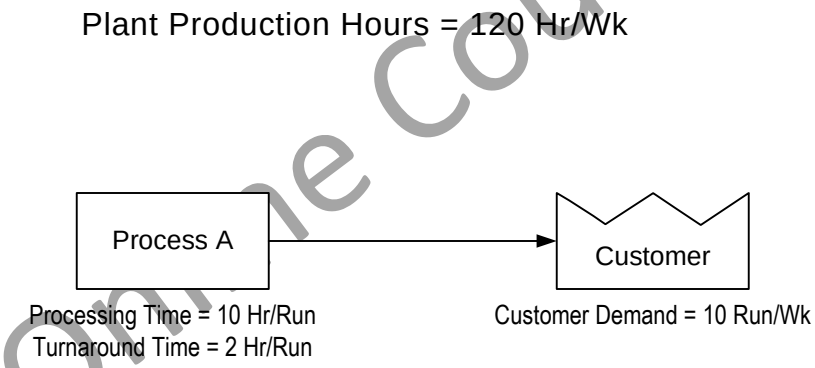
Given the data below, what is the Capacity at Process A?

- 11 Runs/Wk
- 10 Runs/Wk
- 14 Runs/Wk
- 8 Runs/Wk



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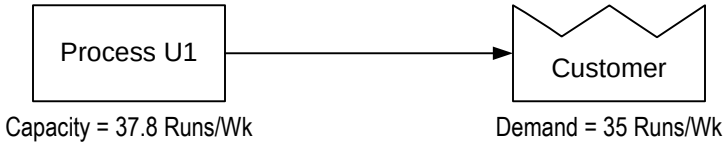
Capacity Utilization

Utilization is the percent of capacity being used by the current customer demand.

Example



Utilization Calculation for Process U1

$$\text{Utilization} = \frac{\text{[Demand]}}{\text{[Capacity]}}$$

$$\text{Utilization} = \frac{35}{37.8}$$

$$\text{Utilization} = 93\%$$

What is the Utilization at Process C?

- ◎ 50%
- ◎ 33%
- ◎ 200%
- ◎ 25%

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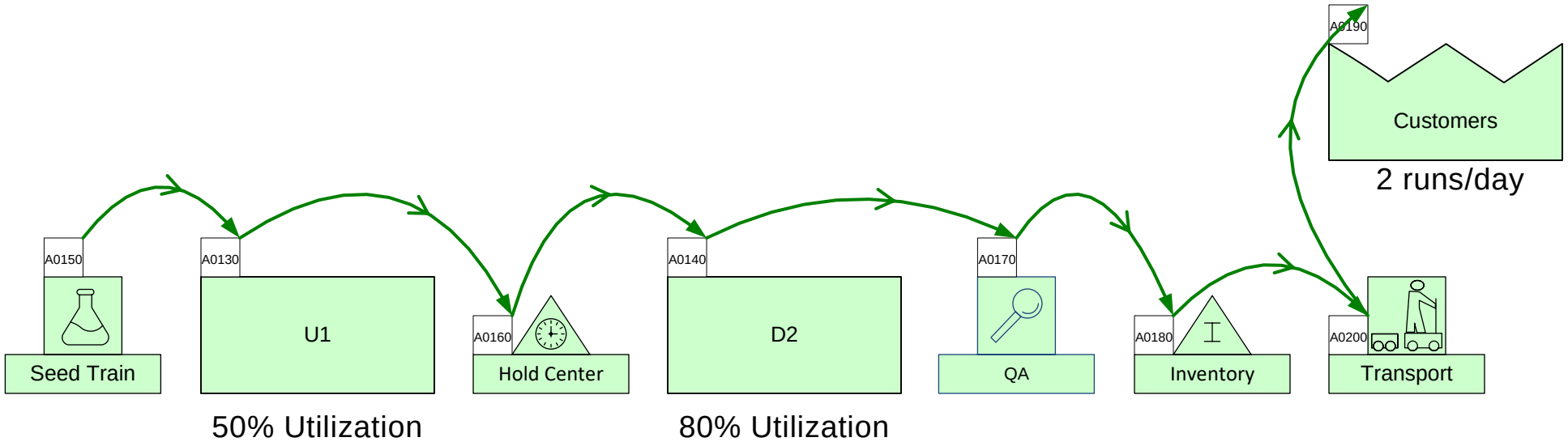
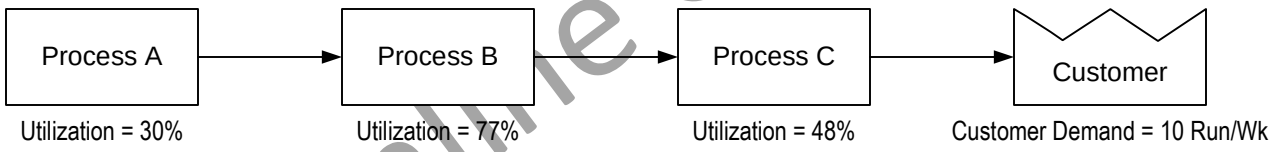
Line Capacity

In the example below, let's say that for a current demand of 2 runs/day, Station U1 had a utilization of 50% and Station D2 had a utilization of 80%. The **line capacity** is assumed to be governed by the highest utilized in-line station and is calculated as current line demand / current max utilization. In our example this would be 2/0.8 = 2.5 runs/day.



What is the Line Capacity of this Value Stream?

- ◎ 7 Run/Wk
- ◎ 18 Run/Wk
- ◎ 17 Run/Wk
- ◎ 13 Run/Wk



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Resource Calculation

Most of the VSM icons have associated resource data and it can be one of two types:

1. Resource per batch
2. Resource per time period

If both values are entered, than the overall resource required is calculated as the sum of the two.

The “Resource per batch” is converted to a resource per period value by multiplying it by the batches going through that activity in a given time period to meet customer demand.

For an in-line activity, there is resource associated with each step in the activity as show below.

Pre	Process	Post	CIP	SIP
2Hr/Batch	2Hr/Batch	0.5Hr/Batch	1Hr/Batch	1Hr/Batch

In this example the total resource required per batch at that activity is 6.5 Hrs/Batch calculated by summing the step values.

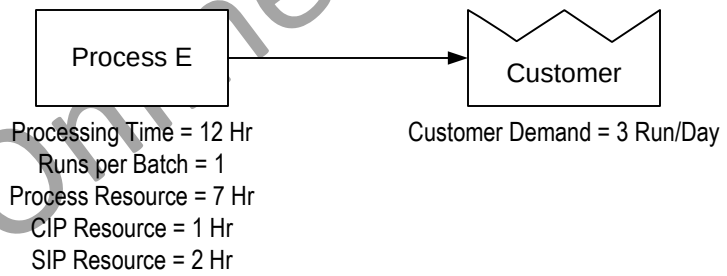
If the number of runs to meet customer demand was 5 per day and each batch was sufficient for 1 run, then the resource required per day would be 6.5*5 = 32.5 Hr/Day.

Resource Utilization

$$\text{Resource Utilization} = \frac{\text{Resource Required}}{\text{Resource Allocated}}$$

What is the Resource Required at Process E?

- ◎ 10 Hr/Day
- ◎ 22 Hr/Day
- ◎ 66 Hr/day
- ◎ 30 Hr/Day



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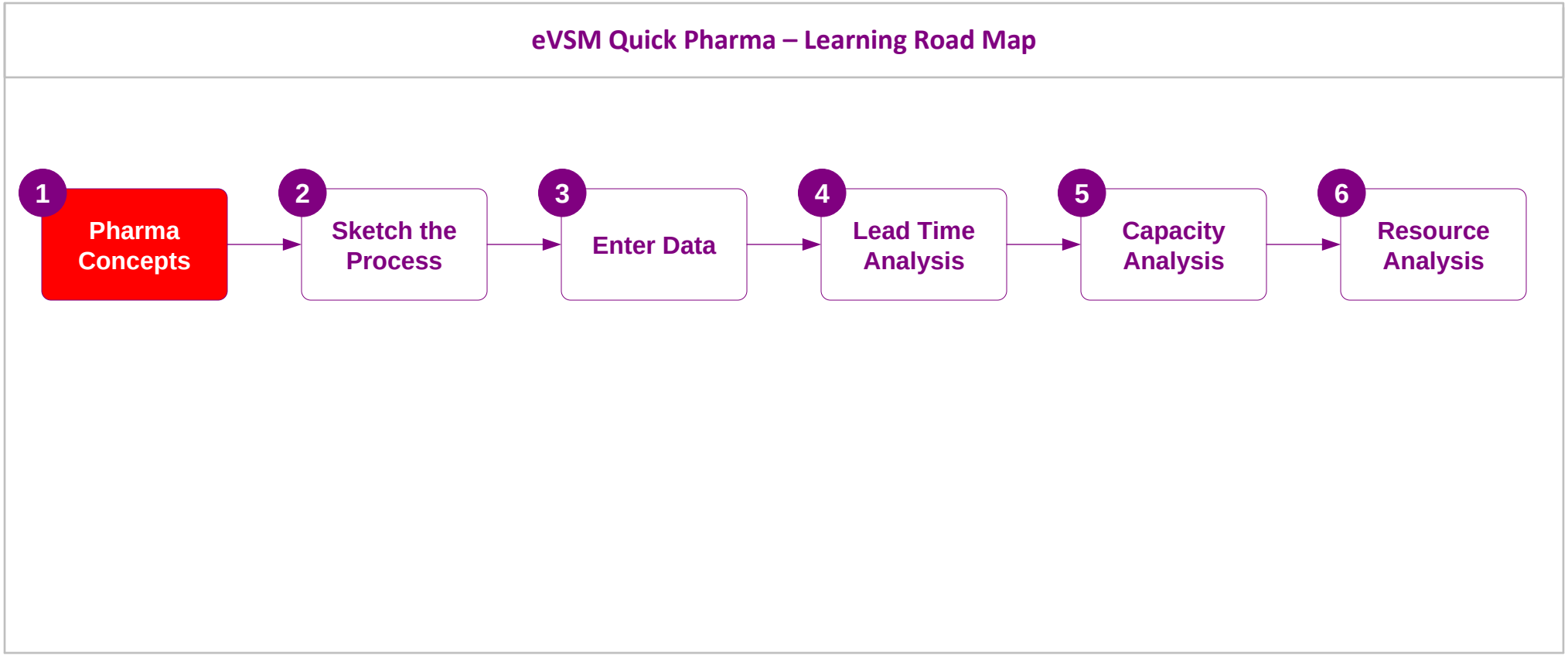
You learned:

- The key concepts of Pharma value stream mapping including the icons used, upstream/downstream, and in-line vs off-line modeling.
- Pharma value stream analyses for lead time, capacity, and resource.

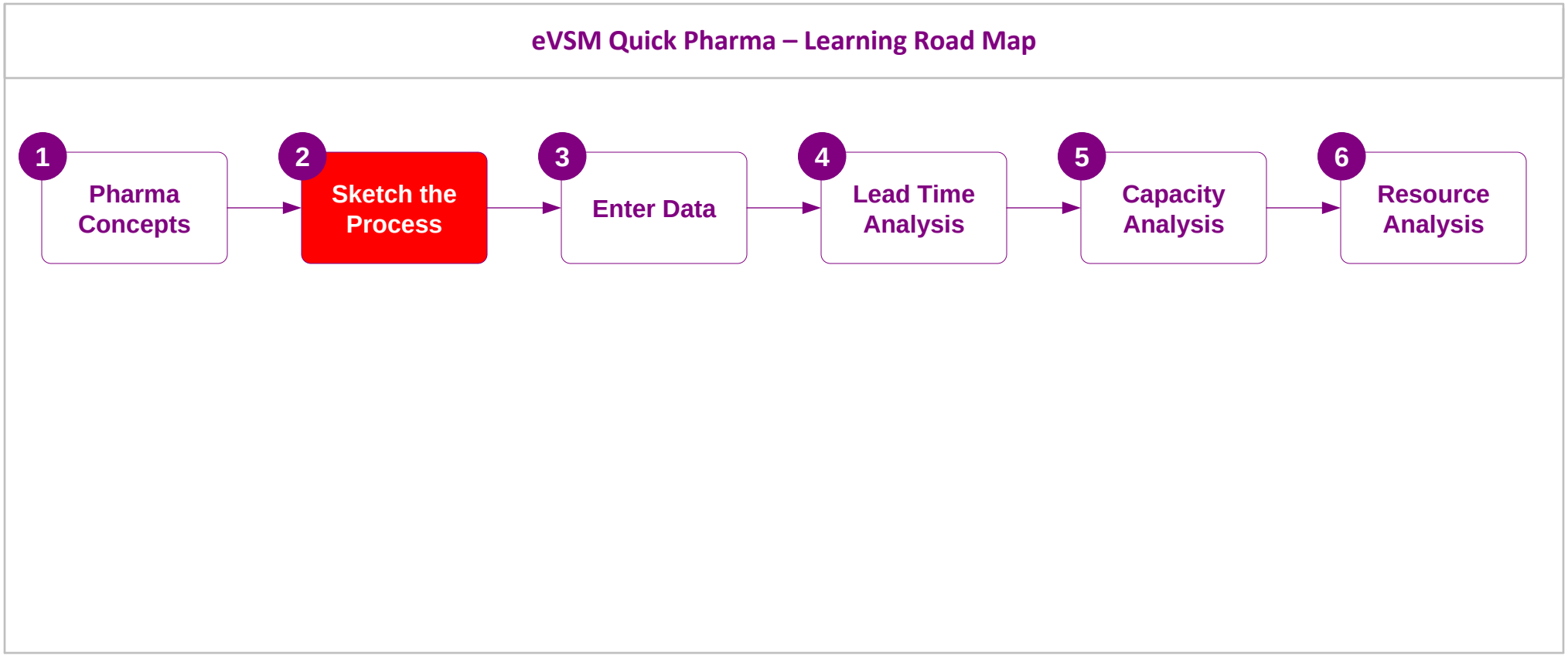


What's next:

In the next several lessons, you will learn how to sketch the material flow for the value stream, how to add data, and then how to set up the automated calculations to help answer what-if questions.

Sketch the Pharma Process Flow

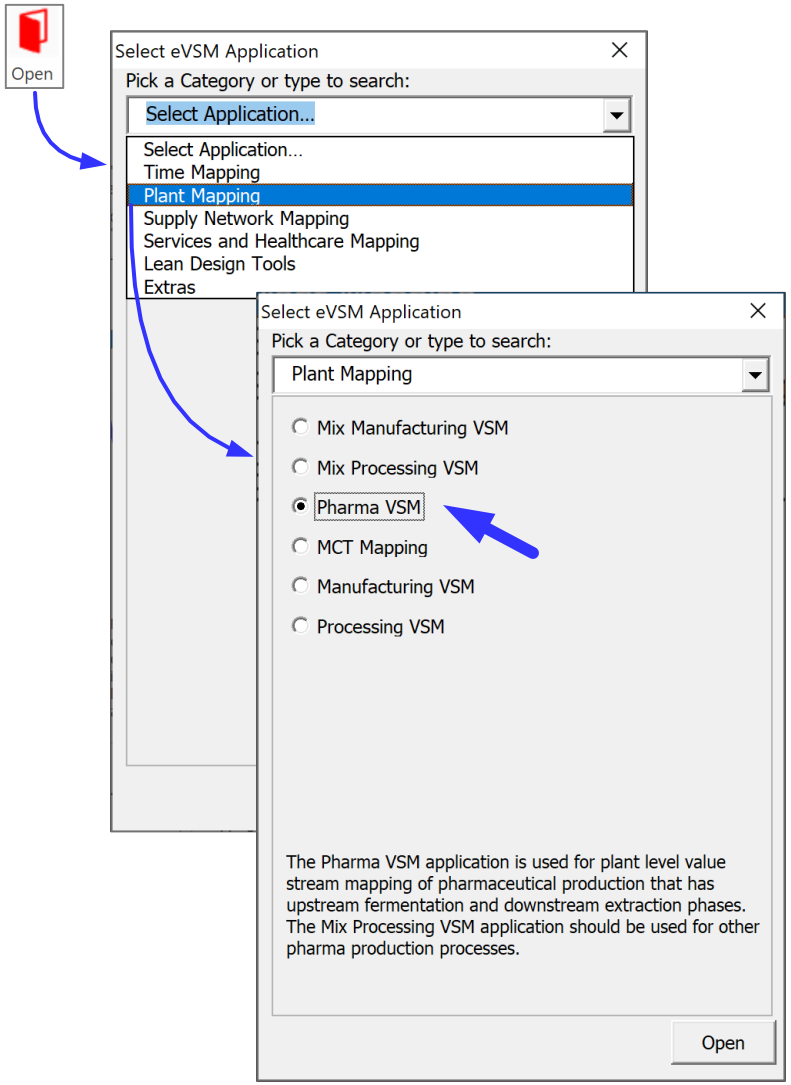
This lesson shows how to access the Quick Pharma stencils and quickly sketch the in-line and off-line material flow for value streams.



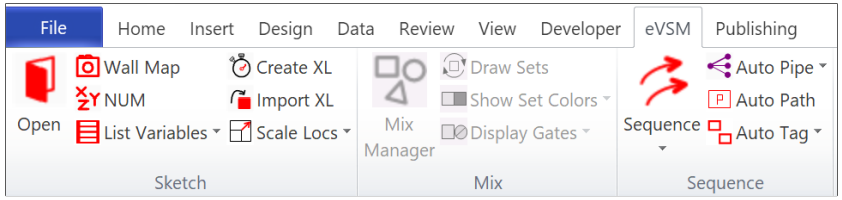
Sketch the Pharma Process Flow

Start eVSM and Open the Quick Pharma Stencils

Opening the Quick Pharma Stencils

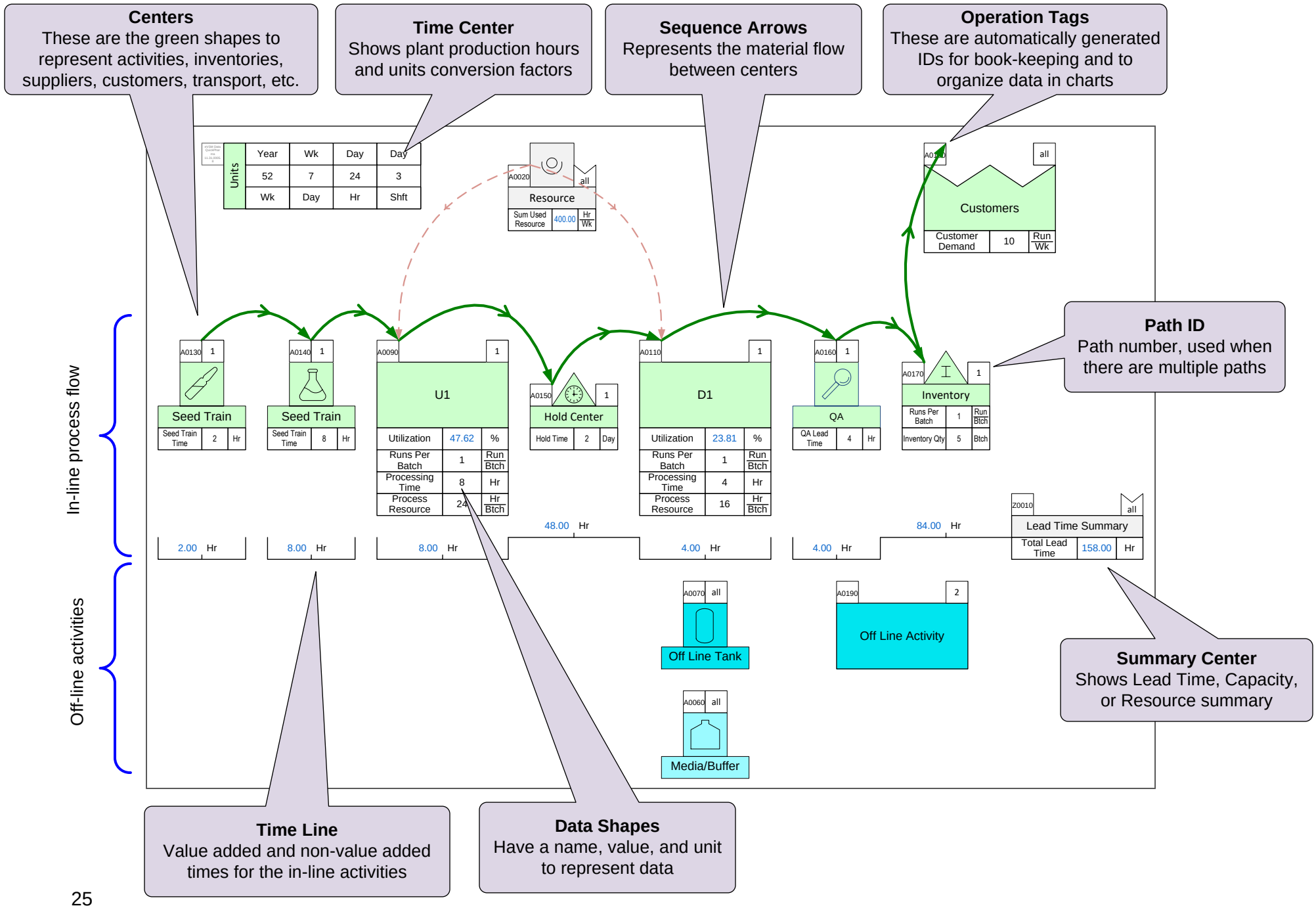


eVSM Mix Toolbar Functions



The Quick Mix toolbar functions are only available when Mix stencils are open. For Quick Pharma, this section will stay greyed out.

Essential Terminology...

