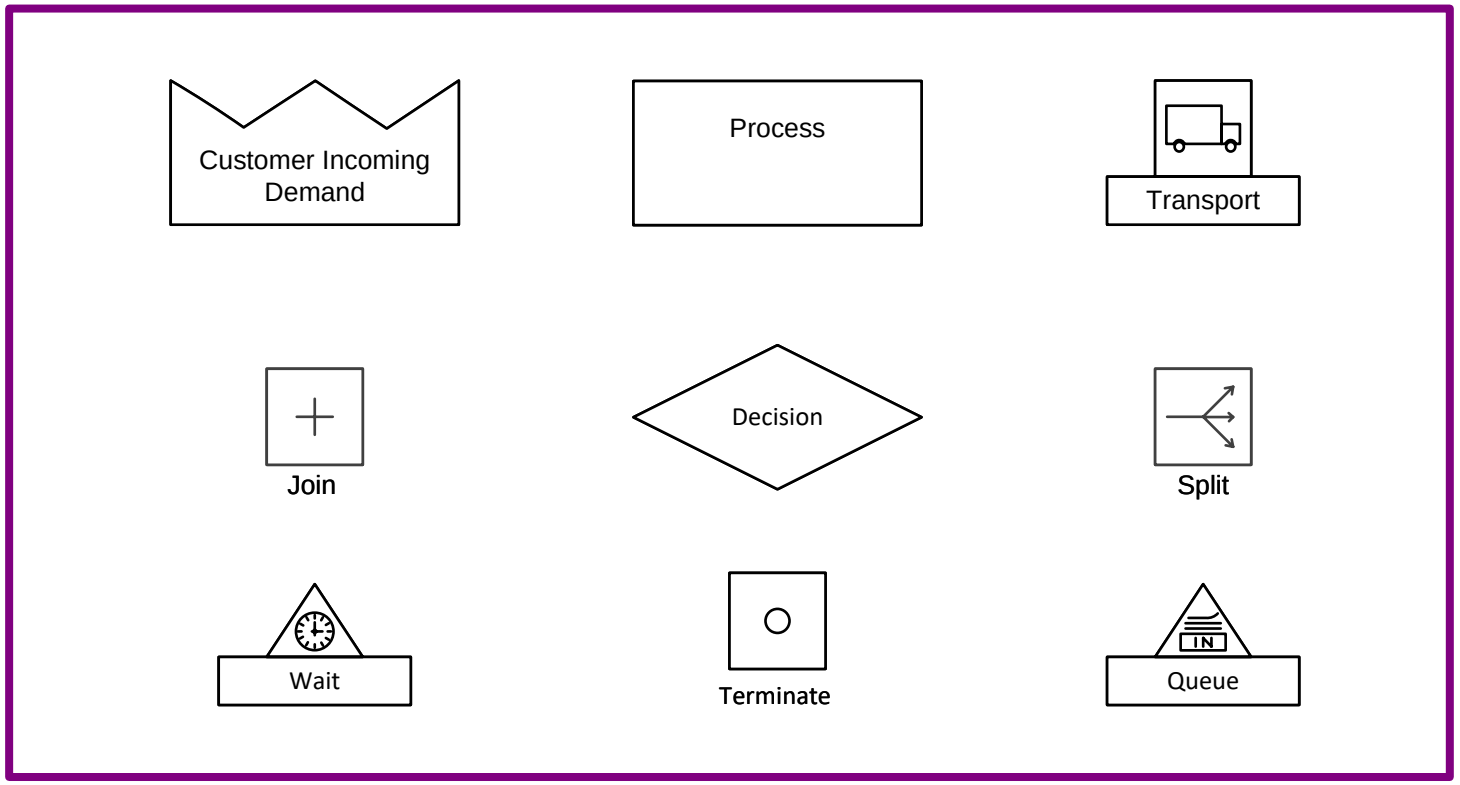
Mix Transactional VSM

This course teaches the Mix Transactional VSM application (The Fast Draw course is a pre-requisite for this and must be completed first). The course covers transactional mapping concepts, hand calculations, step-by-step guide to building VSM models, and the eVSM improvement framework.



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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". If you are using this booklet on-screen while going through the exercises in eVSM, a second monitor is very helpful.