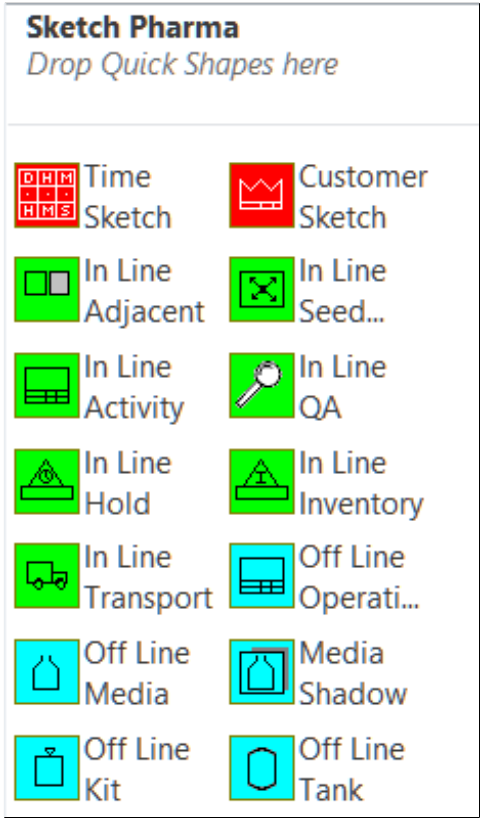


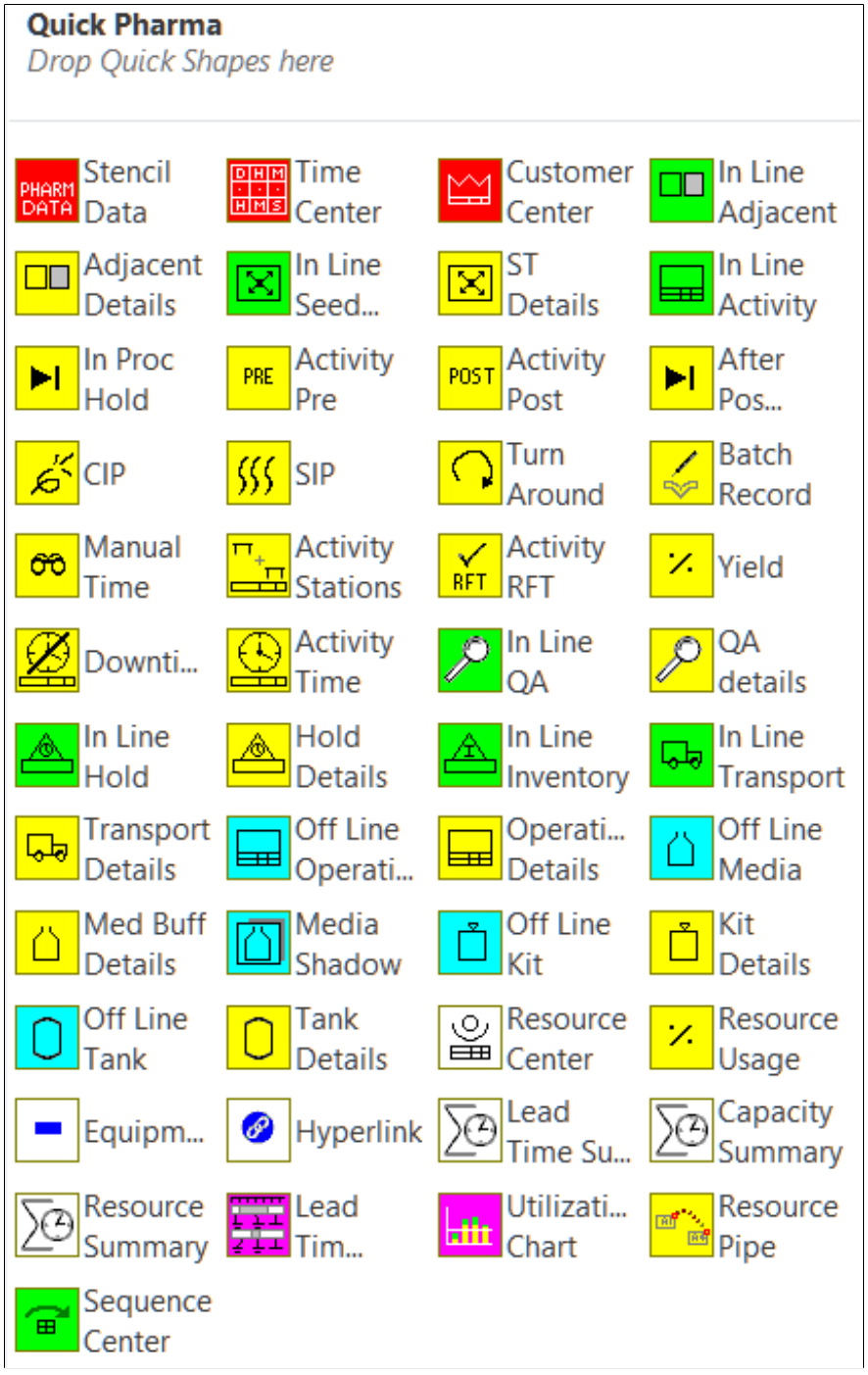
eVSM Quick Pharma Application

The Quick Pharma application is delivered as two compatible Visio stencils.

The first is the “Sketch Pharma” stencil that can let you draw the main map using icons but without data shapes. The data shapes can be added later.

The second is the “Quick Pharma” stencil that allows you to draw with the data shapes from the outset. It also has data shape add-ons (yellow icons) to support further analytics.

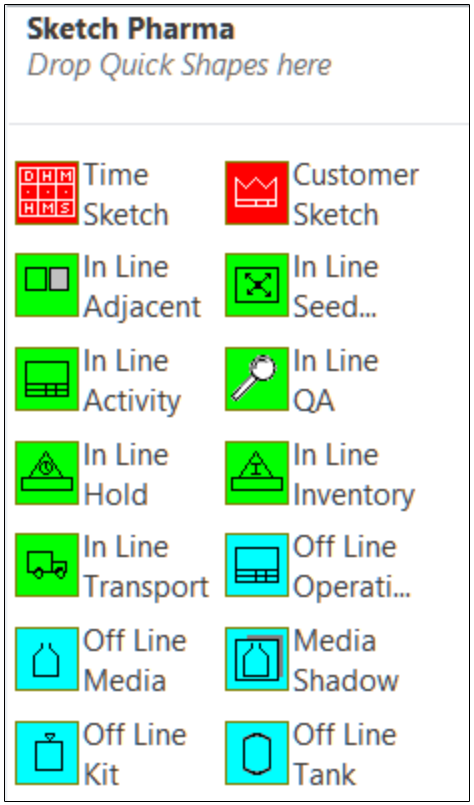




In-Line and Off-Line Operations

In the pharma production process there are operations that impact the overall lead time from the ampoule in the seed train to the finished drug substance after extraction. These are called In-Line activities and are represented as the green icons in the Sketch Pharma or Quick Pharma stencils.

There are also supporting operations like media creation that are essential but are assumed to be timed so that they run in parallel to the in-line activities and are managed such that they do not impact the overall lead time. These are called the Off-Line activities and are represented in blue in the Sketch Pharma and Quick Pharma stencils.

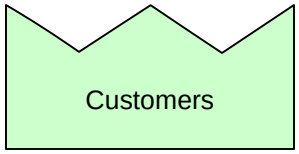


Quick Pharma Value Stream Mapping Icons

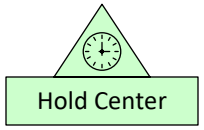
The Bio pharma map can be thought of as a combination on in-line and off-line activities.

The in-Line activities tracks the movement of the main pharma material from cell culture through to product release and includes cell growth, extraction and in-line hold, transport and quality checks. The In-Line activities impact the overall lead time from cell culture to released product. The off-line activities like kit creation, media creation, storage in tanks are assumed to not delay the in-line activities and impact lead time. The in-Line activity icons and the customer center are shown below. The off-line icons are shown on the next page.

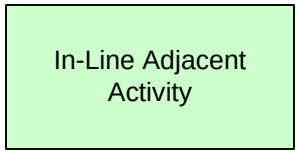
In-Line Icons



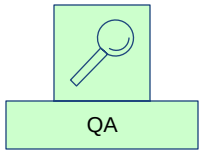
Customer Shape – Used to indicate demand.



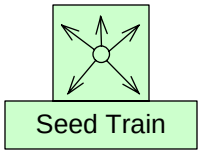
Shape used to represent in-line hold times.



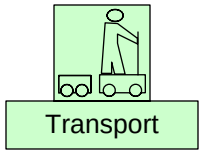
If you choose to split the map (for example upstream and downstream) than this shape is used to summarize the adjacent map so its impact can be seen.



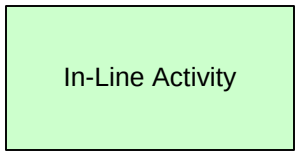
Shape used to represent in-line QA.



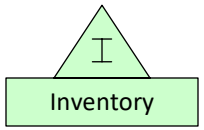
You can use a single shape to represent the whole seed train or multiple ones to represent the different stages from a vial to a tank. Icon variations support graphics like ampoule, wave bag, flask, tank.



Shape used to represent in-line Transport. Icon variations support other transport types.



This shape represents any general upstream or downstream activity and allows for pre, processing, and post steps.

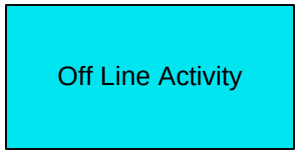


Shape used to represent in-line Inventory storage.

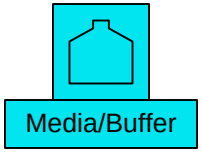
Quick Pharma Value Stream Mapping Icons (Contd.)

Off-line activities support the in-line production but are assumed to be managed such that the in-line production lead time is not impacted.

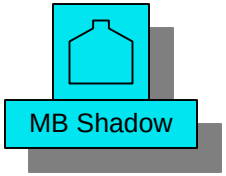
Off-Line Icons



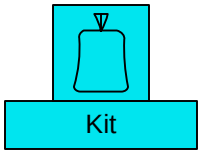
Shape represents a general off-line activity. For example you could have an area dedicated to cleaning small equipment used frequently in production.



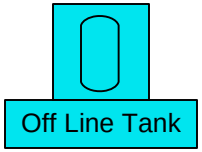
Shape represents media/buffer needed for an in-line activity.



If the same media is used in several places, it can be represented once with details by the media/buffer shape and then everywhere else by the MB (media buffer) shadow shape having the same name.

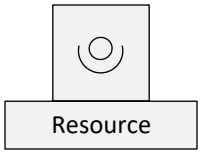


Shape represents kit used to make media/buffer.



Shape represents a storage tank supplying a production step.

Auxiliary Icons

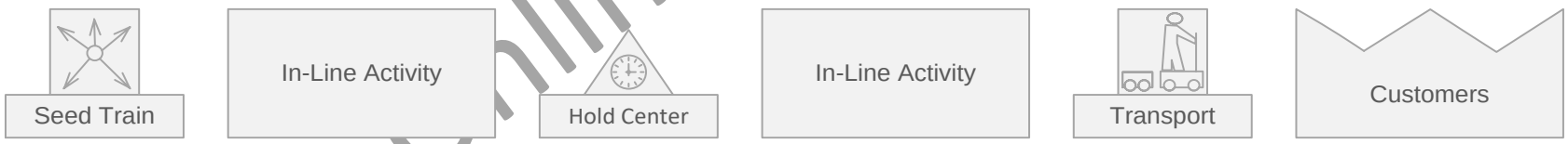


Shape representing a pool of staff. It can be connected to the activities served by the staff and will estimate the minimum staff required.

Equipment ID Tag. For visual purposes only.

Hyperlink Shape. Position on map and then insert a hyperlink to another Visio page or an external file. For navigation purposes only.

Drag out the sketch icons shown below and overlay them on the grey images



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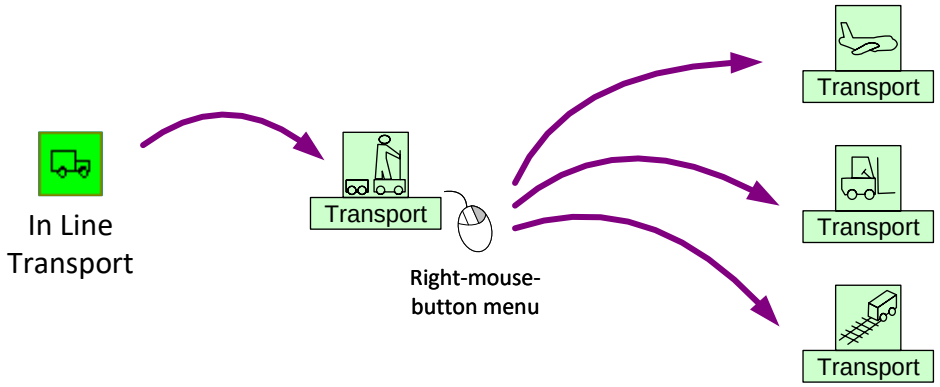
Refresher Tips

Topics below were covered in more detail in the Time Mapping course. The notes here serve as a refresher.

1. Icon Stacks

Icons such as Seed Train, Activity, and Transport belong to families of similar icons. You can switch to other shapes within the same family (eg. Forklift to Truck) with the “Change Shapes” command in the right-mouse menus of the icon.



2. Page Resizing

To re-size the Visio drawing page, hold the Ctrl key and drag any page edge to the new size.

3. Adding Sequence Arrows

Sequence arrows are used to show the material/information flow between activities.

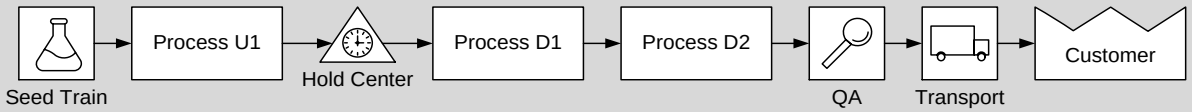
Sequence arrows are mandatory. Without these, the eVSM automated calculations cannot work.

To create and connect Sequence arrows, hold down the Ctrl key, select the centers in the required sequence, and then click the Sequence button in the eVSM ribbon.

Sequence

Draw the icons shown in the image and connect them with Sequence arrows.

Image



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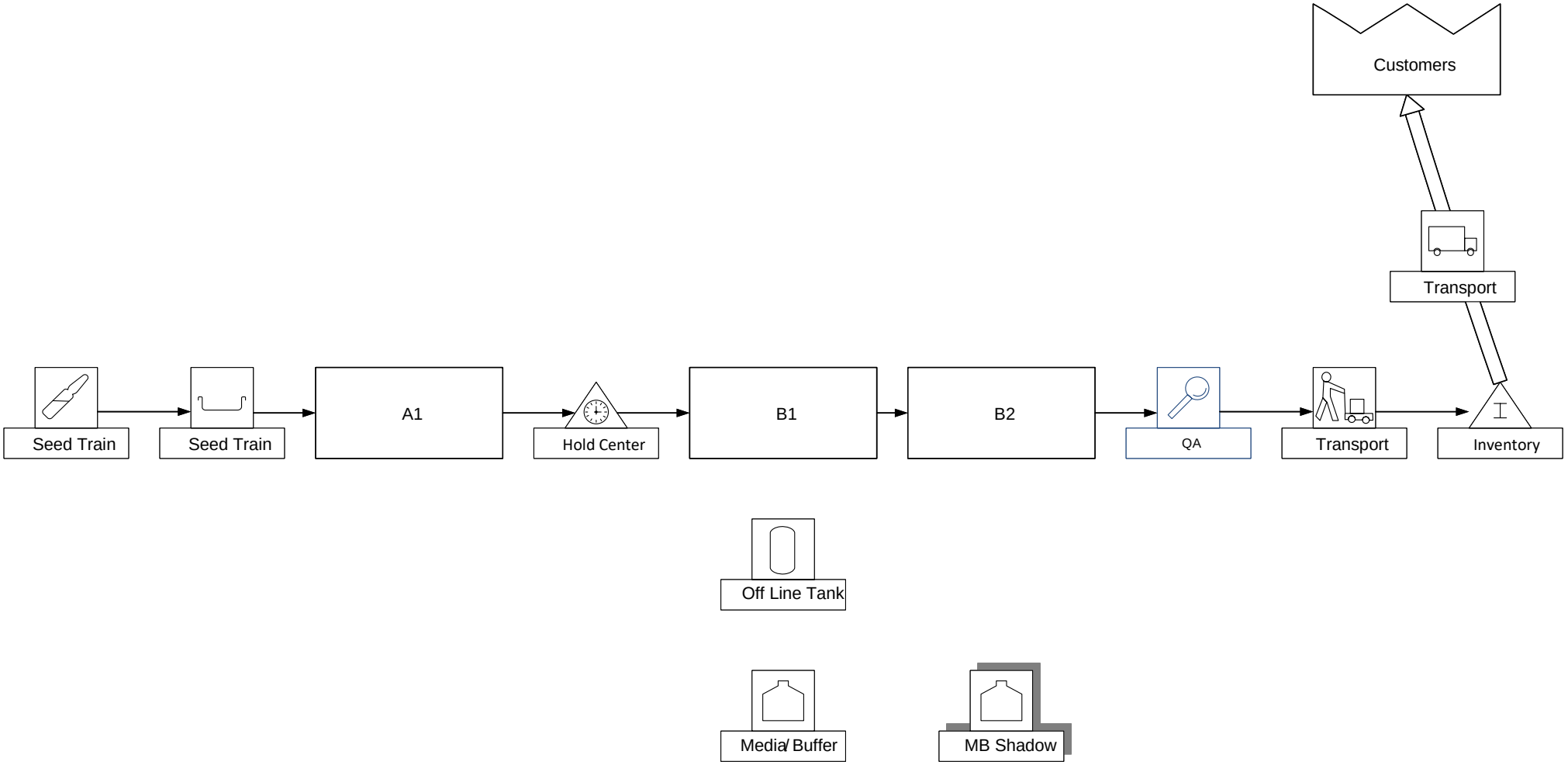
Material Flow for Next Exercise

In the next exercise you will draw the map below with the Sketch Pharma stencil. A printed copy of this page will help. Also, remember that all the pages in this course are available in the eL_QuickPharma.11Notes.pdf which was included in the ZIP file you downloaded for this course.



With the "Sketch Pharma" draw the map shown on the previous page. Use sequence arrows to show the material flow.

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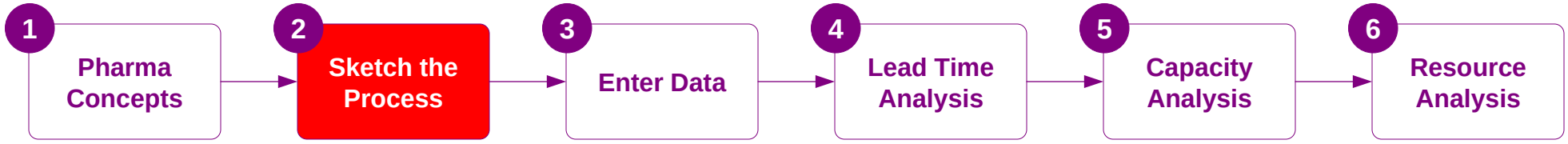
Lesson Summary: Declare Products and Route Sets

You learned:

- How to open the Quick Pharma stencils and initialize a new map
- How to quickly sketch the upstream, downstream, in-line and off-line material flow

Road Map:

eVSM Quick Pharma – Learning Road Map



Steps to sketch the process with Sketch Pharma

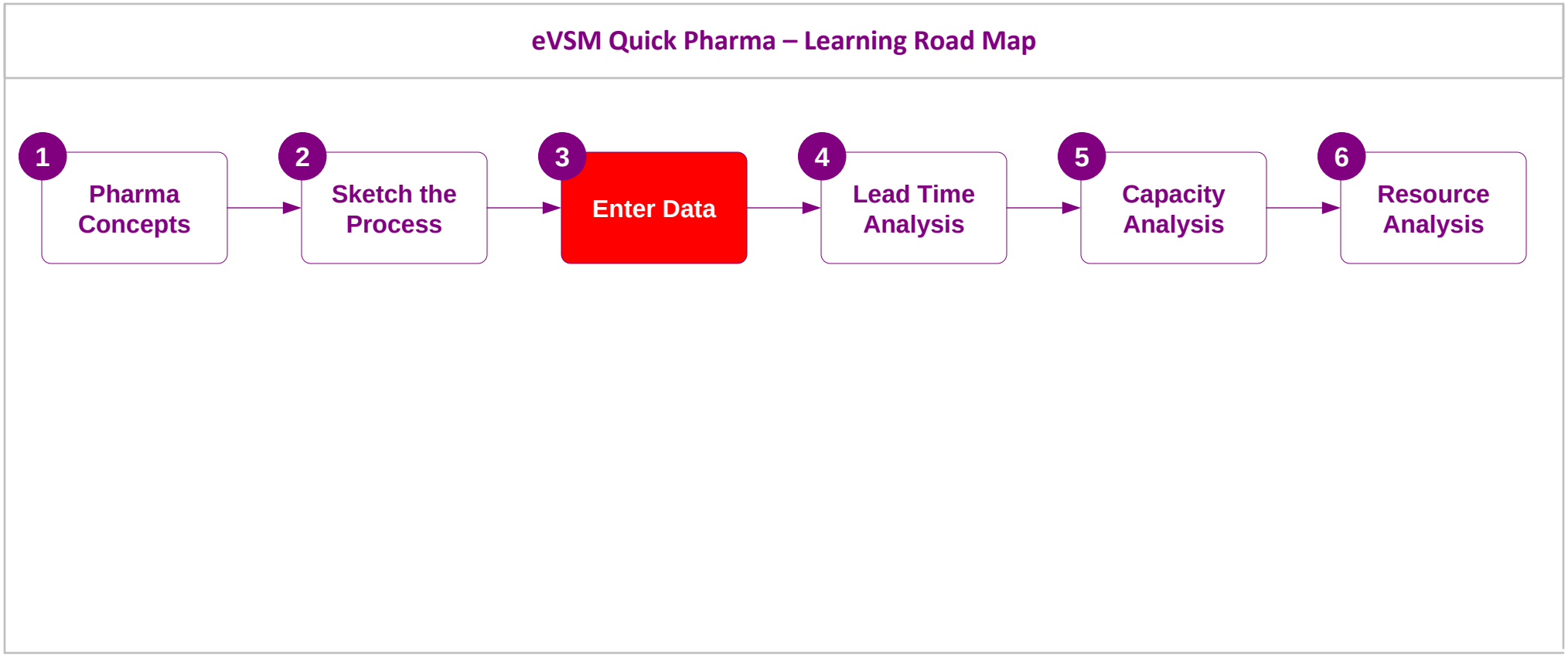
1. Open the Quick Pharma stencils and initiate the page
2. Drag out and line up the shapes from the Sketch Pharma stencil
3. Add Sequence arrows to show the flow of materials

What's next:

You will learn how to add data to the map, how to edit existing data, how to hide/show data, and how to import data via Excel.

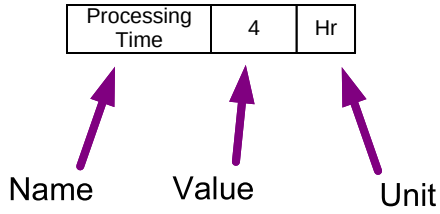
Data Entry for Pharma value stream

Data for the value stream is entered through some special data shapes which are attached to each activity. In this lesson you will learn how to add these data shapes automatically to a sketch map, how to work with these data shapes, and how additional data shapes can be used to perform optional extra calculations. You will also learn how to import data values through Excel.



Enter Data for the Pharma Process Flow

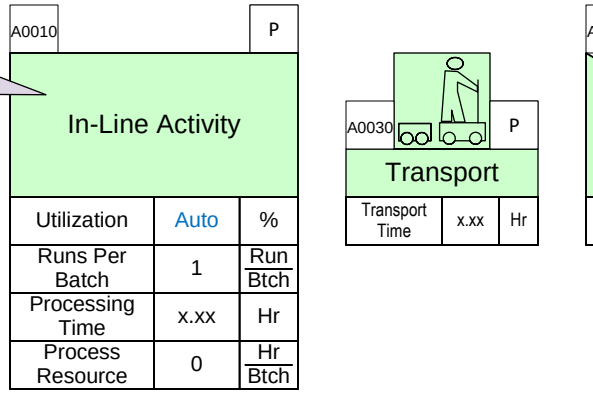
Working with Data on a Map



- Map data is stored in special data shapes which consist of a name, value, and unit.
- To change any field, double-click and then follow the on-screen instructions.
- To move or delete a data shape, you must select the value field.
- The Views (accessed with the Views) button allows you to hide/show data shapes.
- All data shapes, including hidden ones, can be accessed through the List Variables button. Select the Green center first, then click on the List Variables button.
- eVSM comes with a default list of variable names and units. New names and units can be added through “Name and Unit Manager” form which is accessed with the NUM button.
- Default eVSM variable names and units should NOT be modified since they are used in the automated calculations.

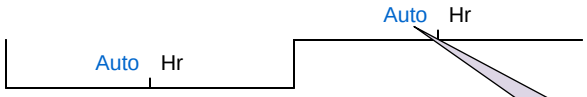
The combination of a green shape along with all the data shapes attached is called a center.

Data shapes represent data for centers they are glued to.



“xx” represents mandatory values you must provide. eVSM cannot perform calculations without these.

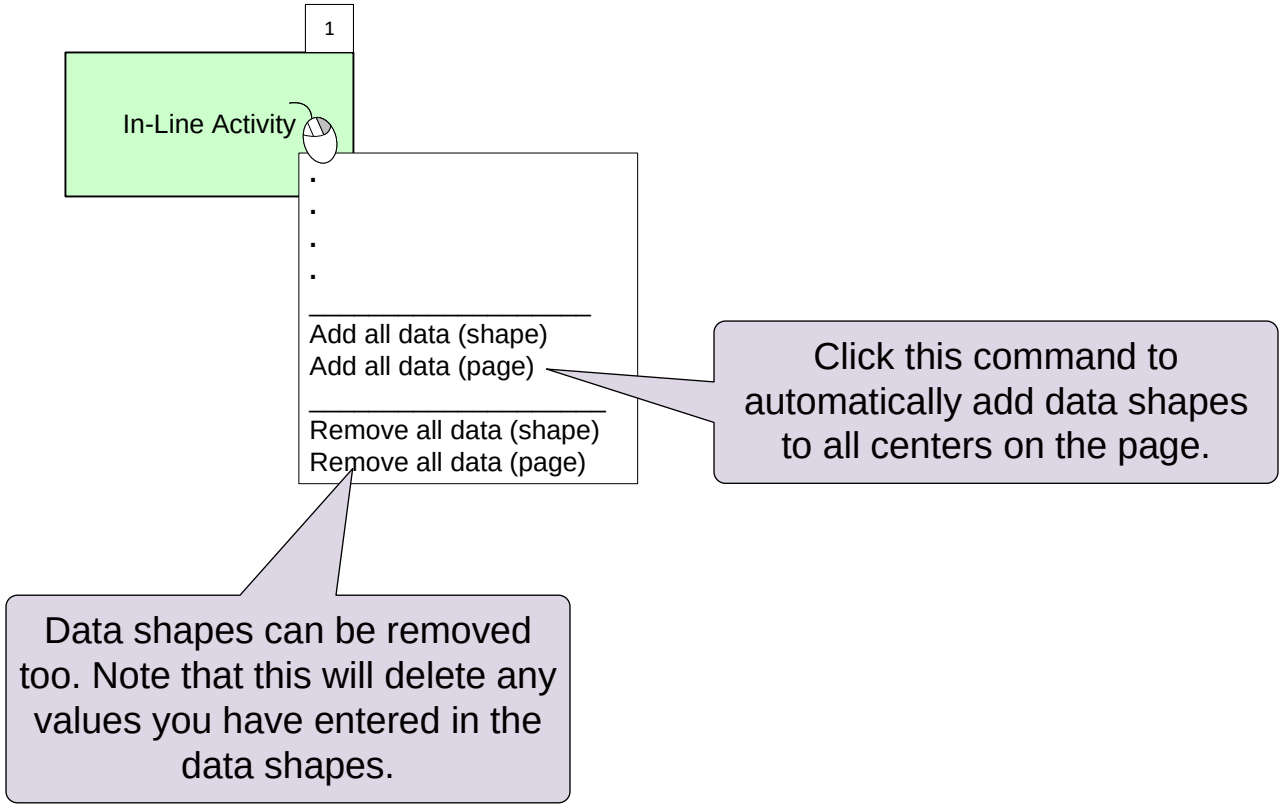
These are VA and NVA (value added and non value added) data shapes. They are glued to centers via a flying glue point.



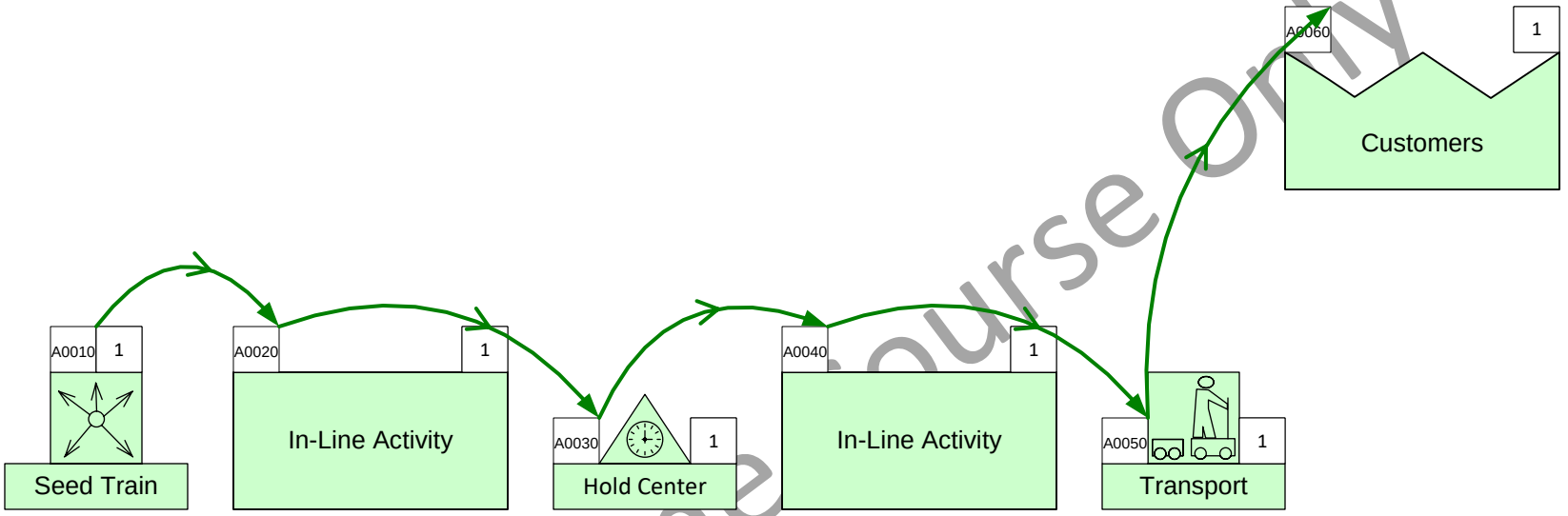
Blue values are automatically calculated by eVSM. Just leave these alone.

Data on Sketch Centers

Data shapes can be automatically added to a Sketch Pharma map. Just right-mouse click on any Sketch Pharma shape on the draining page.



Add data shapes to this process flow. No need to enter data values or change units.



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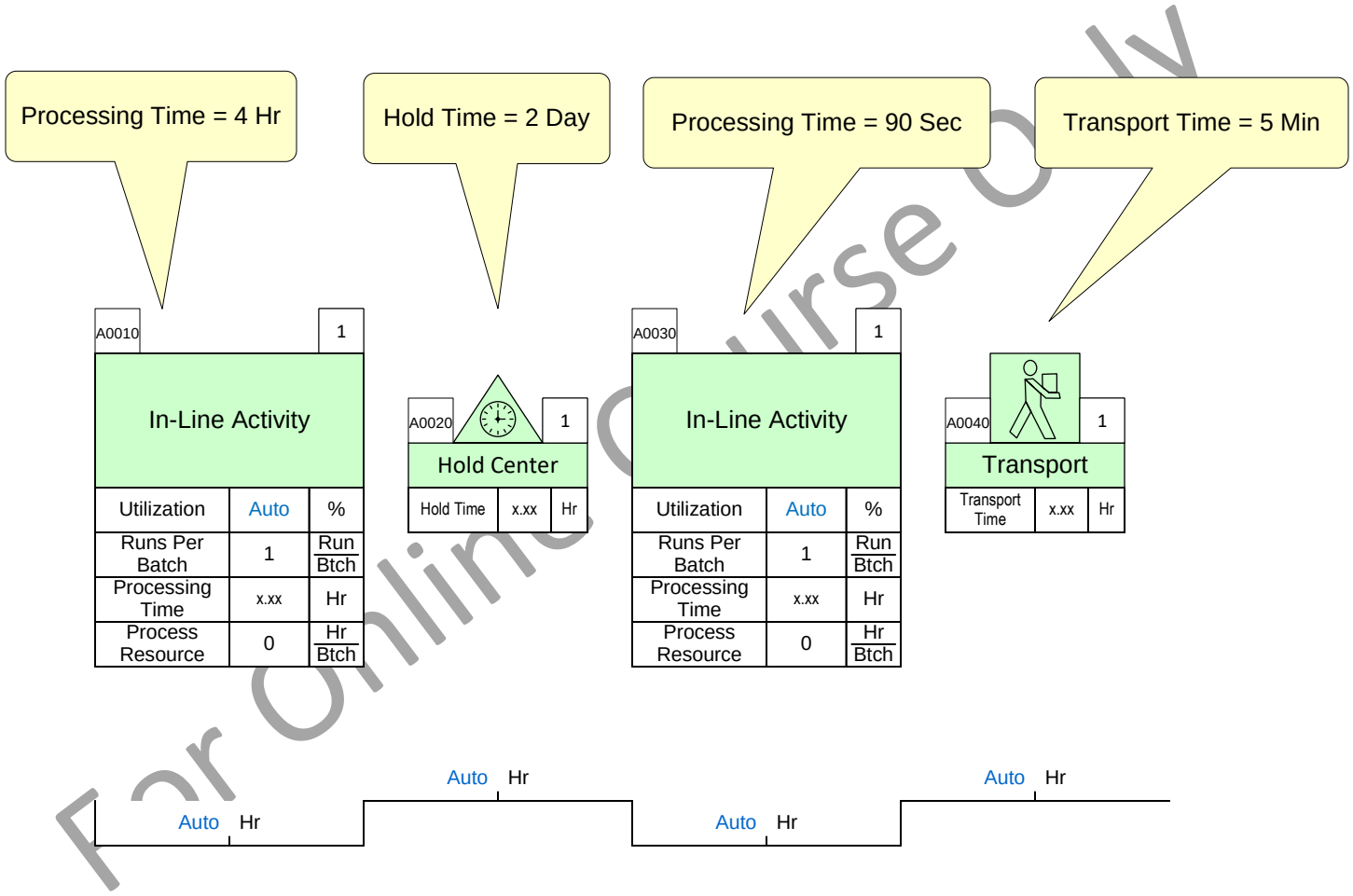
Enter data values



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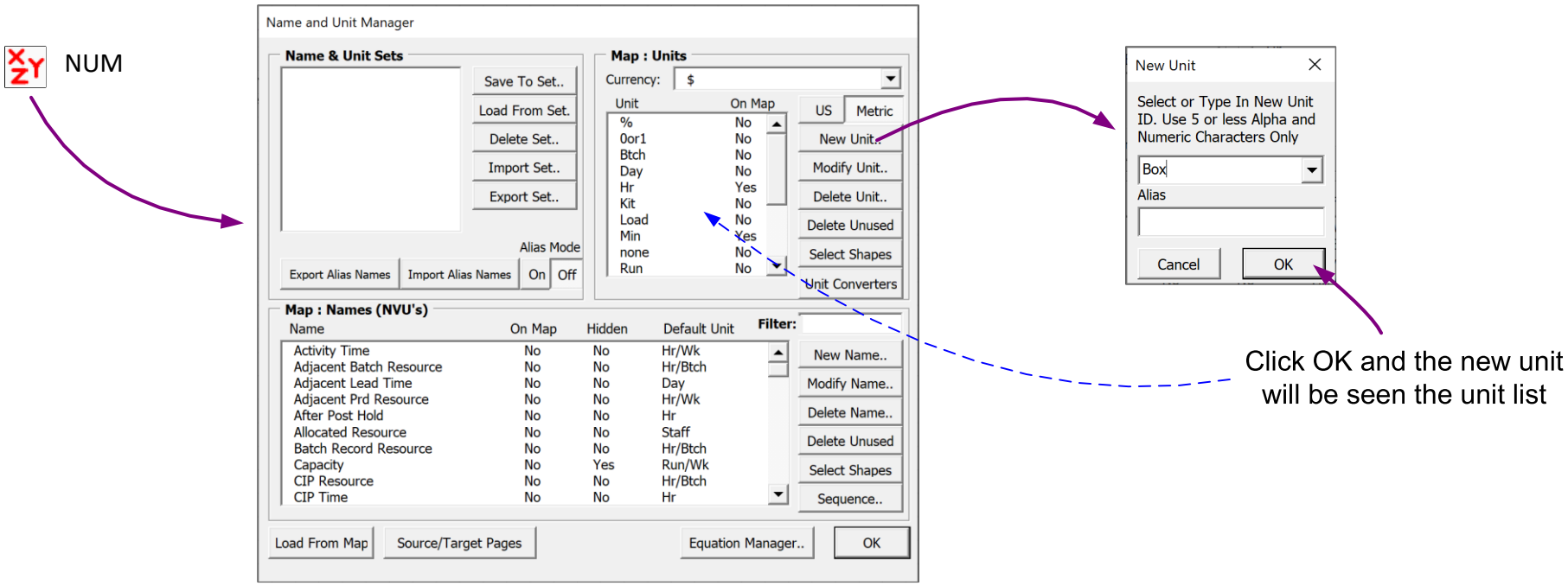
Units	Year	Wk	Day	Day
	52	7	24	3
	Wk	Day	Hr	Shft

Working with Units

The default names and units can be seen in the NUM (Names and Units Manager) dialog. Additional names or units may be added if necessary.

Example: Add a new Unit called “Box”

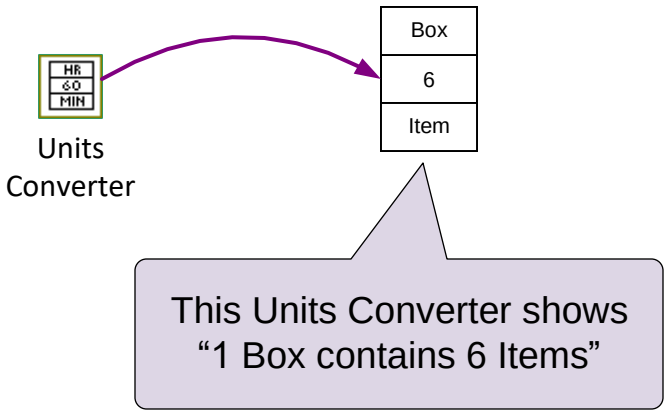


Units Families

Units can be organized into families such as times, weight, length, etc. This allows you to enter data (or view calculations results), and use different units on different parts of the map. For example, you may want to show quantities in Pallets in one place and Boxes in another place.

Some families have already been set up for you, eg. Seconds, minutes, hours, days, or all in one family.

Units are associated to families with Units Convertor shape.



Add new unit convertor

Create a new unit “Tray” and then use a Units Converter to show that there are 12 “Kit” per “Tray”.

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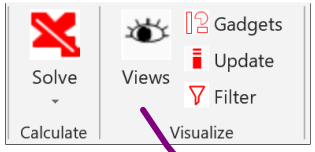
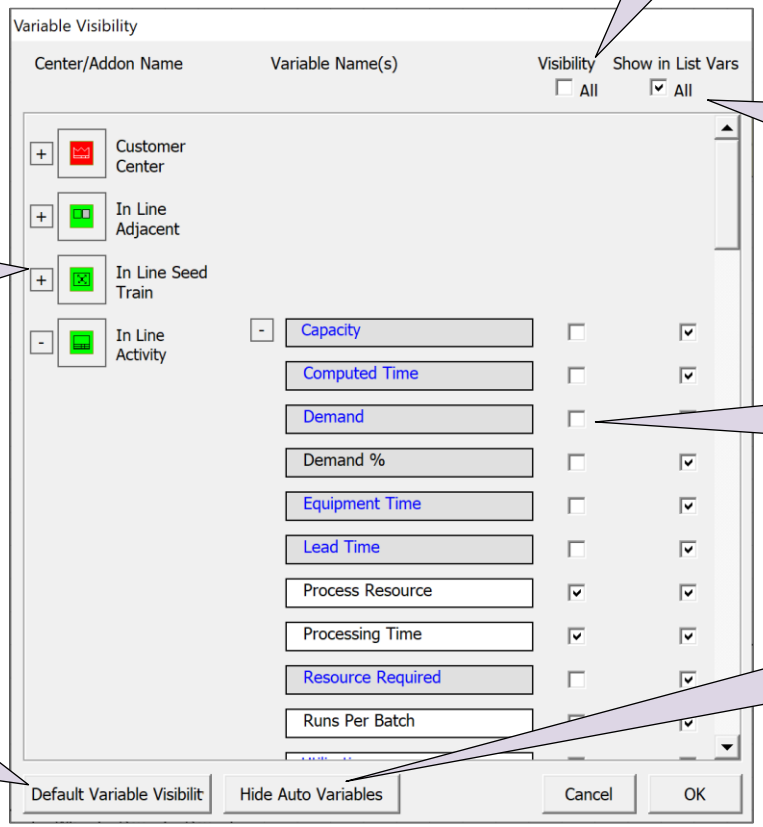
Hide/Show Data Shapes

The Quick Pharma centers include data shapes for data input and to display calculated values. By default, most of these data shapes are hidden to keep the map view simple. Visibility of these is controlled through the Views form.

Views Form



Use this checkbox to hide/ show ALL data shapes on the map



This column of switches is used to determine which variables will appear in the List Variables form (covered in a later page)

Use Expand/Collapse button to access all data shapes for a center

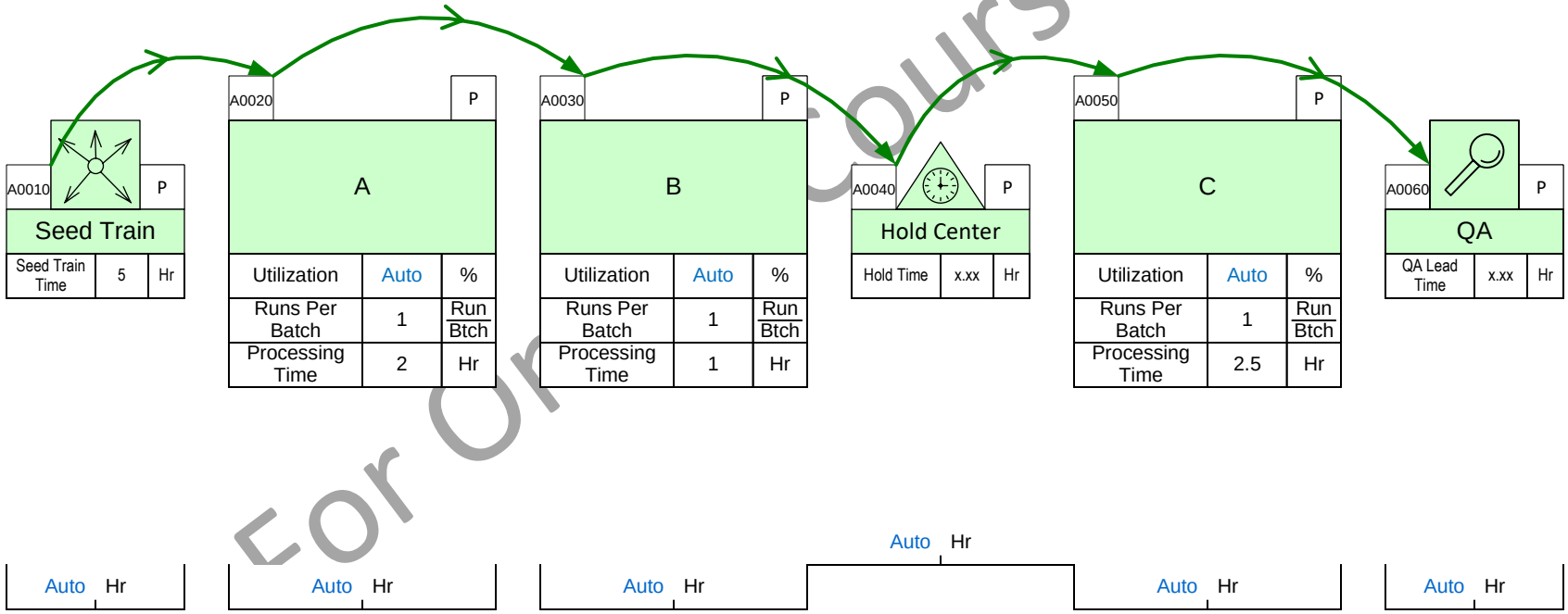
These switches control which data shapes will be visible on the map

This button reverts the switches back to the default state (as it was for a new map)

Use this button to hide all data shapes containing calculated values

Hide/Show Data with Views Dialog

1. Hide the time line (value added and non-value added shapes)
2. Make “Process Resource” data shapes visible



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Using the Yellow Add-ons in Quick Stencils

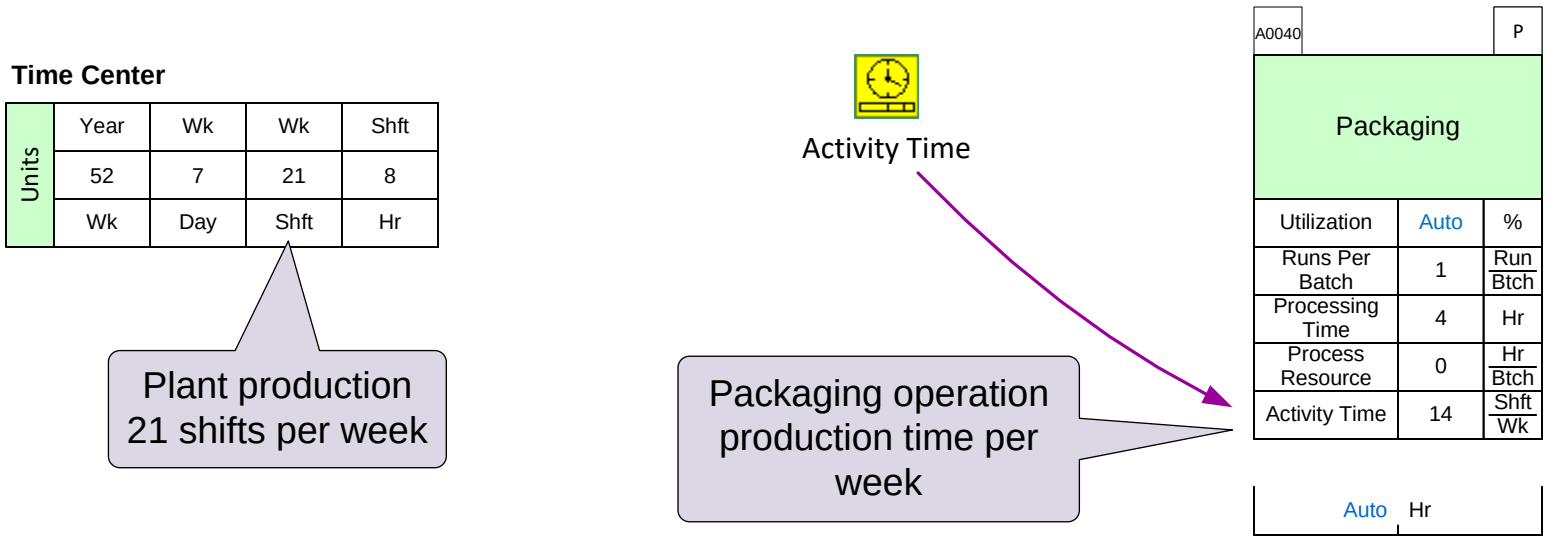
Many common calculations are built into the main centers (green shapes) and sequence arrows. The yellow icons in the Quick stencils provide additional modifications and calculations.

How to Use Add-ons

Just drag out the desired add-on from the stencil and glue it to the bottom of the data shapes stack. New add-ons can also be dropped on the green center shape and it will automatically get attached to the bottom of the stack.

Example

This plant works 21 shifts per week as indicated in the Time Center. Therefore it is assumed the packaging process is available 21 Shft/Wk. However, what if the packaging process is required 14 shifts per week? You can use the Activity Time yellow add-on to show the actual available time.



Add-ons Icon Positions in the Stencil

There is a unique correspondence between green icons in the stencil and the yellow icons that immediately follow the green icon. So yellow icons can be used ONLY with the green icons they “belong” to.