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

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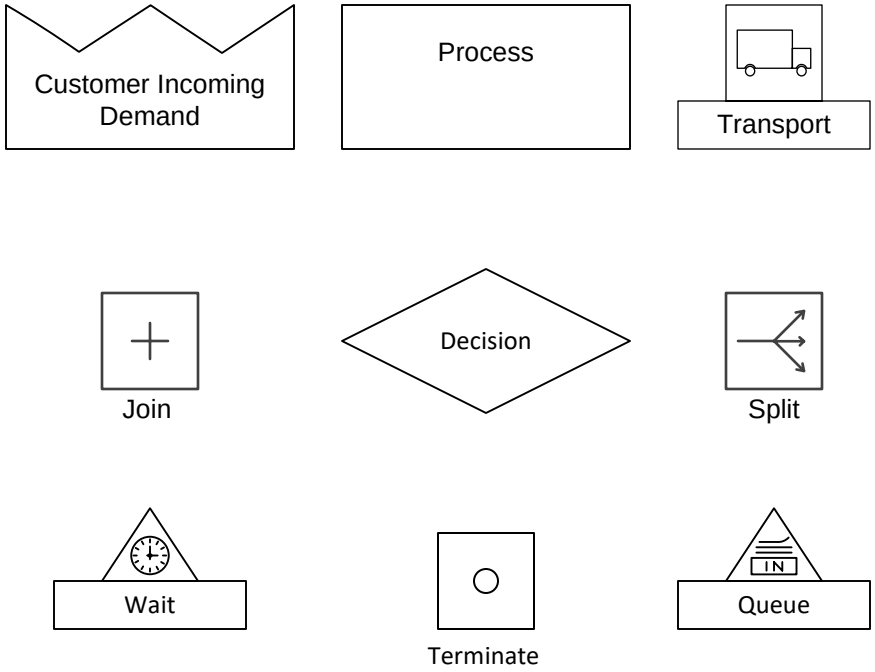
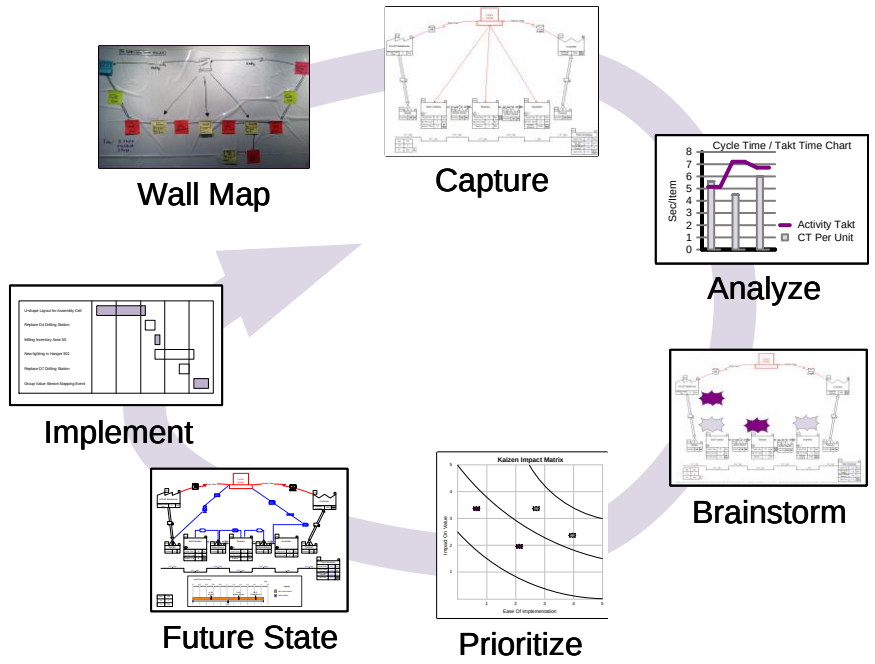
Transactional Mapping Concepts

This course will teach you to use eVSM's Mix Transactional VSM application in an improvement cycle for transactional value streams in office, services, and healthcare. This first Lesson will introduce you to the icons, variables, and concepts that Mix Transactional VSM is based upon.