Add-ons for In-Line Activity Center

In Line Activity

A0050		P
In-Line Activity		
Utilization	Auto	%
Runs Per Batch	1	Run / Btch
Processing Time	x.xx	Hr
Process Resource	0	Hr / Btch

This center is used for both upstream and downstream activities. For upstream usage you may be making a batch from which several downstream runs are made. Hence the runs per batch variable.

The **Processing Time** is considered as part of the lead time.

In Proc Hold

In Process Hold Time	xx	Hr
In Process Hold Resource	xx	Hr / Btch

The **In Process Hold Time** is considered as part of the lead time.

Activity Pre

Pre Time	0	Hr
Pre Resource	0	Hr / Btch

The **Pre Time** is considered as off line and just before processing begins.

Activity Post

Post Time	x.xx	Hr
Post Resource	0	Hr / Btch

The **Post Time** is considered as off line and just after processing completes. It can be a caustic clean ahead of CIP and SIP.

After Post Hold

After Post Hold	xx	Hr

The **After Post Hold** is considered as off line and in parallel with CIP and SIP. So the related equipment time is Max(After Post Hold, CIP+SIP).

CIP

CIP Time	xx	Hr
CIP Resource	xx	Hr / Btch

CIP (Clean In Place)

SIP

SIP Time	xx	Hr
SIP Resource	xx	Hr / Btch

SIP (Steam In Place)

Turn Around

Turnaround Time	xx	Hr
Turnaround Resource	xx	Hr / Btch

This can be used instead of the detailed breakup of the non-process times.

Batch Record

Batch Record Resource	0	Hr / Btch

The recording is assumed off line and not to impact lead time.

Manual Time

Manual Time	0	Hr

This is not used for analytics but useful to consider opportunity for resource optimization.

Activity Stations

Stations	1	Stn

This is used for duplicate stations that are run in parallel.

Activity RFT

Right First Time	100	%

Not used for analytics but useful for considering improvements.

Yield

Step Yield	xx	%

Not used for analytics but useful for considering improvements.

Downtime

Downtime	xx	%

Equipment downtime. Used to estimate effective capacity.

Activity Time

Activity Time	x.xx	Hr / Wk

Activity time (after breaks) used if different at a station from that of the overall plant.

Quick Pharma Add-ons Examples

Example 1

Activity Ds2 has 3 Stations working in parallel.

A0060		P
Ds2		
Runs Per Batch	1	Run / Btch
Processing Time	4	Hr
Process Resource	2	Hr / Btch
Stations	3	Stn
Auto	Hr	

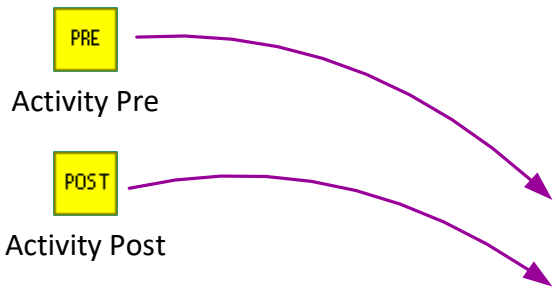
Example 2

The production line works 3 shifts a day, but the Packaging activity in available only for 1 shift per day.

A0070		P
Packaging		
Runs Per Batch	1	Run / Btch
Processing Time	4	Hr
Process Resource	2	Hr / Btch
Activity Time	1	Hr / Day
Auto	Hr	

Example 3

We have significant Pre and Post time.



A0080		P
Ds2		
Runs Per Batch	1	Run / Btch
Processing Time	4	Hr
Process Resource	2	Hr / Btch
Pre Time	2	Hr
Pre Resource	2	Hr / Btch
Post Time	1.5	Hr
Post Resource	1	Hr / Btch
Auto	Hr	

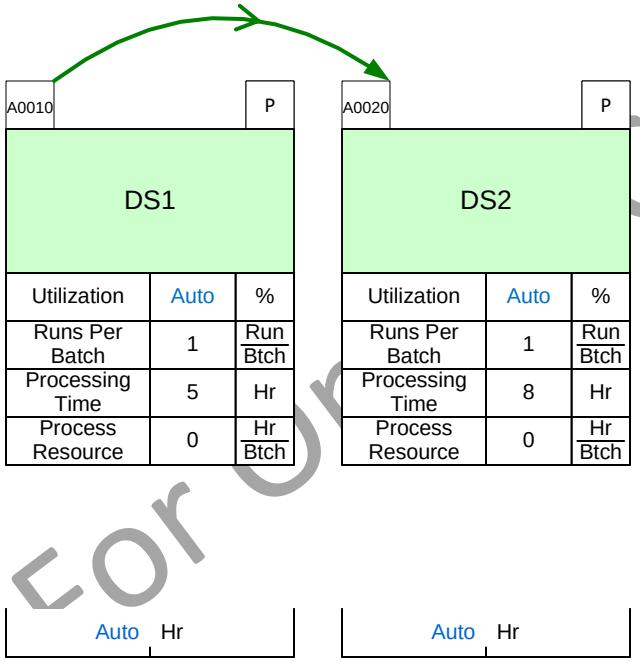
Example 4

The equipment at activity Us2 has a downtime of 15% and a yield of 80%.

A0090		P
Us2		
Runs Per Batch	1	Run / Btch
Processing Time	4	Hr
Process Resource	2	Hr / Btch
Downtime	15	%
Step Yield	80	%
Auto	Hr	

Use add-ons to represent the following in the two activity centers

1. Activity DS1 is available 15 shifts per week
2. Activity DS2 has 3 stations



Plant Operating Hours

Units	Year	Wk	Wk	Shft
	52	7	21	8
	Wk	Day	Shft	Hr

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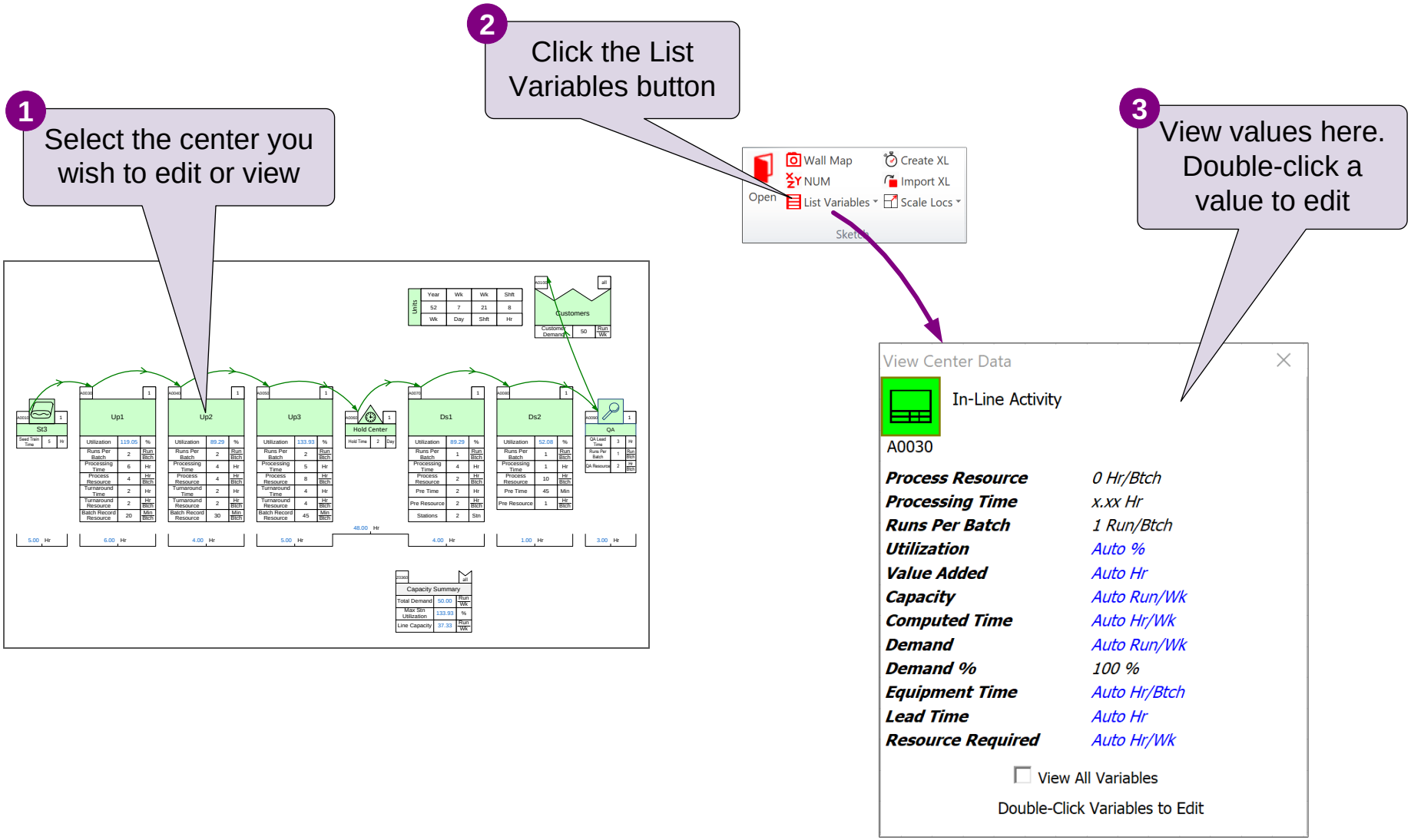
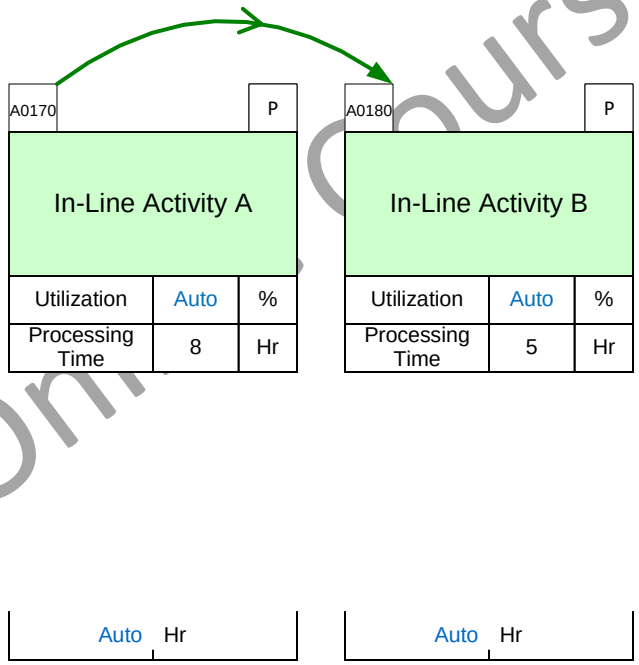
Edit Hidden Data with List Variables

Data shapes can be edited directly when they are visible on the map. The List Variables form provides a way of viewing and editing values for hidden data shapes.



Viewing and Editing Data with List Variable



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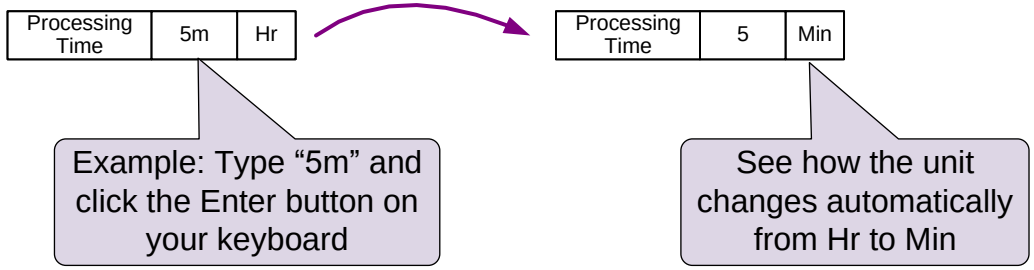
Refresher Tips

Topics below were covered in more detail in the Time Mapping course. The notes here serve as a refresher.

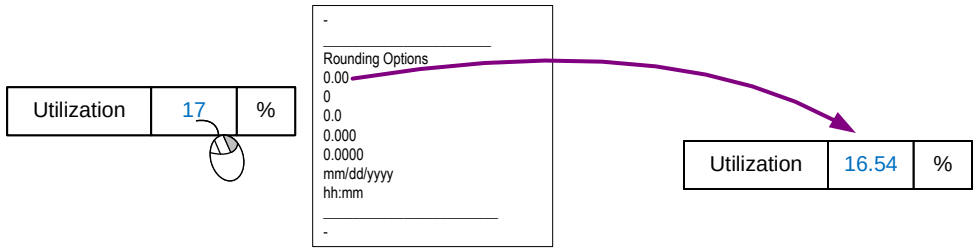
1. Instant change of Units

Sometimes you need to use different time units for the same variable on different parts of the map. Eg. Processing Time may be in seconds at some activities and hours at others. You can of course double-click the unit field and change the unit where required.



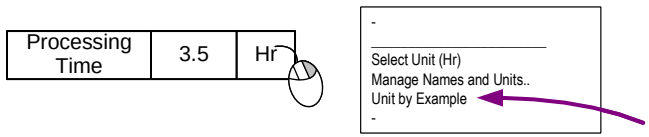
2. Rounding

You can control the decimal places displayed in data shapes with the Rounding command in the right-mouse button menu.



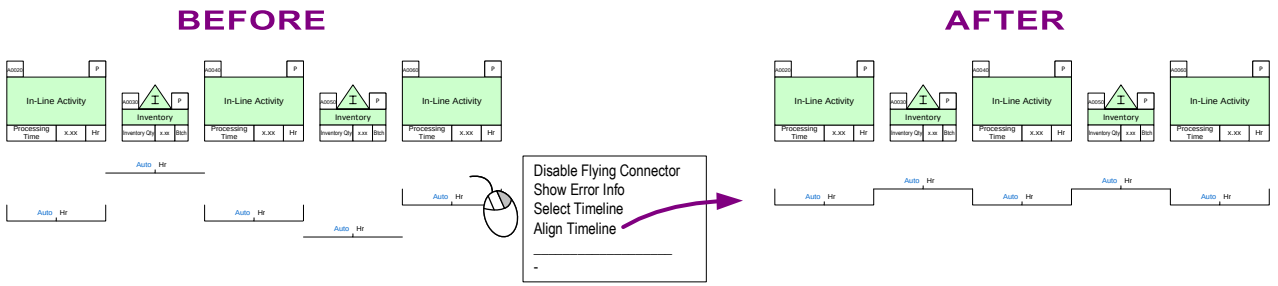
3. Units by Example

When you need to set the unit for a variable throughout the whole map, you can set it on one data shape, then use the “Units by Example” command to change it everywhere.

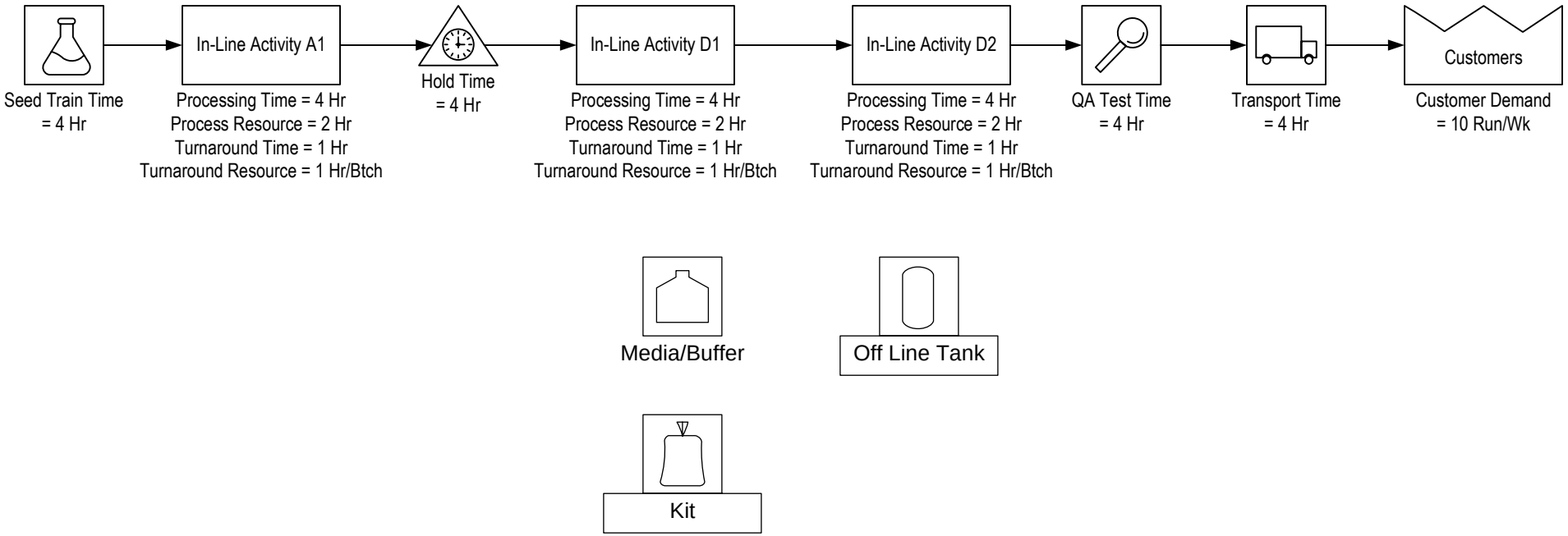


4. Align Timeline

The timeline (value added and non-value added data shapes) can be quickly aligned with the “Align Timeline” command.



Map for Next Exercise



Draw the map shown on the previous page, complete with all data shown, and sequence arrows.

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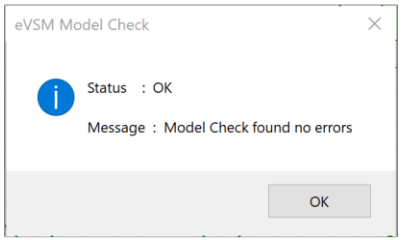
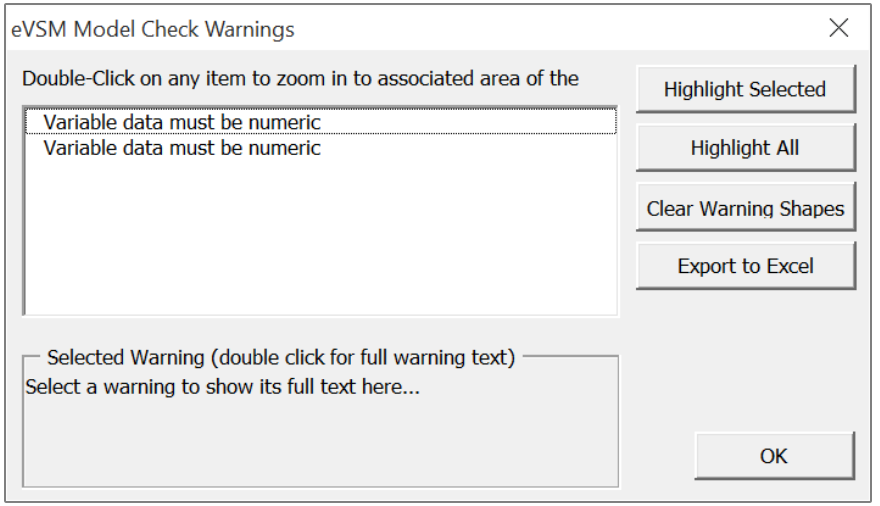
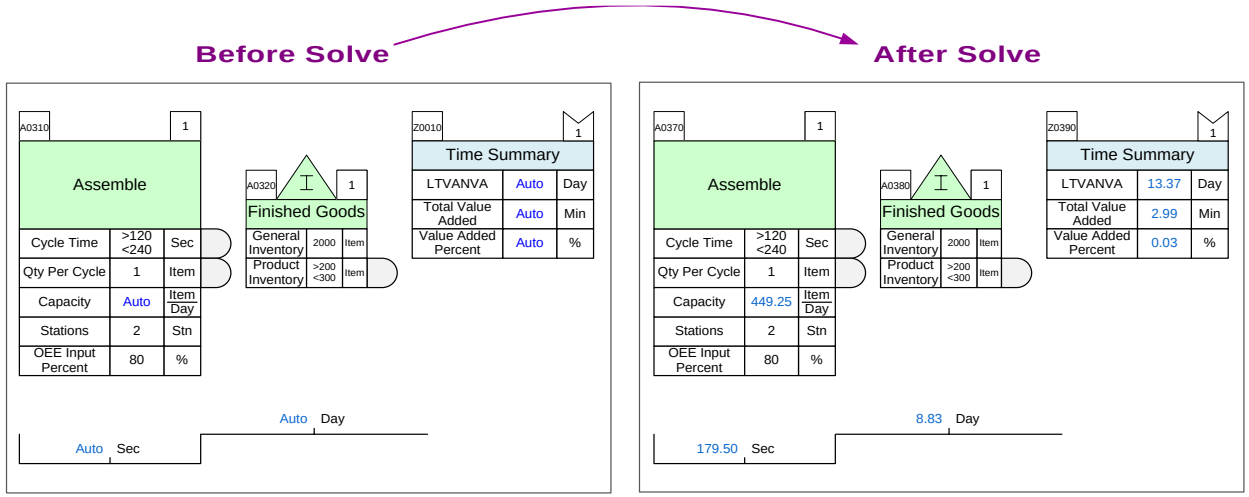
Check and Solve the Map

The Check function identifies common user mistakes on the map. It also attempts to fix certain problems. You should always run the Check function before the first Solve. To run, just click the Check button. Any problems will be listed in a warning message (see right). If there are no problems, you will see an OK status like this:



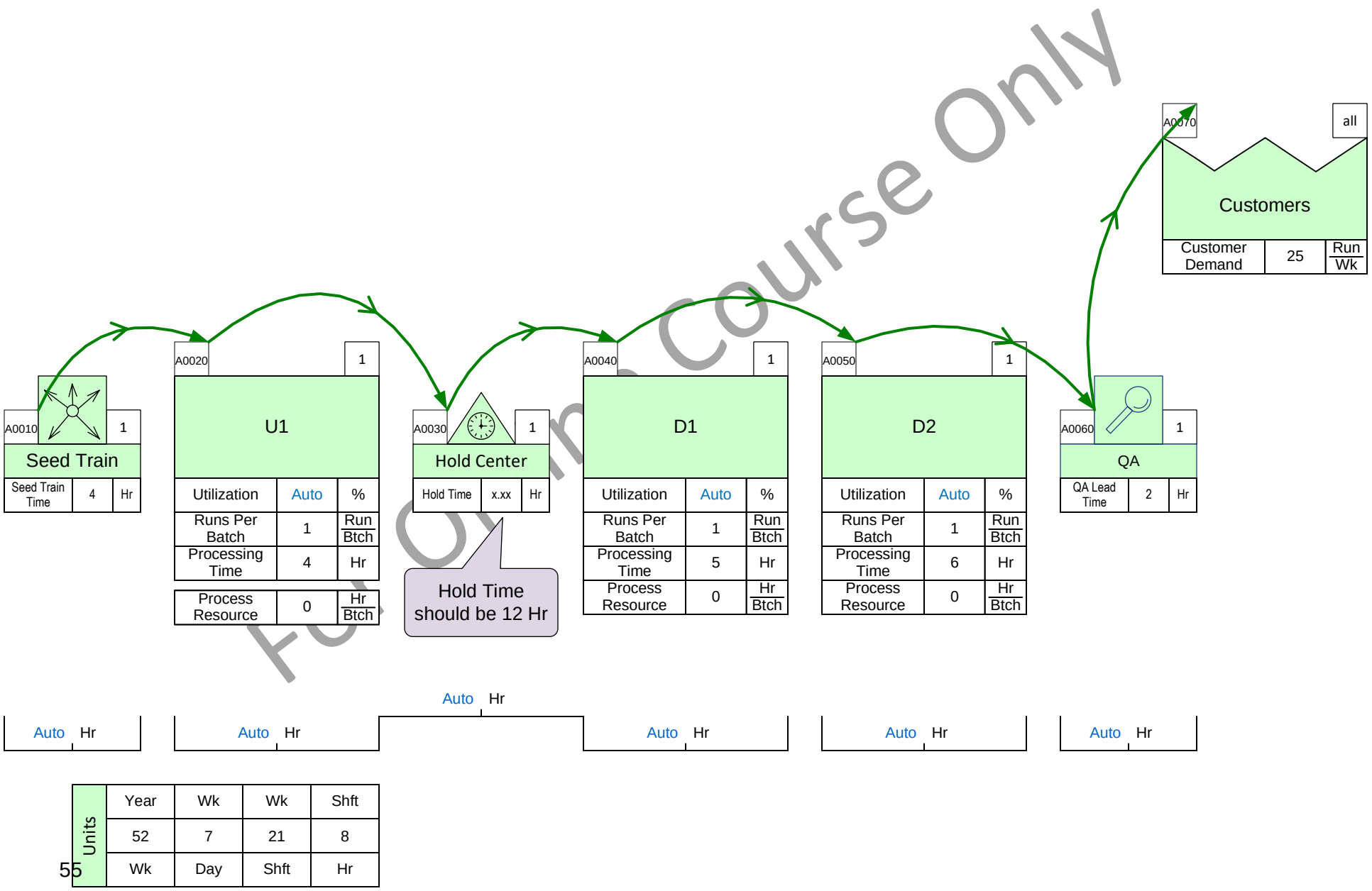


When ready, click the Solve button. This will perform the calculations, and the blue values on the map will show the calculation results. Solve also updates any charts on the map.