Transactional Icons

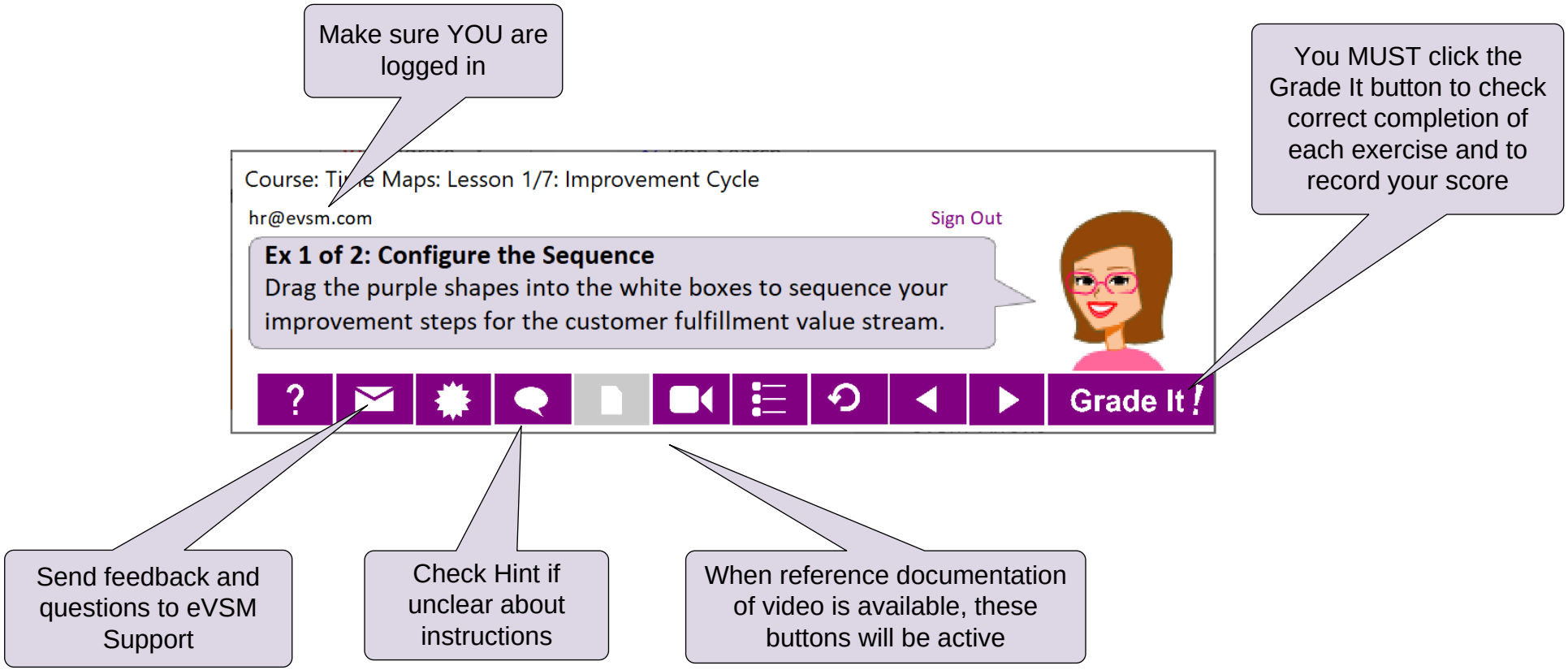


Continuous Improvement Cycle



Working with eLeanor

The eLeanor learning system includes a range of useful functions:



Important Notes

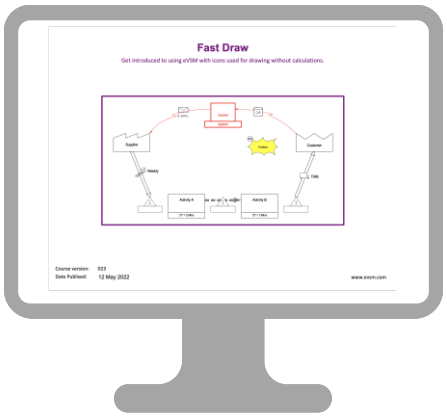
1. When you complete an exercise, you **MUST** click the “Grade It” button.
2. Points are deducted for incorrect attempts.
3. If you are stuck on an exercise, check the Hint. If that does not help, go back and review the preceding Readme pages. If you are still unsure, click the Feedback button and ask your question.

Ideal Setup to work with eLeanor

To run eLeanor, you must have Visio, Excel, eVSM, and an internet connection. See full checklist at https://evsm.com/eLeanorSetup

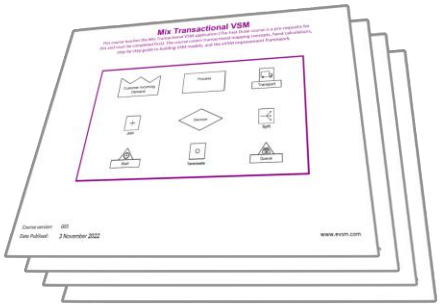
Your PC screen must have a minimum of 1280x720 pixel resolution.

Additionally, you must have a second monitor or a printed copy of the course notes.



Second Monitor to view the course notes

OR

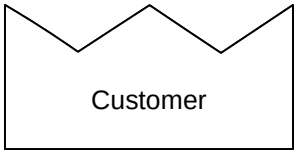


Printed hardcopy of course notes

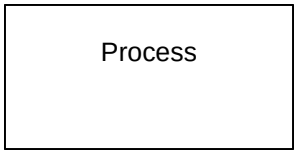
Note

The course notes are included in the downloaded course ZIP file. You can also download a fresh copy by clicking the “See Reference Materials” button in the eLeanor control panel.