Check and Solve this map

The Hold Center time should be 12 Hr



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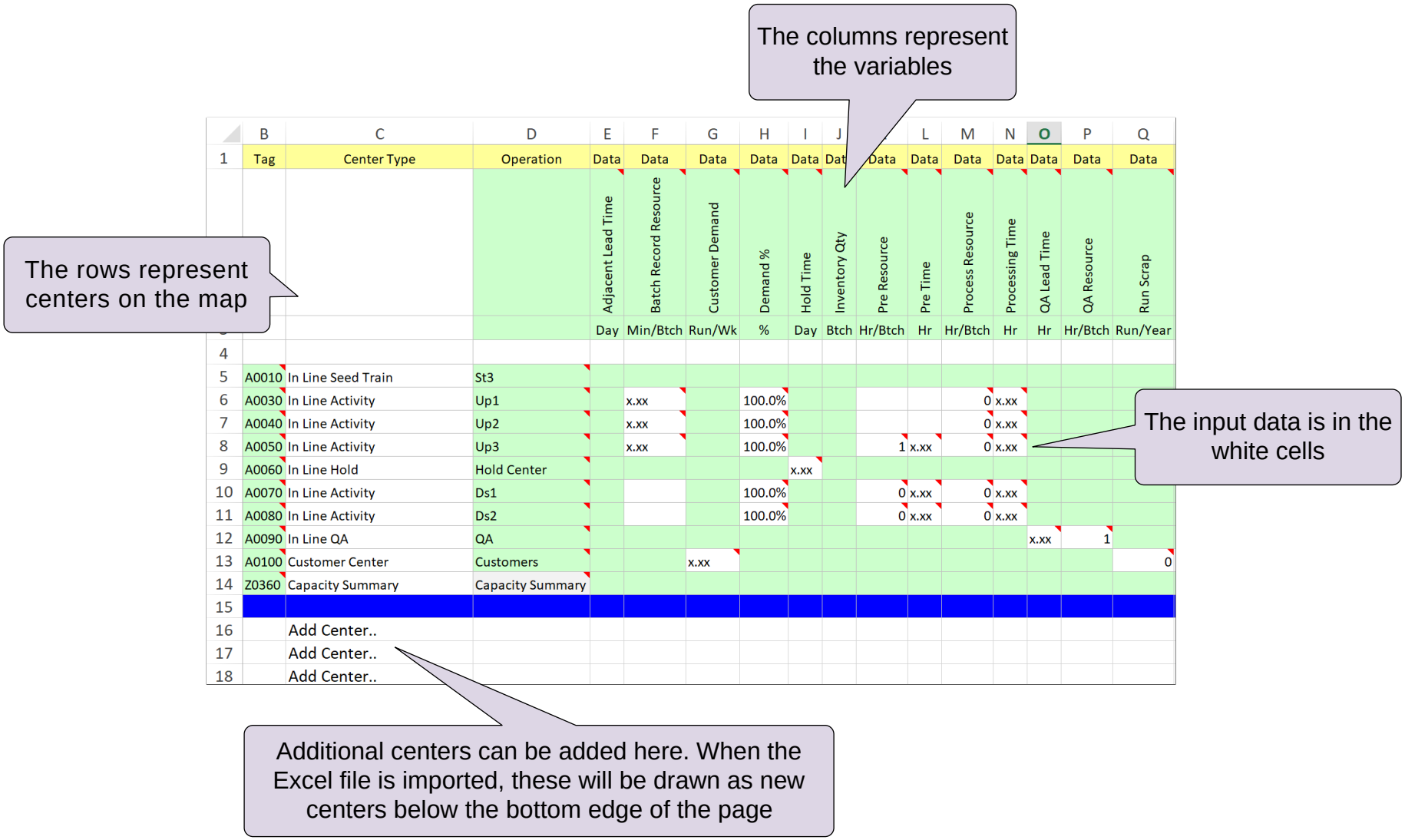
Data Input through Excel

Sometimes it is more convenient or easier to input data through Excel rather then type directly on the map. eVSM facilitates this with:

- Create XL - Creates an Excel file which represents all the data input values for the current map.
- Import XL - Import XL pulls the data in from Excel to the map.



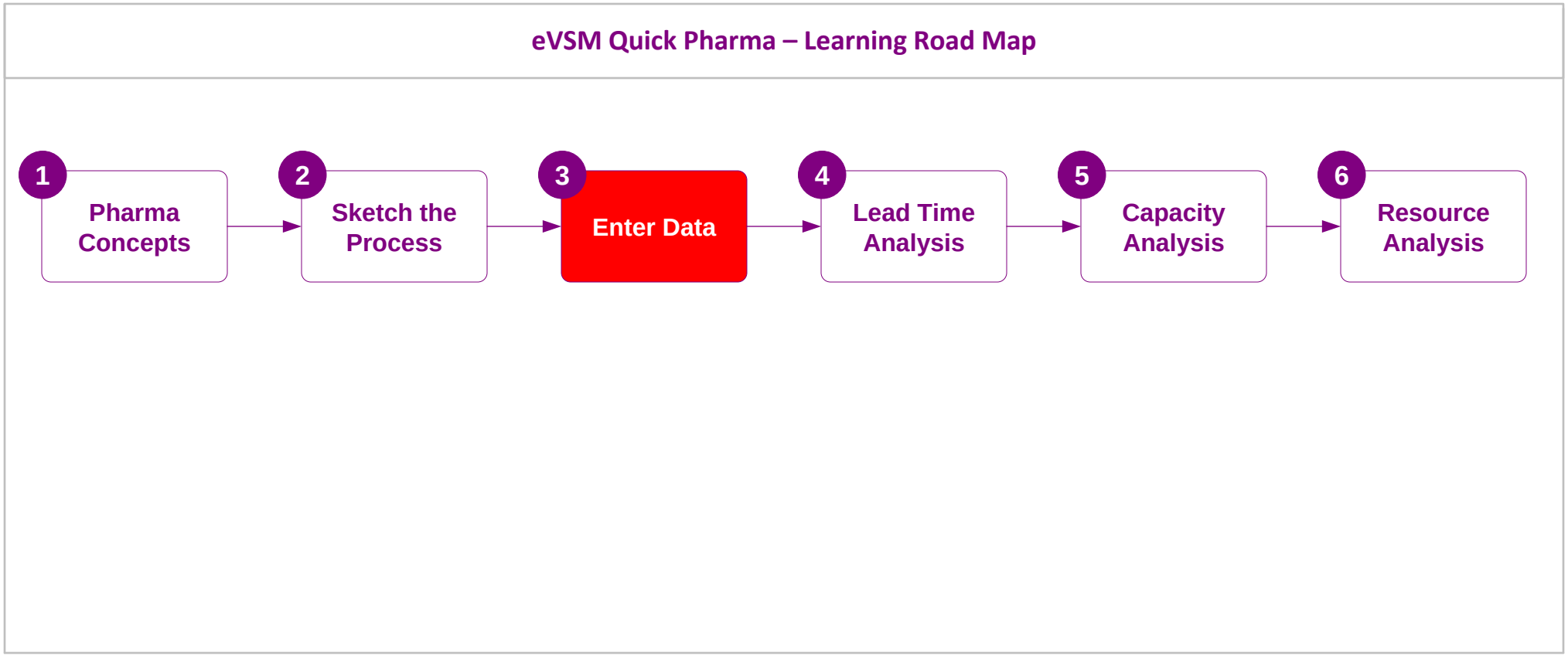
	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Tag	Center Type	Operation	Data	Data	Data	Data	Data	Dat	Data	Data	Data	Data	Data	Data	Data
				Adjacent Lead Time	Batch Record Resource	Customer Demand	Demand %	Hold Time	Inventory Qty	Pre Resource	Pre Time	Process Resource	Processing Time	QA Lead Time	QA Resource	Run Scrap
				Day	Min/Btch	Run/Wk	%	Day	Btch	Hr/Btch	Hr	Hr/Btch	Hr	Hr	Hr/Btch	Run/Year
4																
5	A0010	In Line Seed Train	St3													
6	A0030	In Line Activity	Up1		x.xx		100.0%					0	x.xx			
7	A0040	In Line Activity	Up2		x.xx		100.0%					0	x.xx			
8	A0050	In Line Activity	Up3		x.xx		100.0%			1	x.xx	0	x.xx			
9	A0060	In Line Hold	Hold Center					x.xx								
10	A0070	In Line Activity	Ds1				100.0%			0	x.xx	0	x.xx			
11	A0080	In Line Activity	Ds2				100.0%			0	x.xx	0	x.xx			
12	A0090	In Line QA	QA											x.xx	1	
13	A0100	Customer Center	Customers			x.xx										0
14	Z0360	Capacity Summary	Capacity Summary													
15																
16		Add Center..														
17		Add Center..														
18		Add Center..														

Lesson Summary: Enter Data

You learned:

- How to work with data shapes
- How to automatically add data shapes to an eVSM sketch map
- How to work with eVSM Add-ons for optional calculations
- How to import data values through Excel

Road Map:

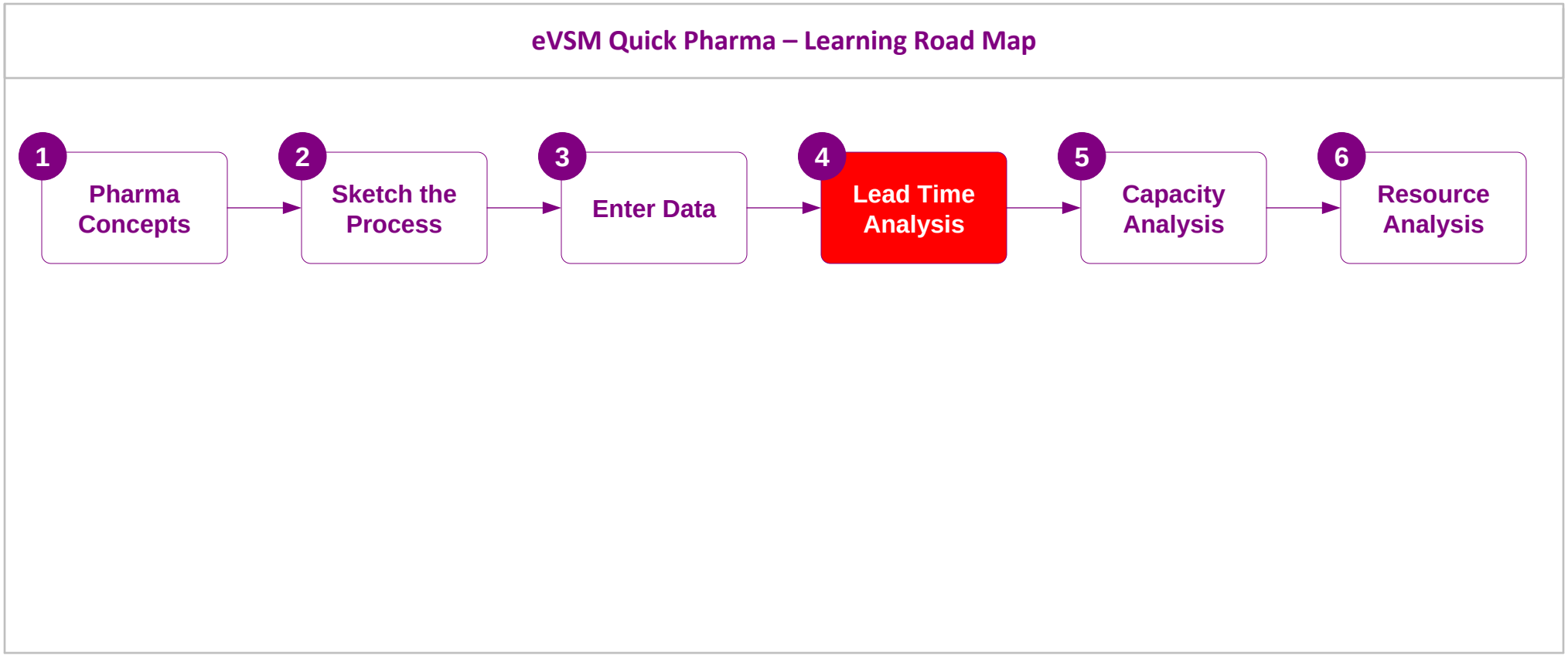


What's next:

How to calculate the and visualize the lead time for value streams,

Lead Time Analysis

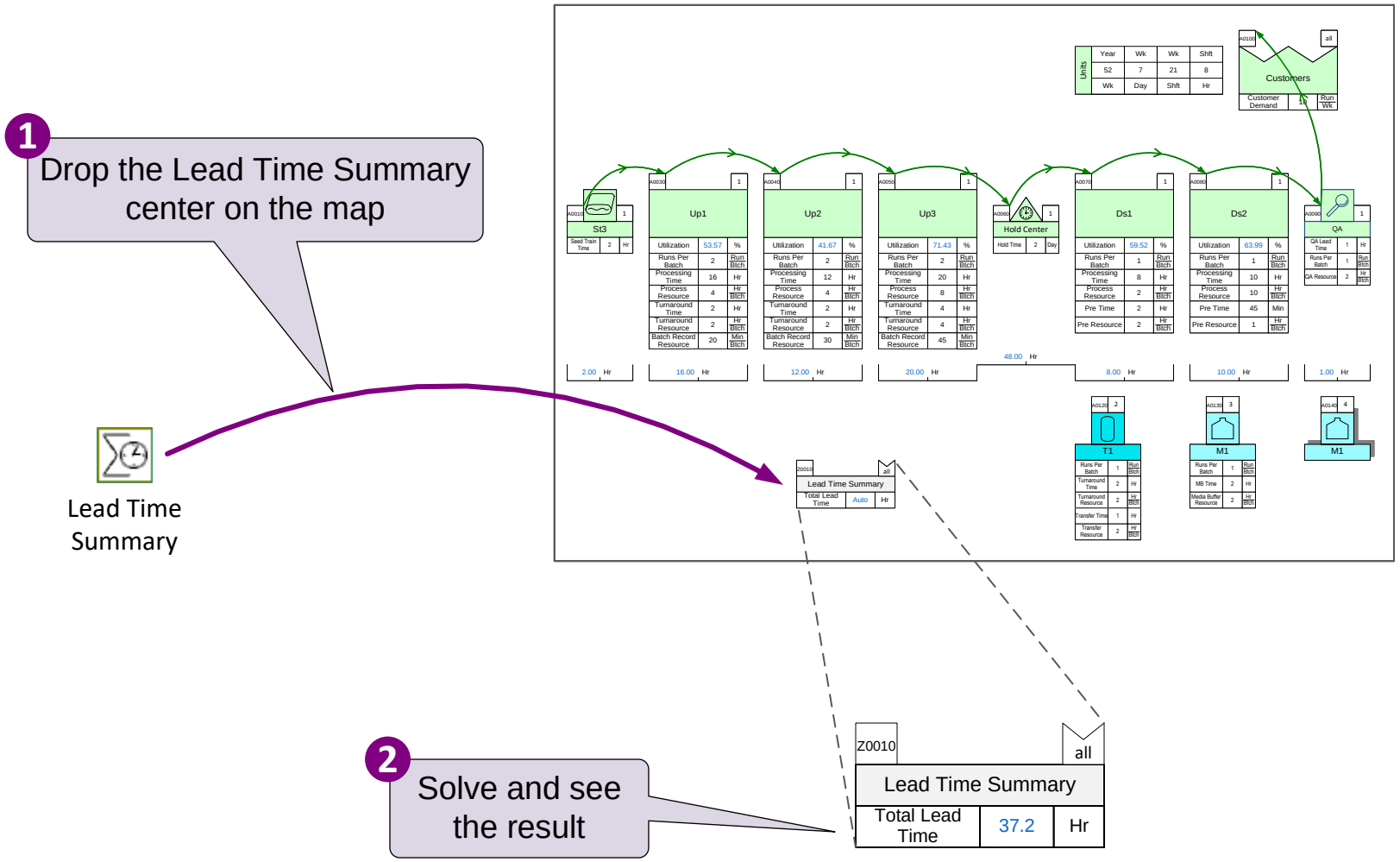
In lesson 1, you learned the concepts and components of lead time. This this lesson you will learn how to input data for lead time analysis and then see the calculations in a summary and a chart.



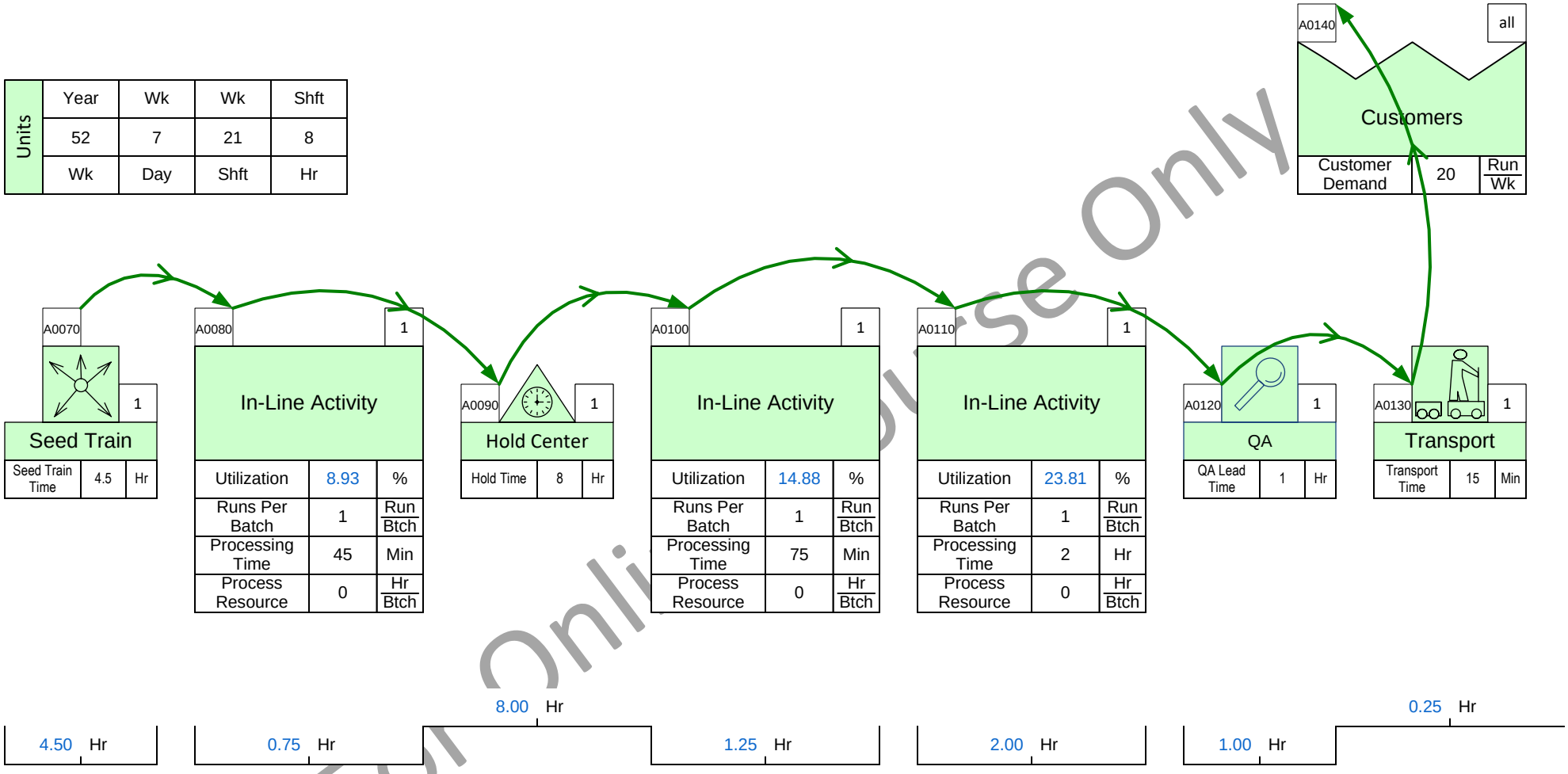
Lead time analysis for the Pharma Value Stream

Time Summary

The Lead Time Summary center calculates the total time for the materials to go through the full in-line process.



Add a Time Summary and Solve the Model to calculate the total lead time for the in-line processes.



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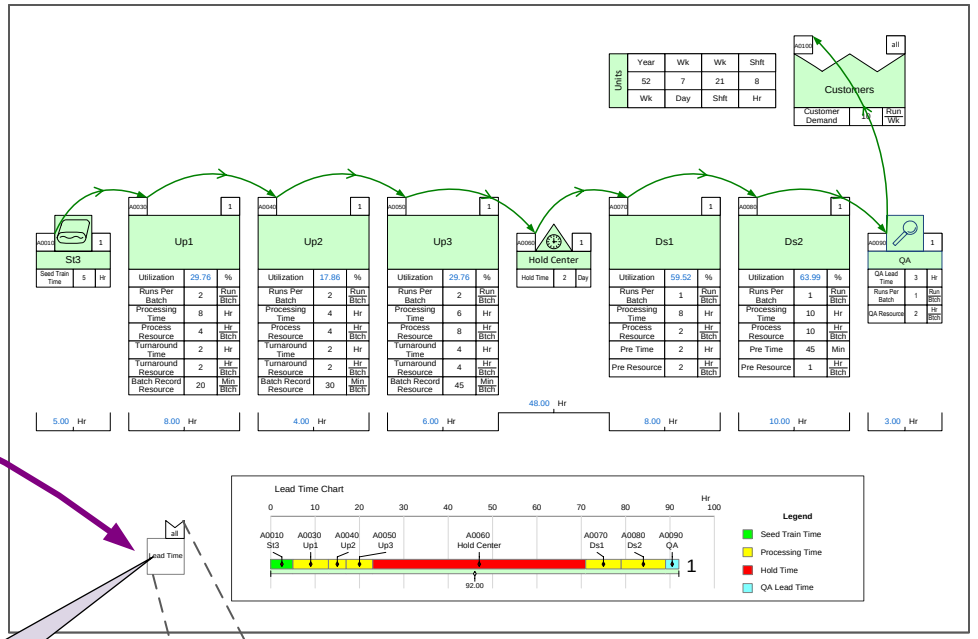
Lead Time Chart

The Lead Time Chart visualizes the lead time components.

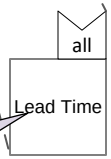
1. Drop the Lead Time Chart shape on the page.

Lead Time Chart

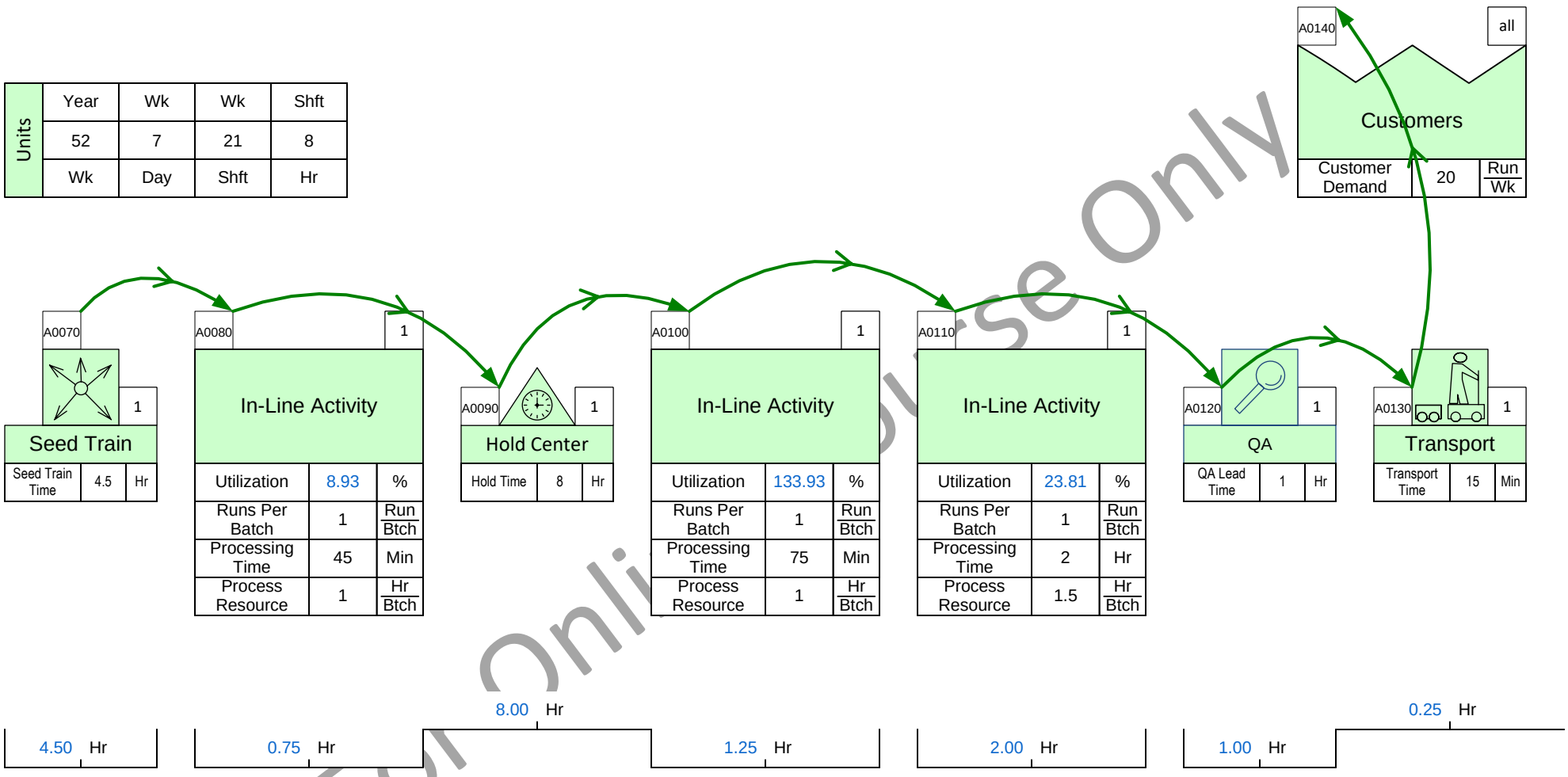
2. In the right-mouse menu of the chart shape, select the “Plot Lead Time” command.



3. The right-mouse menu of the chart shape also includes “Edit Ladder Chart Data” command which allows you to change units, scale, etc.



Plot the Lead Time chart for this value stream



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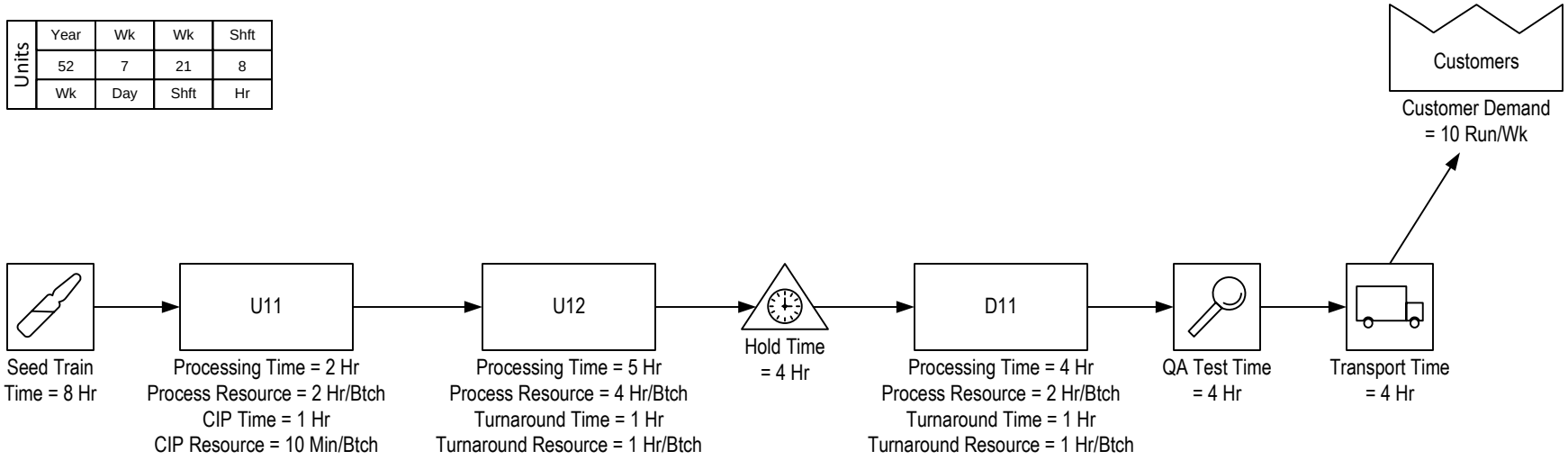
Map for Next Exercise



Draw the map shown on the previous page

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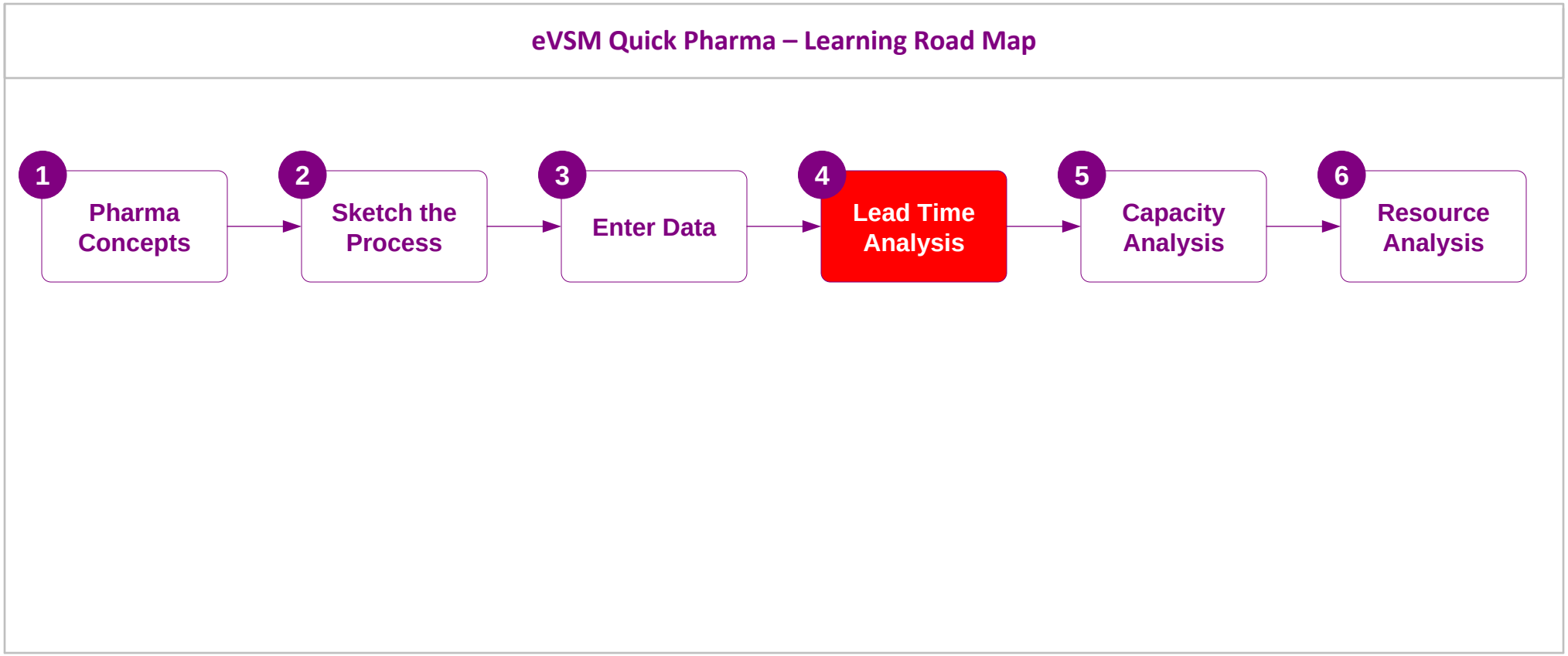
Lesson Summary: Lead Time Analysis

You learned:

- How to use a lead time summary center.
- How to plot a lead time chart.
- You saw where the controls are to customize the chart for scale, tweak units, title, legend, etc.

Road Map:

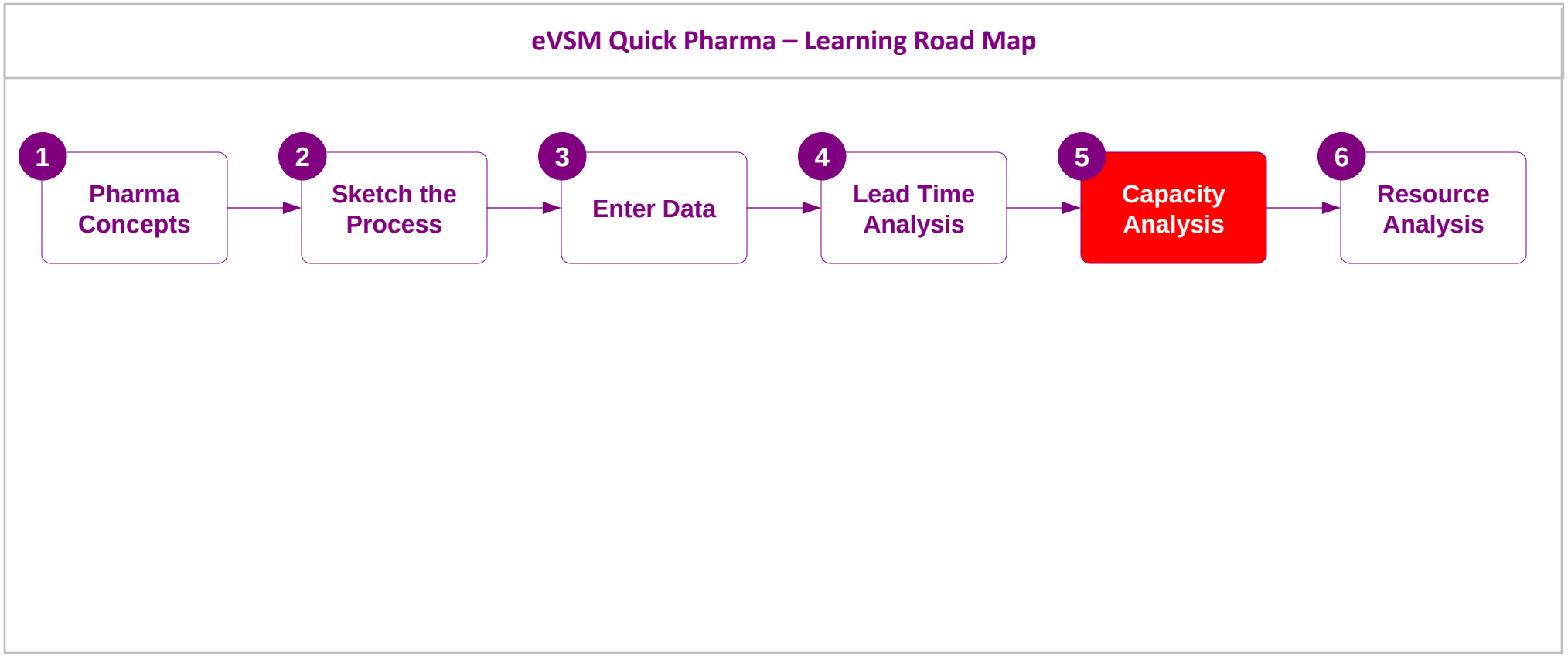


What's next:

You will learn about capacity and capacity analytics in more detail.

Capacity Analysis

In this lesson we will learn how to analyze the capacity of the value stream. You will see how to identify any bottle-necks, how to calculate the line capacity, how to represent causes of capacity loss, and how to explore impact on capacity of improvement ideas in eVSM.

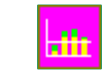


Capacity analysis for the Pharma Process Flow

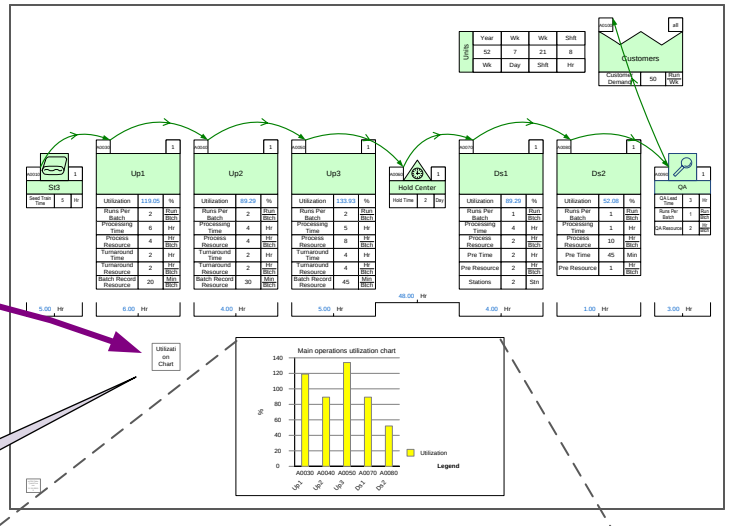
Capacity Analysis

The Utilization Chart in the Quick Pharma stencil summarizes the capacity utilization per activity for the whole value stream. Steps to plot the Utilization chart:

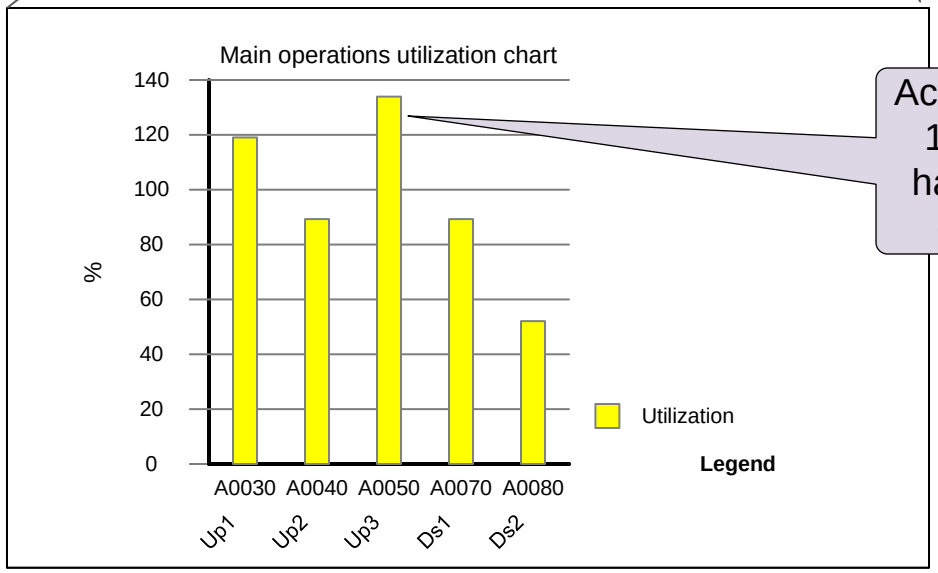
1. After the map has been solved, drop the Utilization Chart shape on the map



Utilization Chart



2. Click the “Plot Chart” command in the right-mouse menu

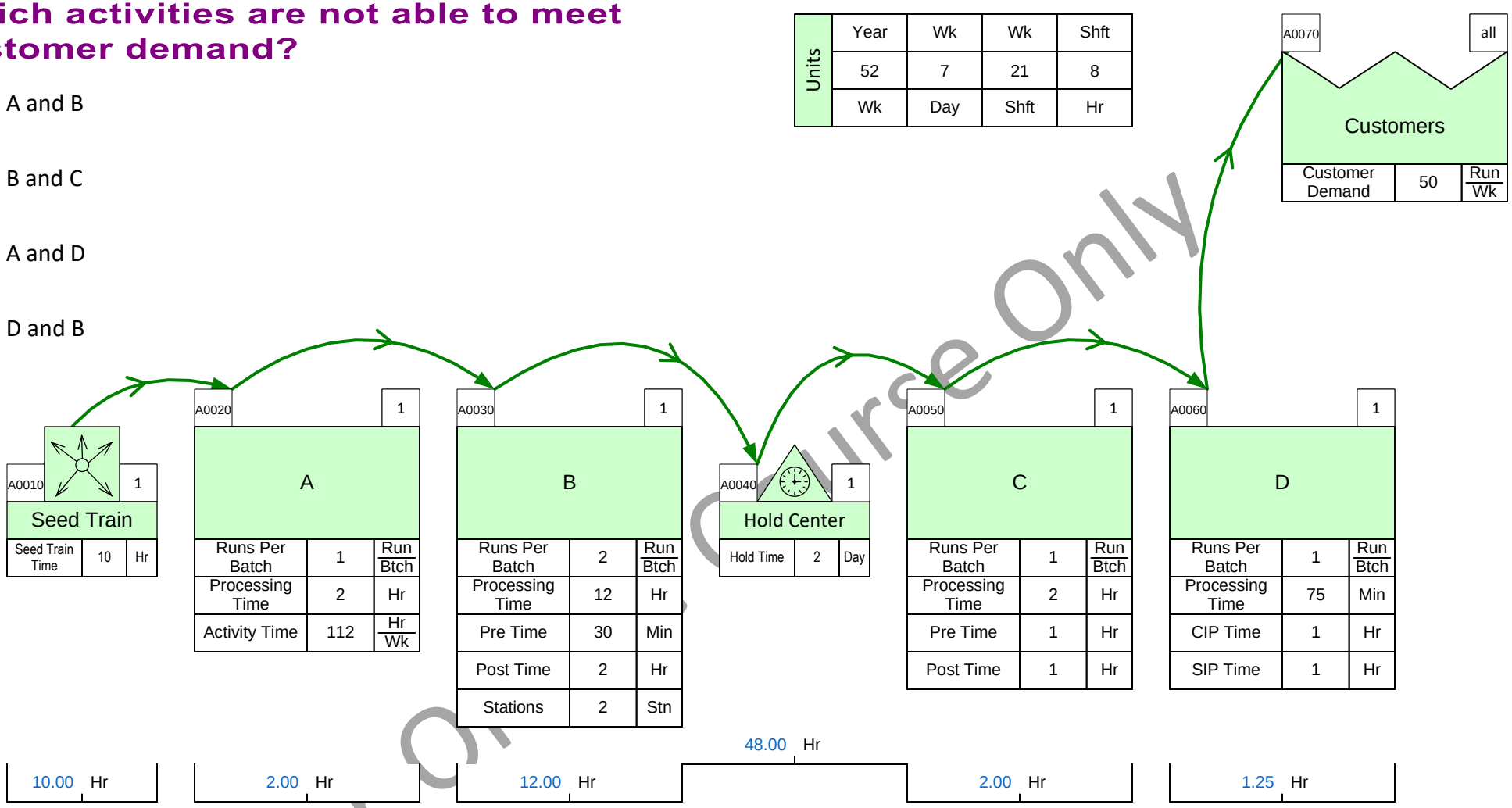


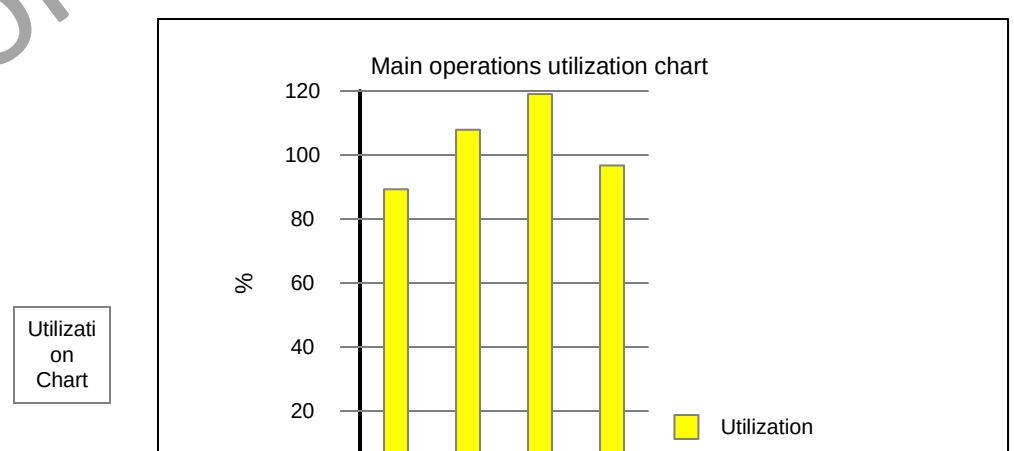
Activities which exceed 100% utilization will have trouble meeting customer demand

Which activities are not able to meet customer demand?