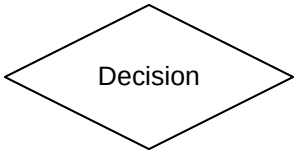
Transactional VSM Shapes



Customer Input



Activity Center

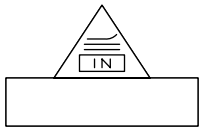


Decision Center

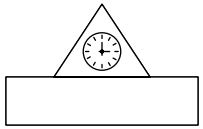
Join Center

Split Center

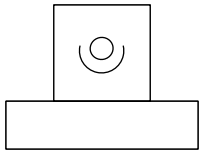
Terminate Center



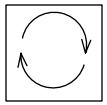
Queue Center



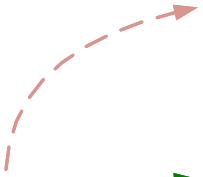
Wait Center



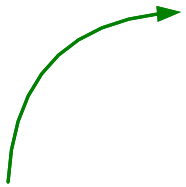
Resource Center



Linker Center



Pipe Arrow

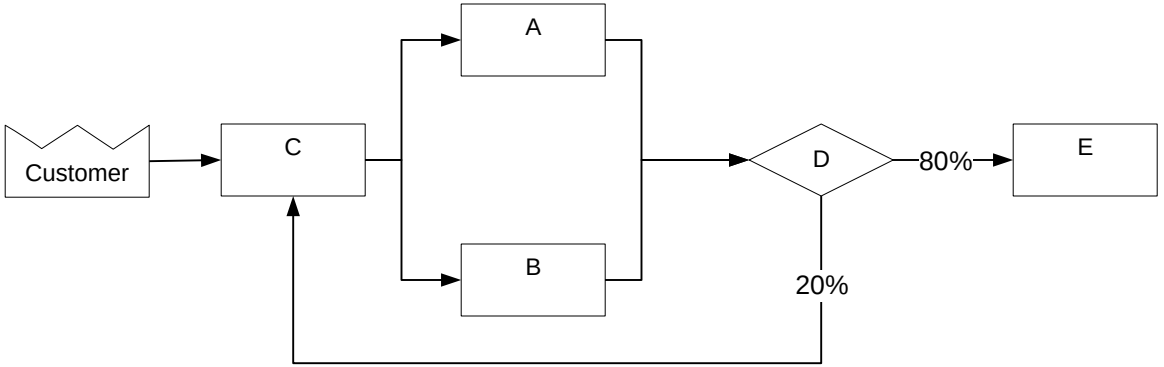


Sequence Arrow

Demand

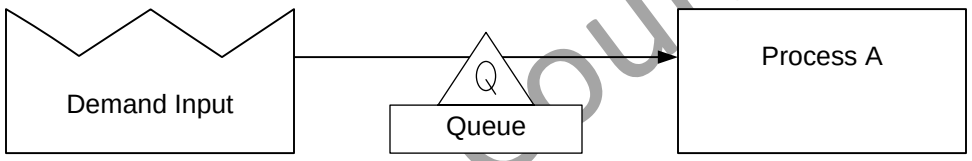
Importance of Demand on a Value Stream Map

- In a transactional map, work units are transformed along the process, sometimes loop back, split into multiple parallel proce sses and have processes join together before proceeding.
- This makes the understanding of “demand” at any step particularly challenging. Once demand is understood at a step, it can be “extracted” in considering its capacity, and then its contribution to overall cost and lead times.
- There are two demand values at each step. First time demand and repeat demand. If there are no loop backs, repeat demand is zero.