- A and B
- B and C
- A and D
- D and B

Units	Year	Wk	Wk	Shft
	52	7	21	8
	Wk	Day	Shft	Hr





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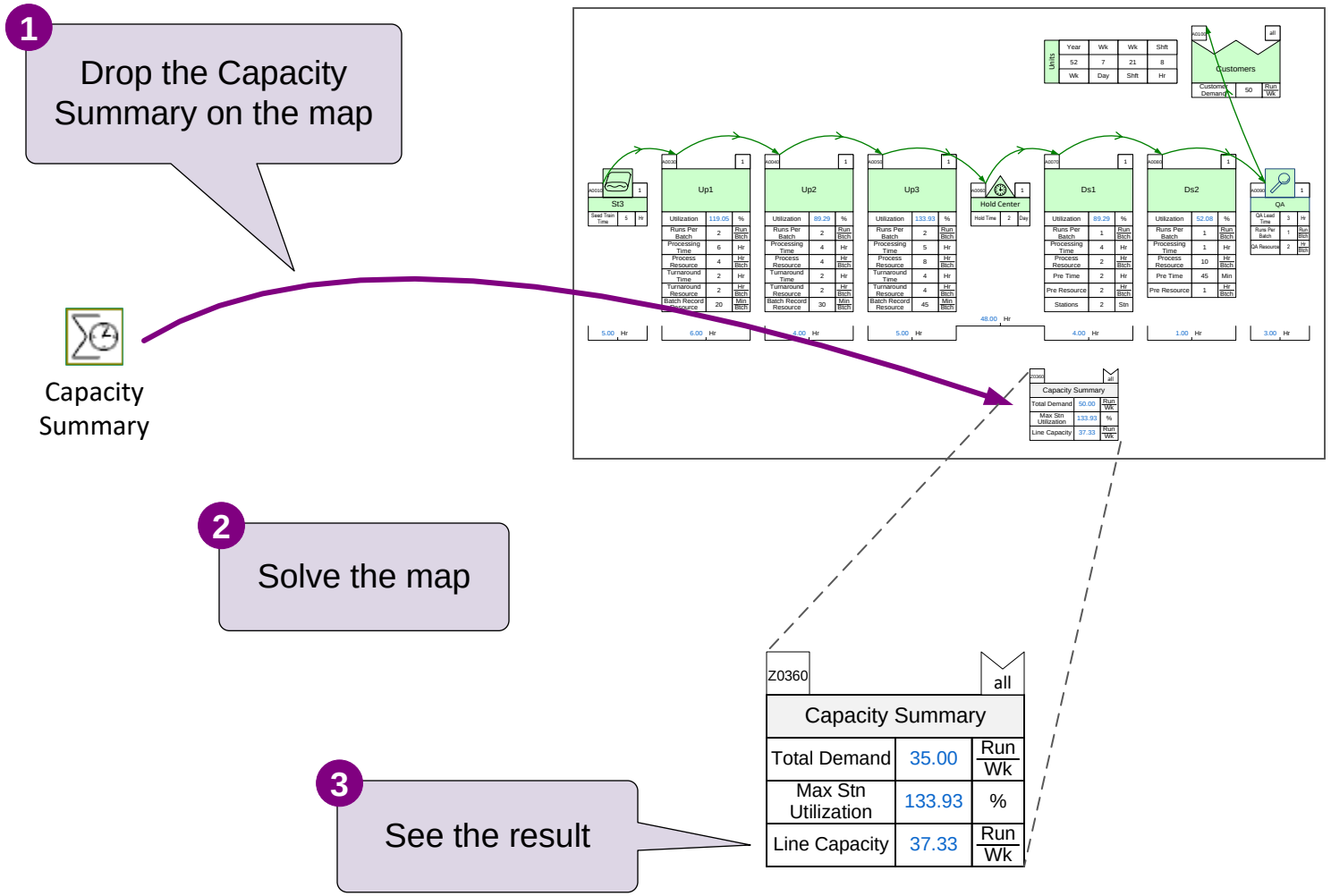
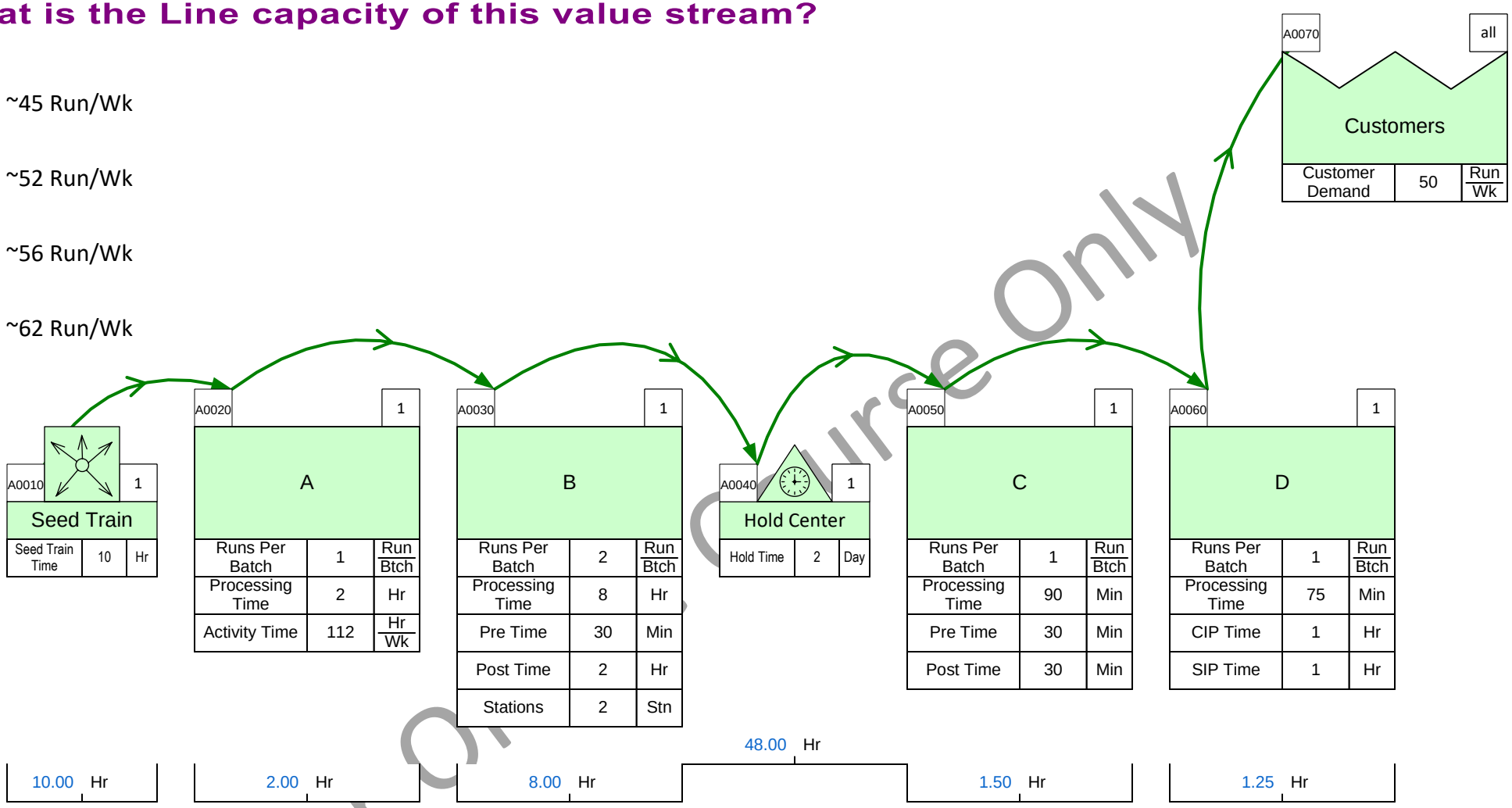
Line Capacity

The line capacity is calculated in Capacity Summary. Steps to use:



What is the Line capacity of this value stream?

- ~45 Run/Wk
- ~52 Run/Wk
- ~56 Run/Wk
- ~62 Run/Wk



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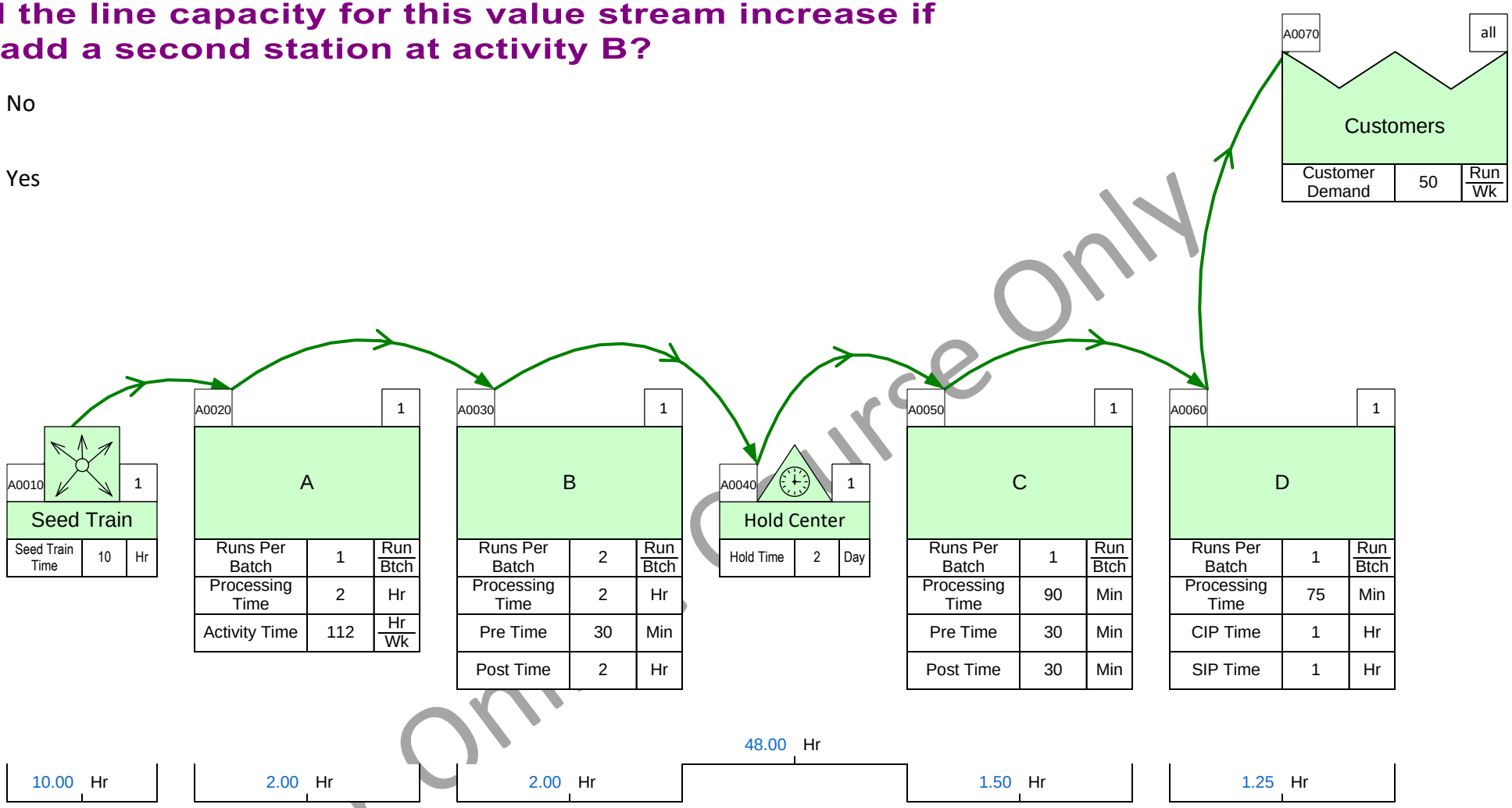
Units	Year	Wk	Wk	Shft
	52	7	21	8
70	Wk	Day	Shft	Hr

Z0360 — all

Capacity Summary		
Total Demand	50.00	Run/Wk
Max Stn Utilization	96.73	%
Line Capacity	51.69	Run/Wk

Will the line capacity for this value stream increase if we add a second station at activity B?

- ◎ No
- ◎ Yes



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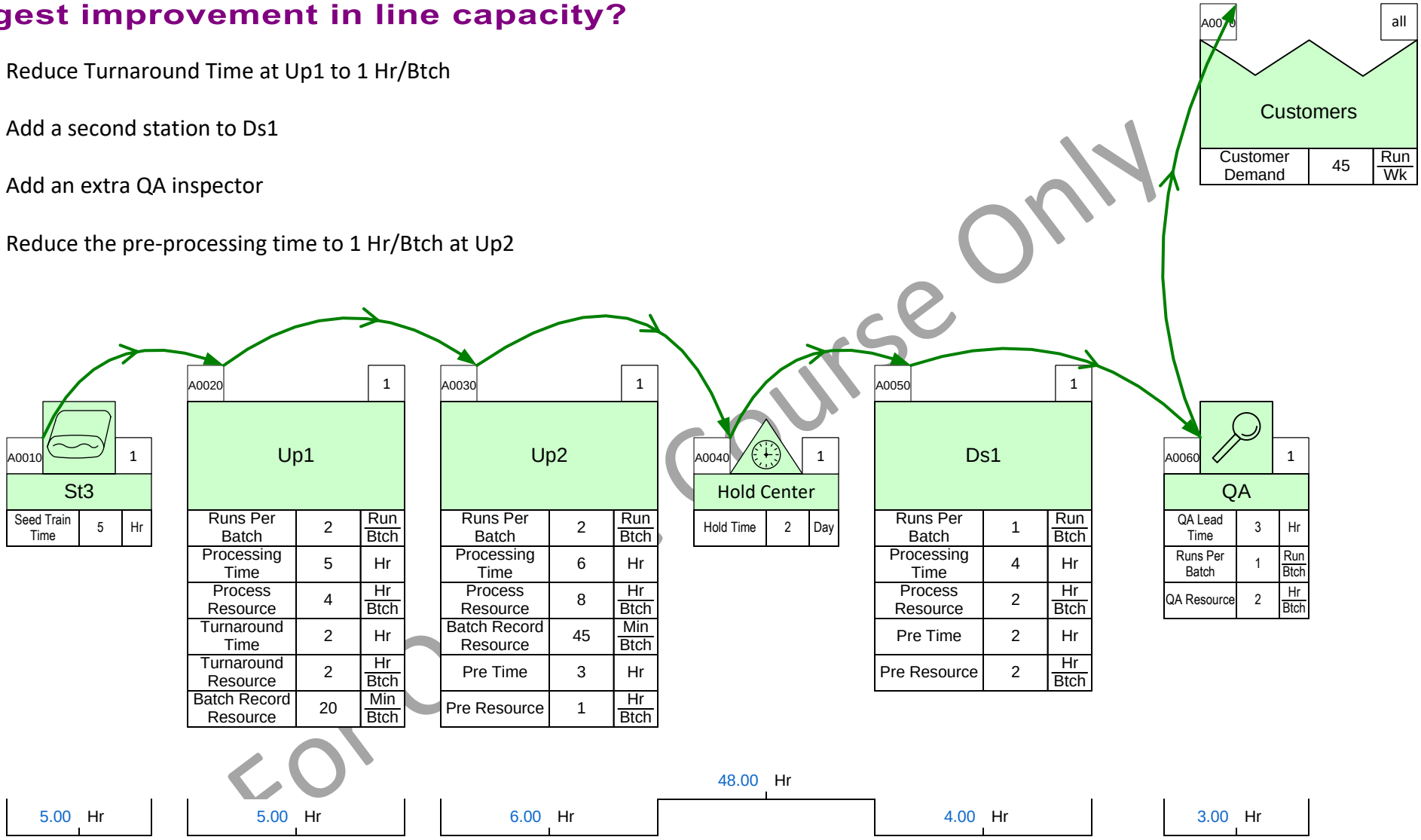
Units	Year	Wk	Wk	Shft
	52	7	21	8
	Wk	Day	Shft	Hr

Z0360 — all

Capacity Summary		
Total Demand	50.00	Run / Wk
Max Stn Utilization	96.73	%
Line Capacity	51.69	Run / Wk

Which one of the following changes will show the biggest improvement in line capacity?

- ◎ Reduce Turnaround Time at Up1 to 1 Hr/Btch
- ◎ Add a second station to Ds1
- ◎ Add an extra QA inspector
- ◎ Reduce the pre-processing time to 1 Hr/Btch at Up2



Units	Year	Wk	Wk	Shft
	52	7	21	8
	Wk	Day	Shft	Hr

Z0360	all
Capacity Summary	
Total Demand	45.00 Run Wk
Max Stn Utilization	160.71 %
Line Capacity	28.00 Run Wk

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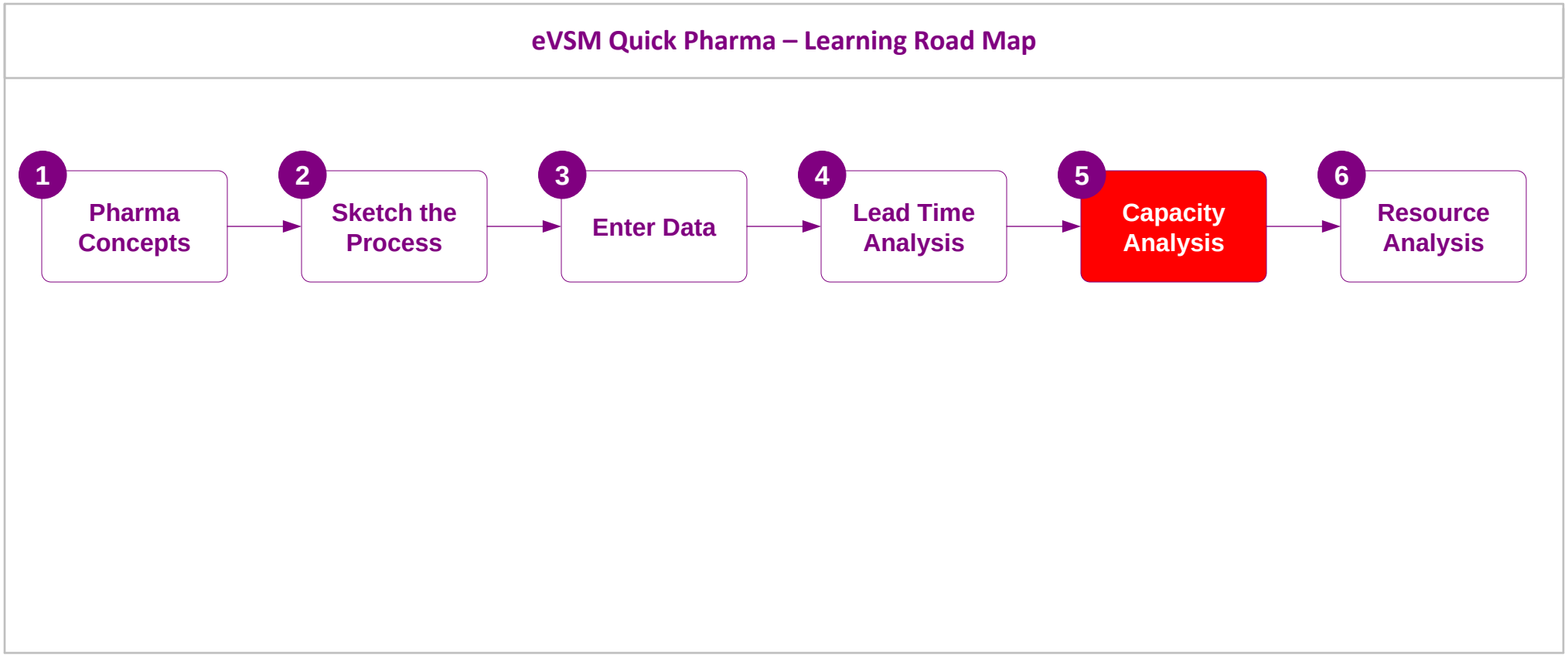
Lesson Summary: Capacity Analysis

You learned:

- How to preform a capacity analysis on a map
- How the Utilization chart can visualize capacity
- How to show the line capacity
- How to explore impact on capacity of improvement ideas

Road Map:

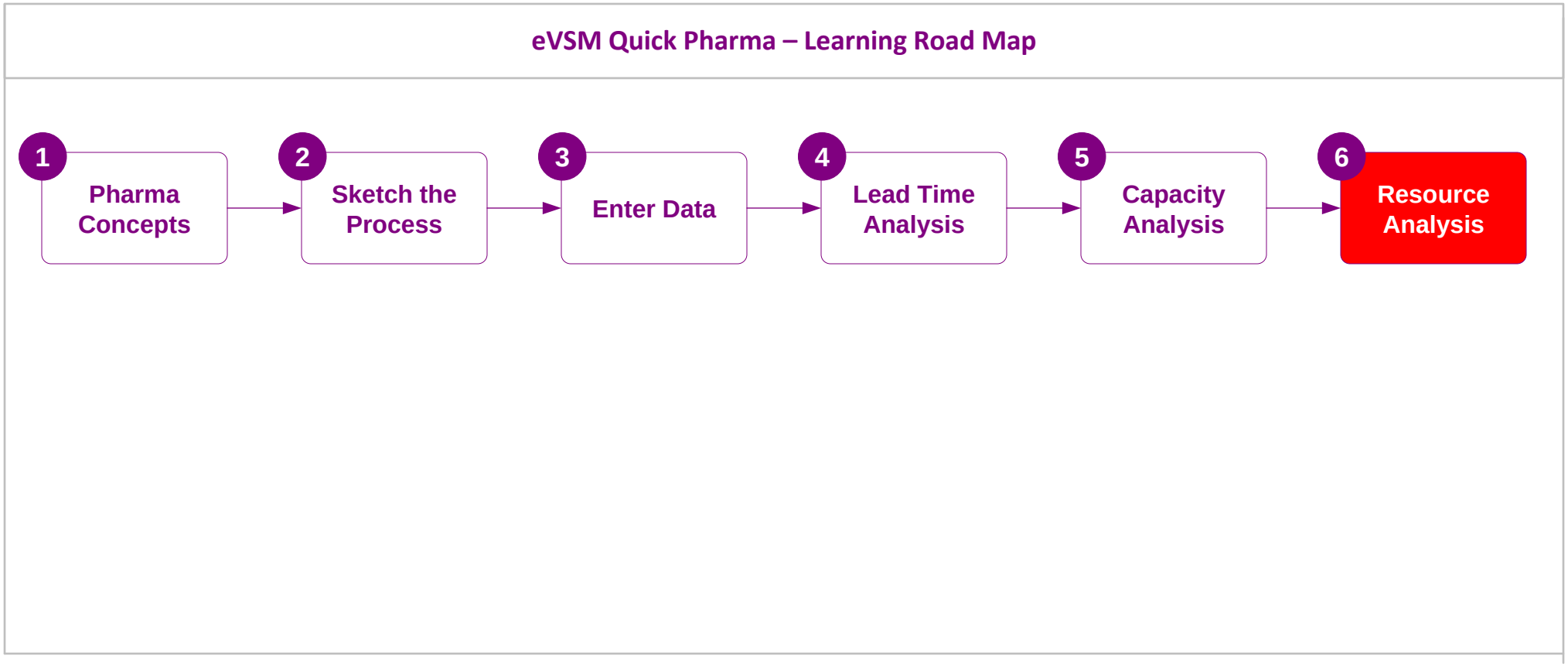


What's next:

You will learn how to preform a resource analysis on a map in eVSM.

Resource Analysis

Given your customer demand and operation parameters, eVSM can calculate resource required and the resource utilization for a part or the whole of the value stream. This lesson shows how.

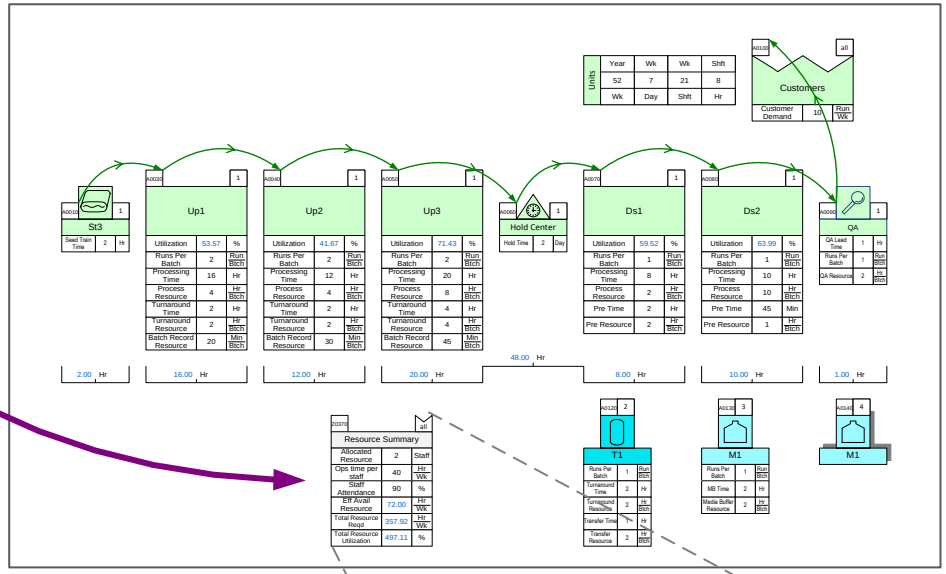


Resource analysis for the Pharma Process Flow

Total Resource Required and Total Resource Utilization

The total resource required for the value stream depends on the customer demand, the effort required to process each run, all the pre and post activities, and the supporting off-line activities. A quick way to get this total estimate is with the Resource Summary center.