Q. If there is an 'Input Demand' of 100 units, what will demand at Process A be?

- ◎ 40 Units
- ◎ 100 Units
- ◎ 140 Units



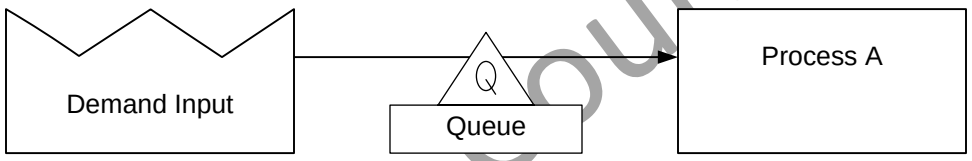
Demand = 100 Units

Queue = 40 Units

Lead Time = 15 Mins

Q. What will the demand be at process A if the number of units in the queue is increased from 40 to 50?

- ◎ 150
- ◎ 50
- ◎ 100



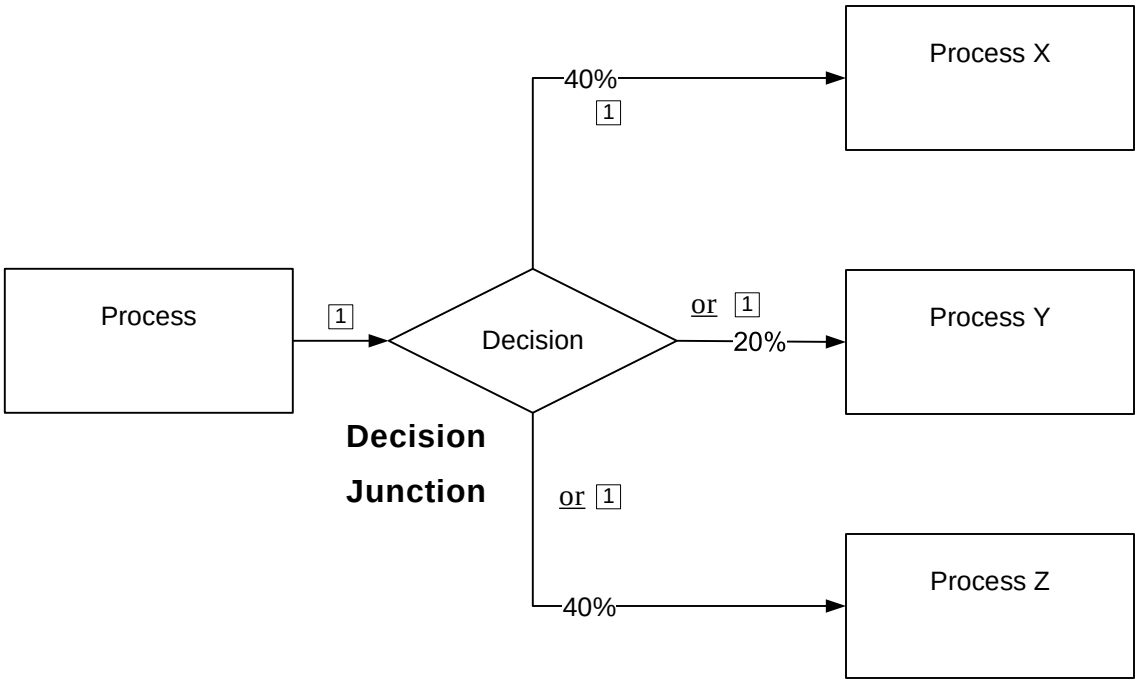
Demand = 100 Units

Queue = 40 Units

Lead Time = 15 Mins

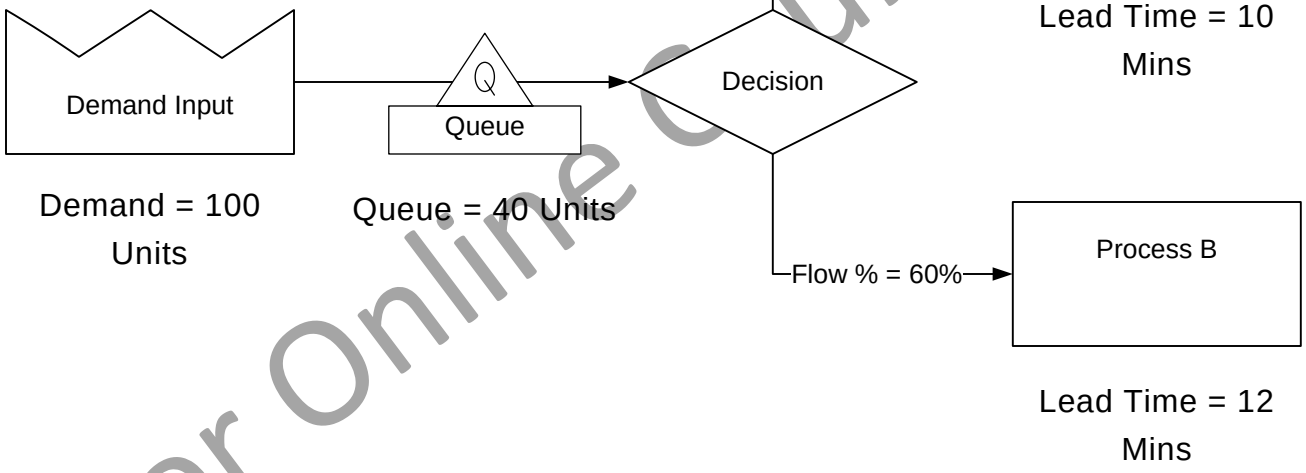
Decision Construct

A junction where incoming work units are routed to ONE of the outgoing paths based on the Flow % values and probability.



Q. What is the demand at process B?

- 60 Units
- 40 Units
- 100 Units
- 160 Units

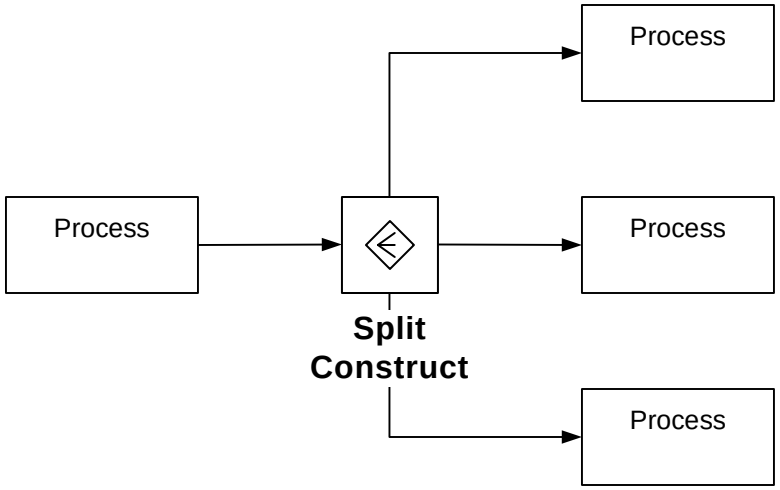


Split/Join

The Split and Join constructs facilitate modeling of parallel work.

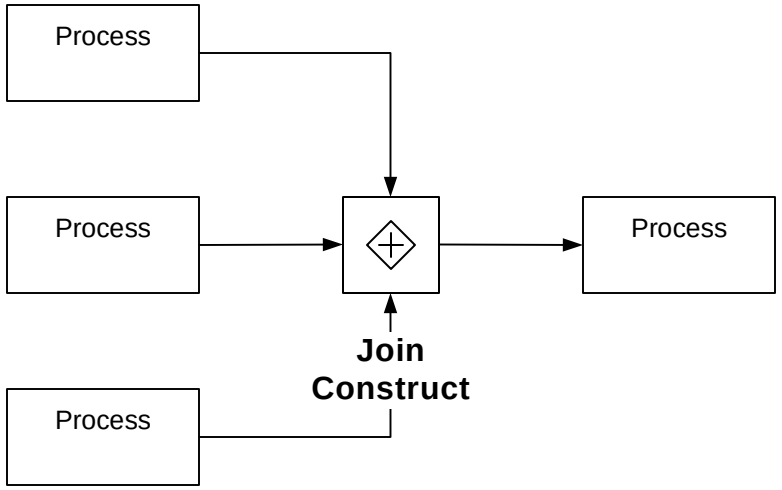
Split Construct

A junction with exactly one incoming path and two or more outgoing paths. The work unit from the incoming path results in a parallel work unit on EACH of the outgoing paths.



Join Construct

A junction with 2 or more incoming paths. Work Units on all incoming paths are needed for the work to move forward. There is only ever 1 outgoing path.

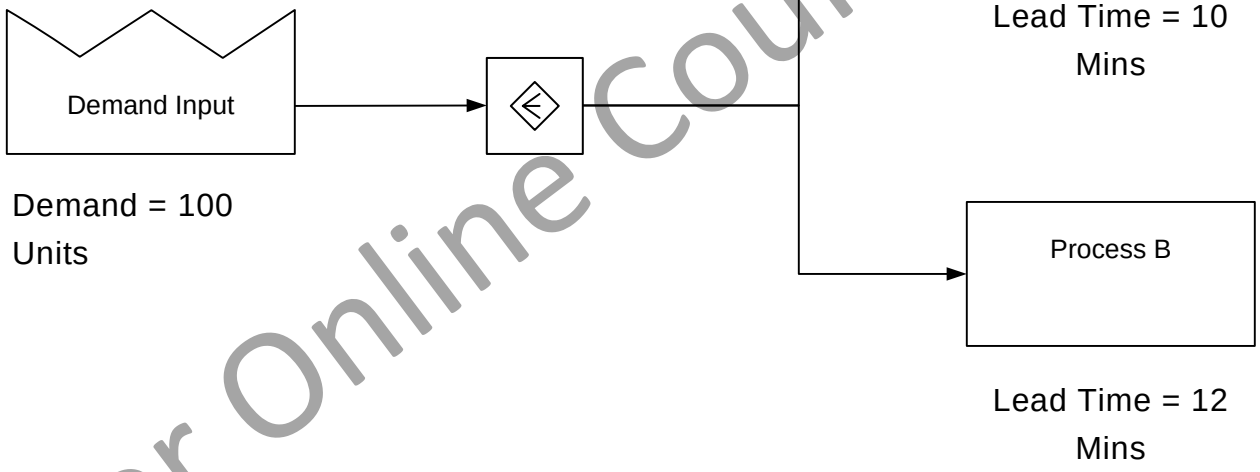


Split/Joins are different form the Decision construct in that ALL the work content has to go through each path. An example of this may be the approval process where Legal, Engineering, and Production need to sign-off.

Once the work item goes through Split, it cannot proceed down-stream until it goes through a Join. So, Splits and Joins are always matching pairs on the map. The number of incoming arrows to the join must match the number of outgoing arrows in the corresponding upstream split center

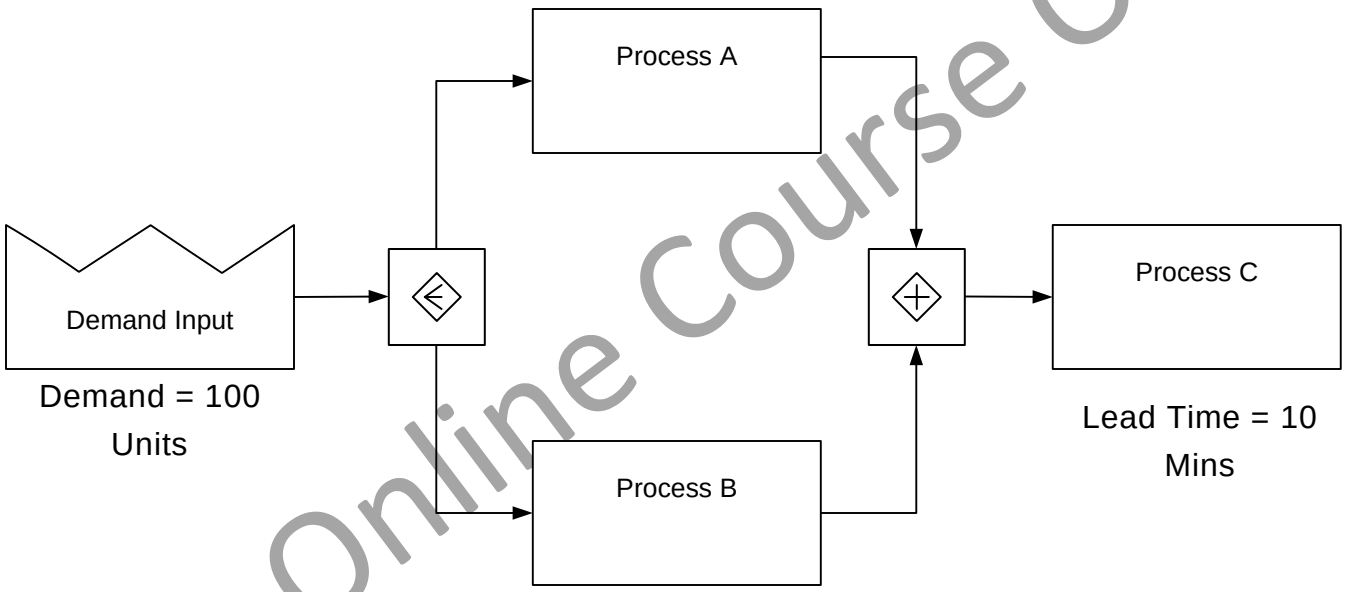
Q. What is the demand at process A?