Once you have the value stream model configured with the input data, simply drop the Resource Summary center on the page, enter the allocated staff data, and Solve.



Total Staff.

Staff availability after holidays, sick leave, etc. accounted for.

Z0020 | all

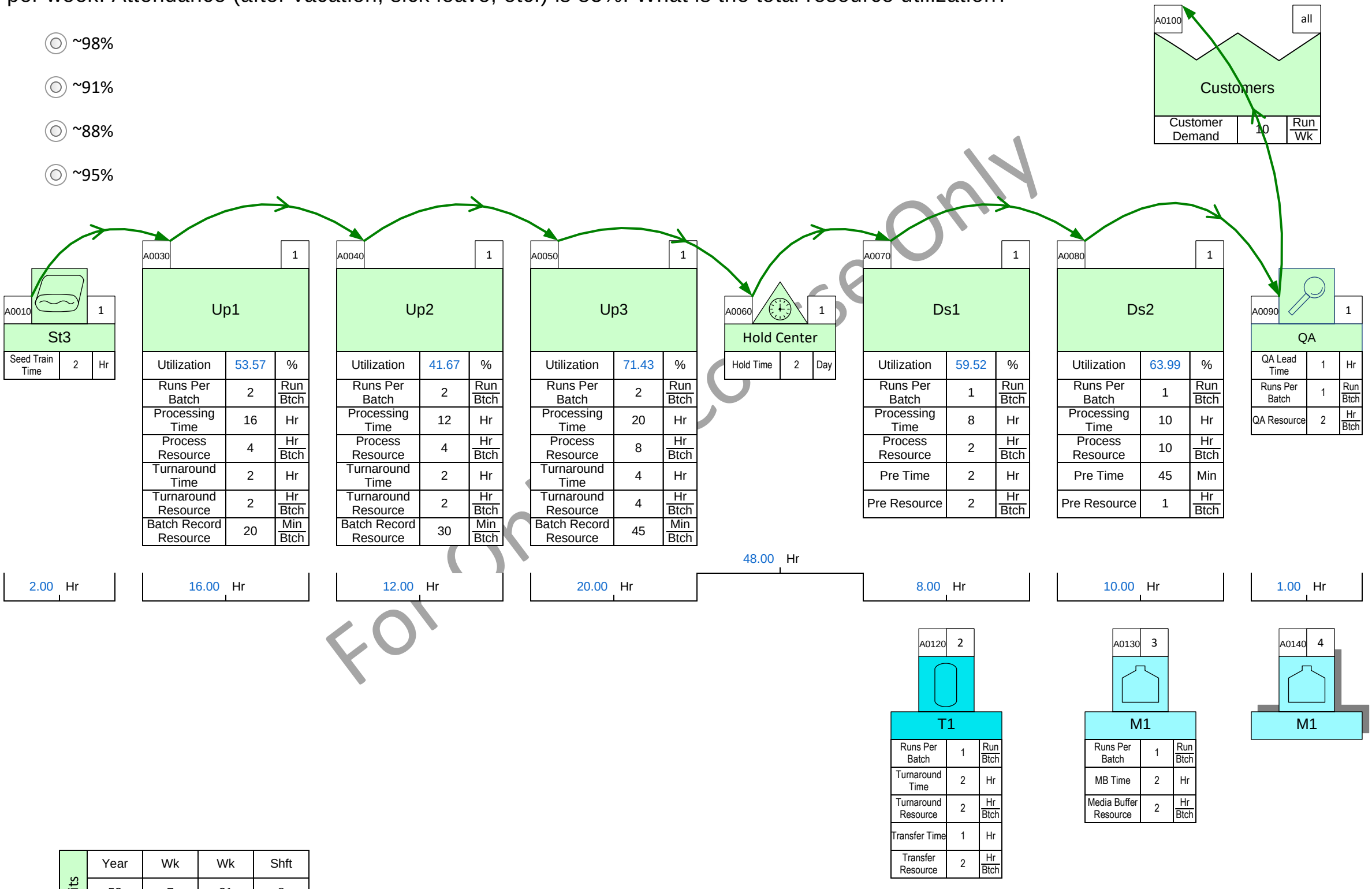
Resource Summary		
Allocated Resource	22	Staff
Ops time per staff	40	Hr/Wk
Staff Attendance	90	%
Eff Avail Resource	792.00	Hr/Wk
Total Resource Reqd	735.83	Hr/Wk
Total Resource Utilization	92.91	%

Blue values calculated automatically by eVSM.

Total Resource

You have a team of 12 associates to cover all activities shown below. All associates work 40 hours per week. Attendance (after vacation, sick leave, etc.) is 85%. What is the total resource utilization?

- ~98%
- ~91%
- ~88%
- ~95%



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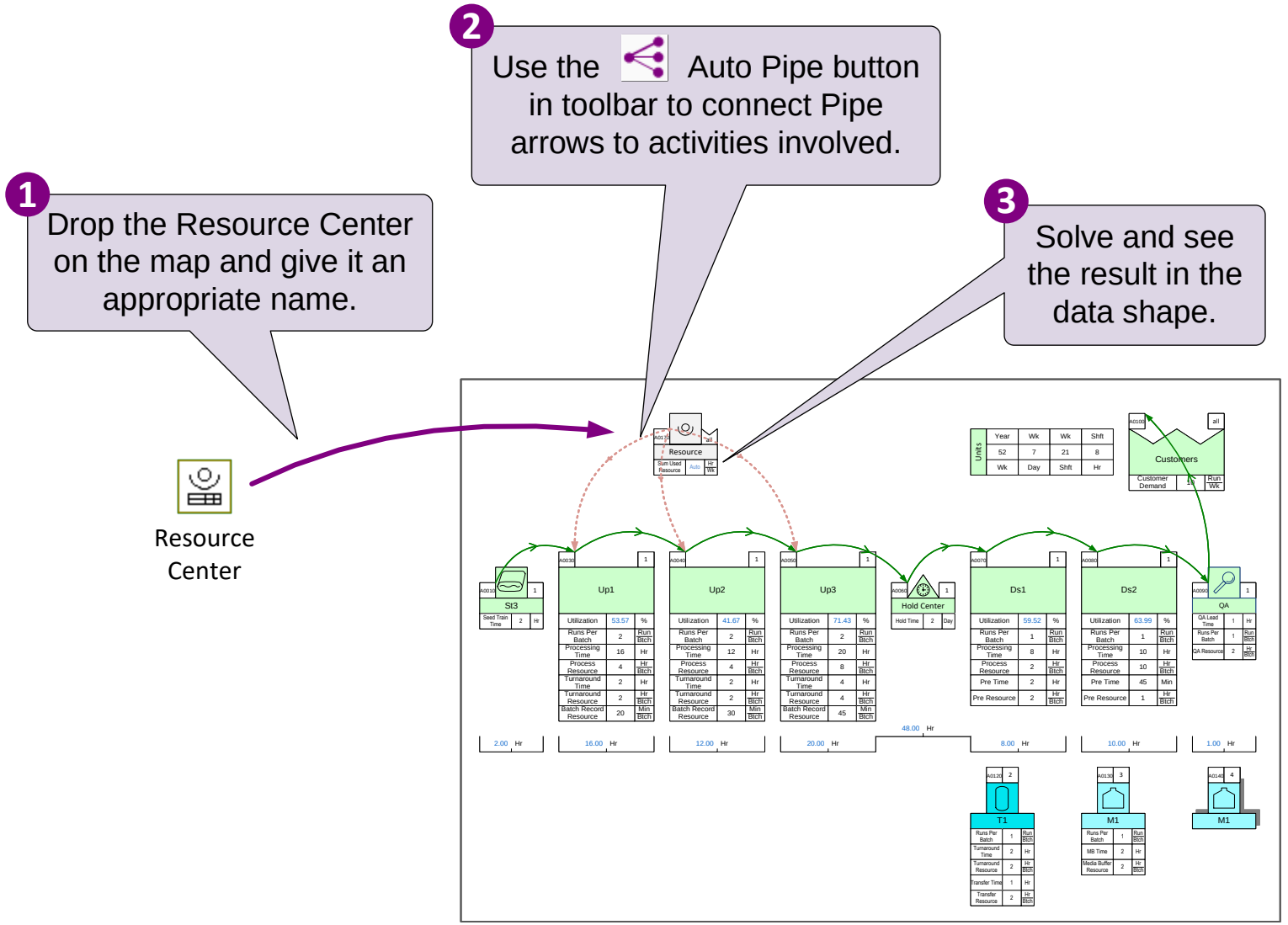
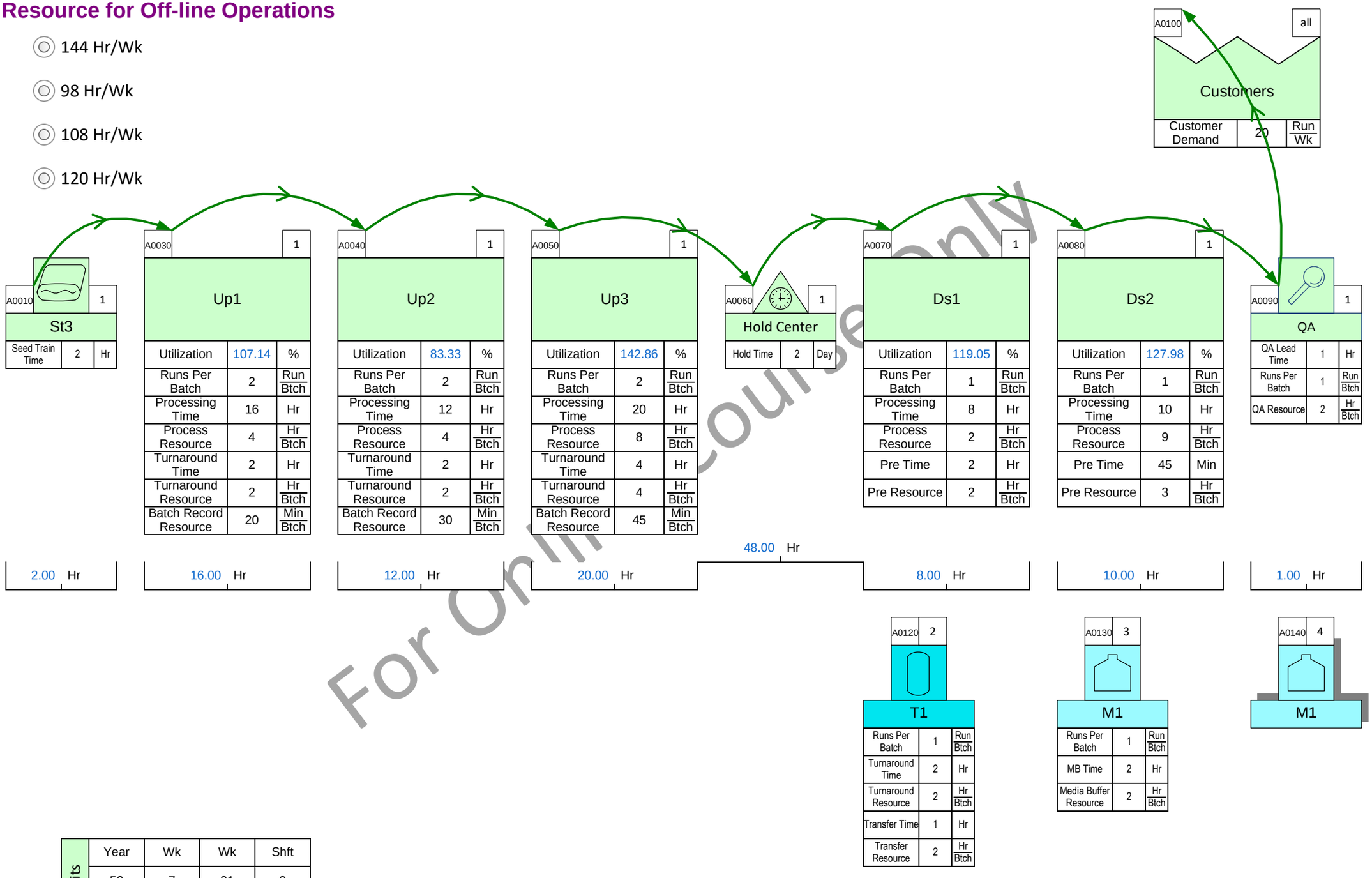
Resource Analysis for a Part of the Value Stream

When you need to calculate the resource usage for just a part of the value stream, you can use the Resource Center.



Resource for Off-line Operations

- 144 Hr/Wk
- 98 Hr/Wk
- 108 Hr/Wk
- 120 Hr/Wk



Units	Year	Wk	Wk	Shft
	52	7	21	8
	Wk	Day	Shft	Hr

For Online Course Only

Resource Utilization for a Part of the Value Stream

To calculate the resource utilization for a part of the value stream, follow these steps.

1. Drop the Resource Center on the map and give it an appropriate name.

Resource Center

Resource Usage

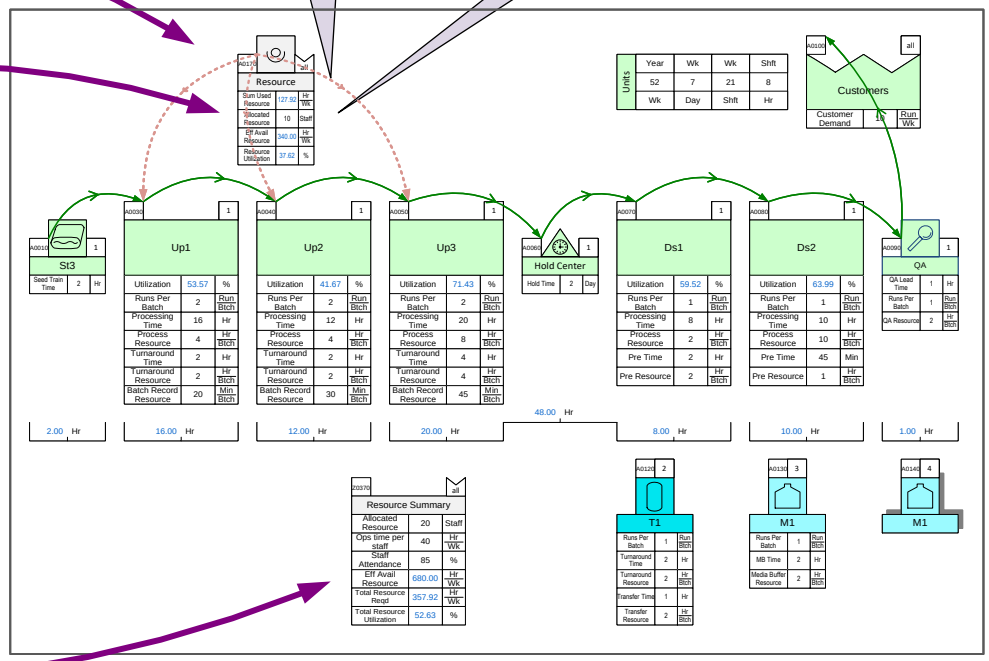
2. Attach the Resource Usage add-on to the Resource Center.

3. Make sure there is a Resource Summary center on the map with the plant resource data.

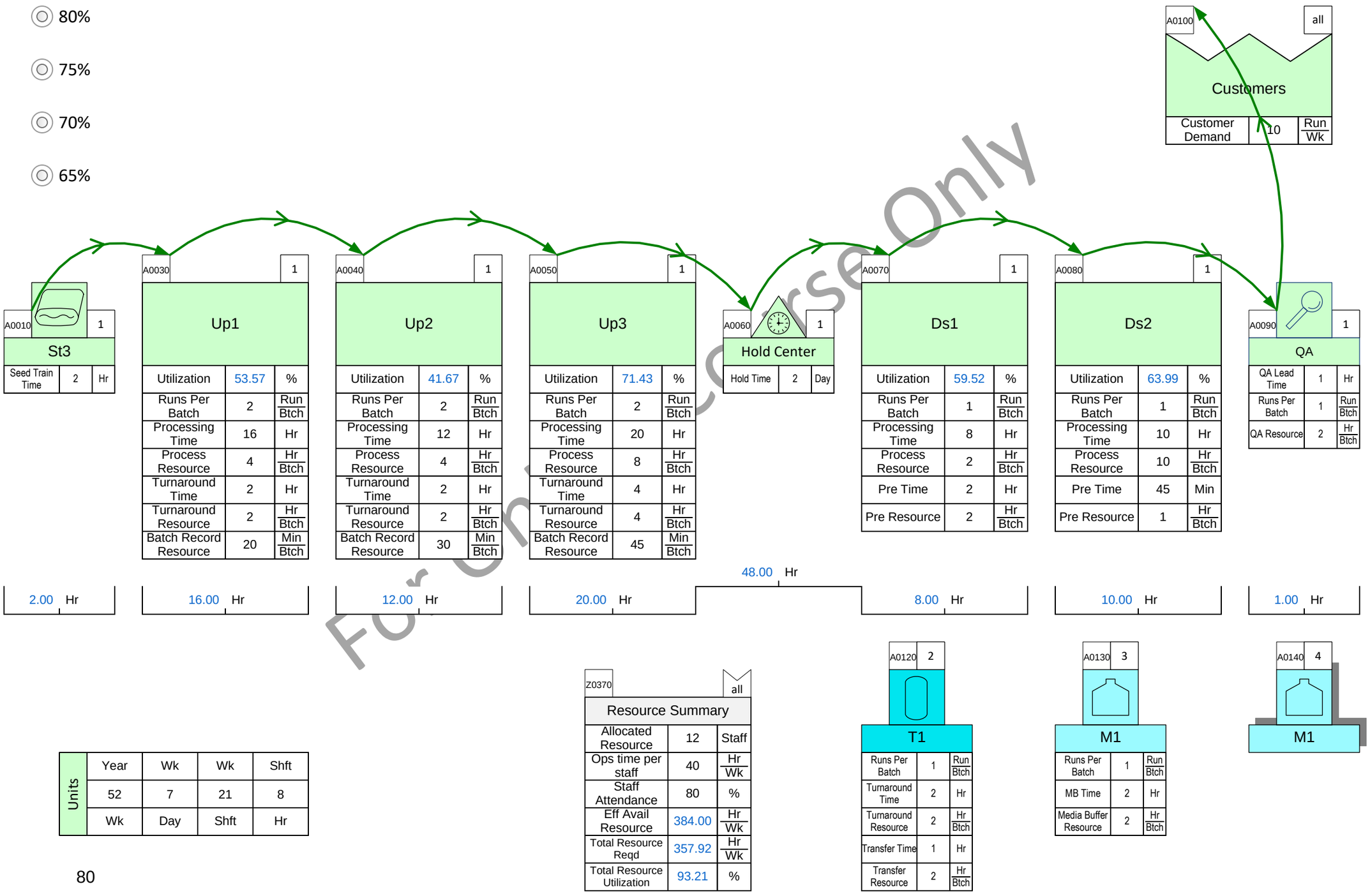
Resource Summary

4. Use the Auto Pipe button in toolbar to connect Pipe arrows to activities involved.

5. Solve and see the result in the Resource Center.



Resource for Up-stream In-line Operations



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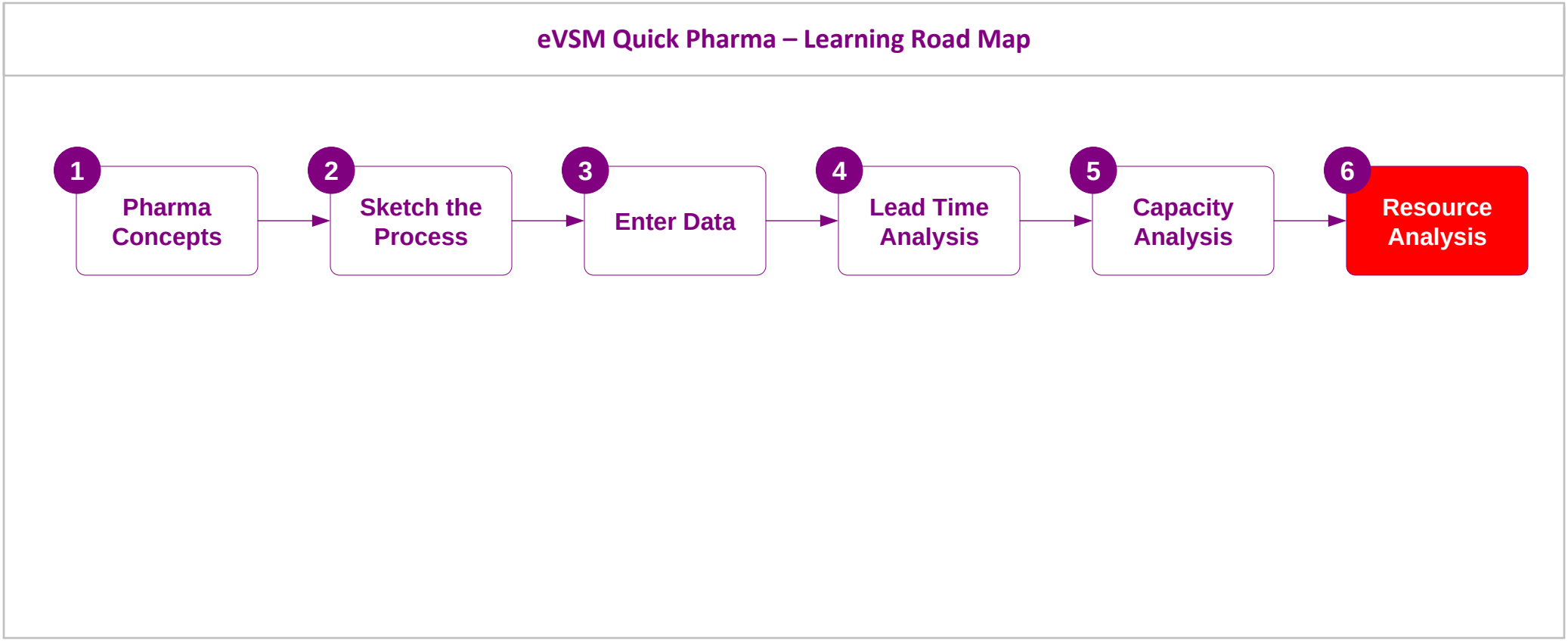
Lesson Summary: Resource Analysis

You learned:

- How resource requirements are modelled in eVSM
- How to calculate the total resource usage and utilization for the whole value stream
- How to calculate the resource usage and utilization for a part of the whole value stream

Road Map:



What's next:

Keep a copy of the course notes handy for future reference. Attempt capturing one of your value streams in eVSM. If you have questions, connect with support@evsm.com to discuss.

Useful Links

eVSM Toolbar Guide	evsm.com/toolbarguide
Map Examples	evsm.com/examples
eVSM Blogs	evsm.com/blog
eVSM Support FAQ	evsm.com/support
Download Latest Version	evsm.com/install