- 50 Units
- 150 Units
- 100 Units



Q. What is the demand at process C?

- 50 Units
- 100 Units
- 25 Units

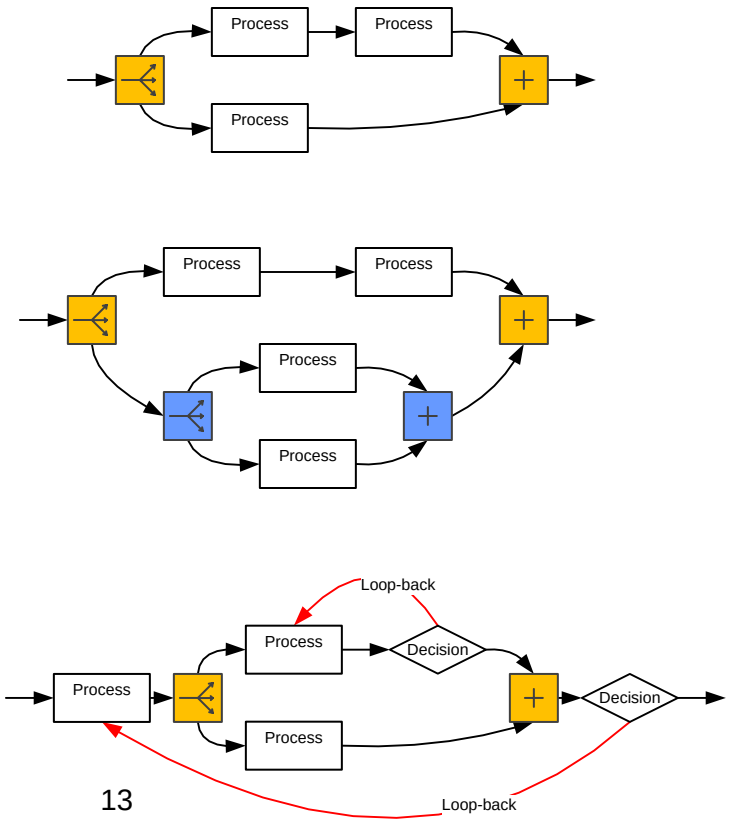


Split/Join Rules

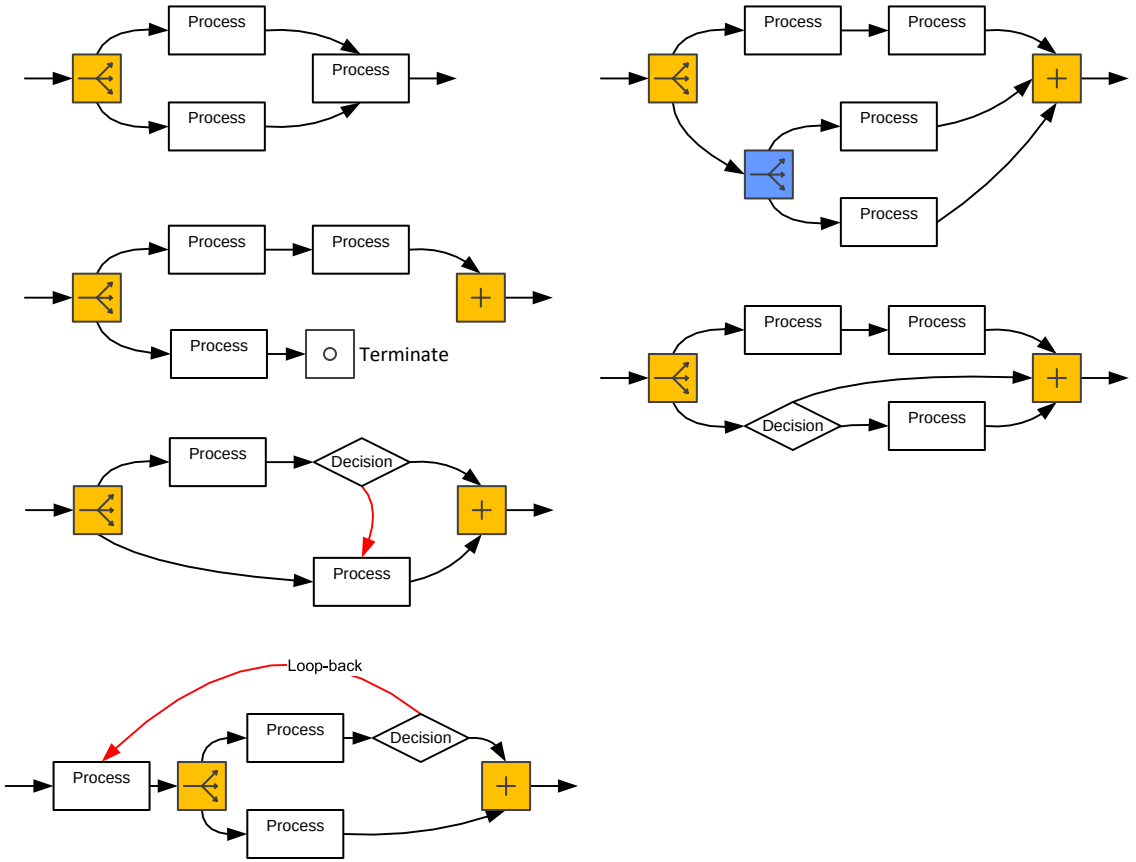
- All split centers must each have a corresponding join center
- The number of paths coming into a Join must match the number of paths coming out of the corresponding Split
- Paths cannot terminate within the Split/Join pair
- Decision outcomes from within a Split/Join pair cannot by-pass the Join
- Cannot loop back from within a Split/Join pair to an activity outside the pair

The sketches below show valid and invalid configurations for Splits and Joins.

Examples of valid Split/Joins

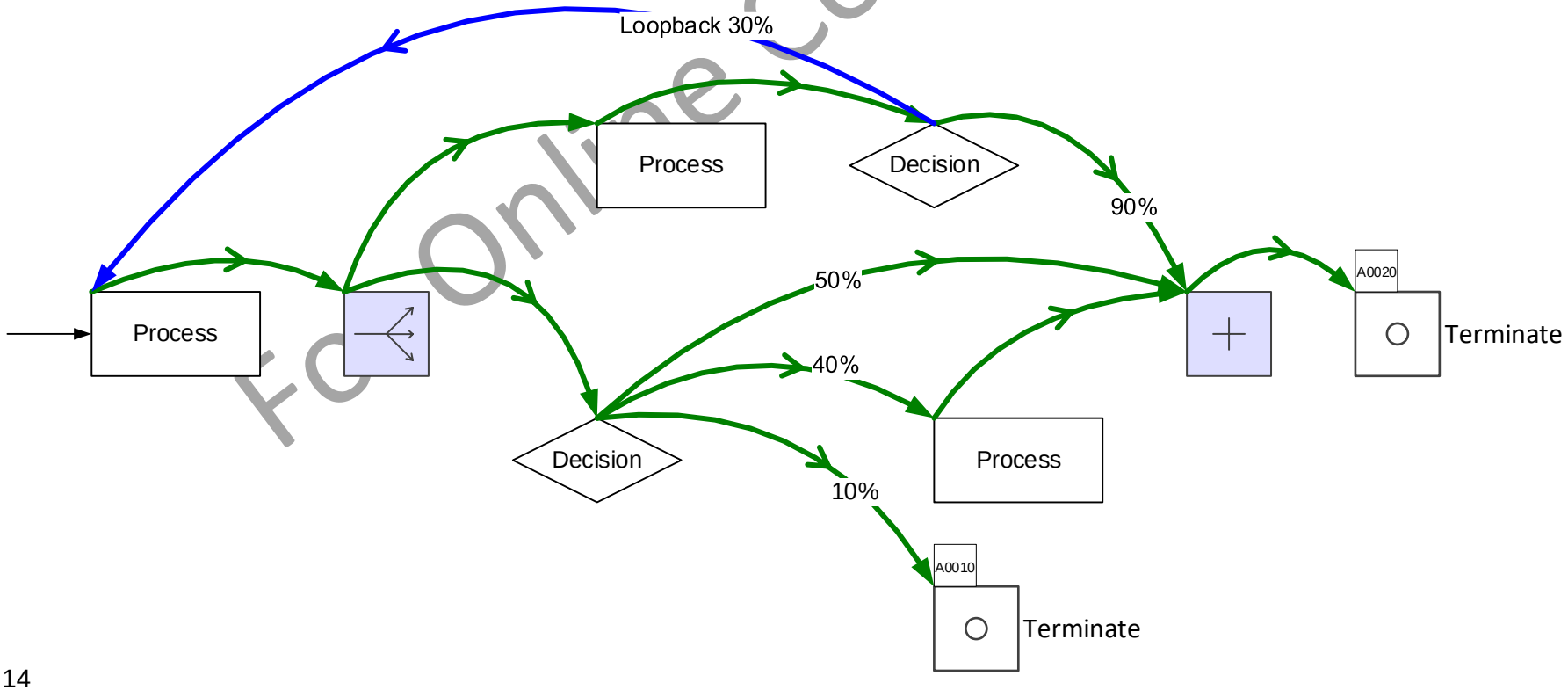


Examples of Non-valid Split/Joins



In the map below, which of the following violates the Split/Join rules? (Select ALL that apply)

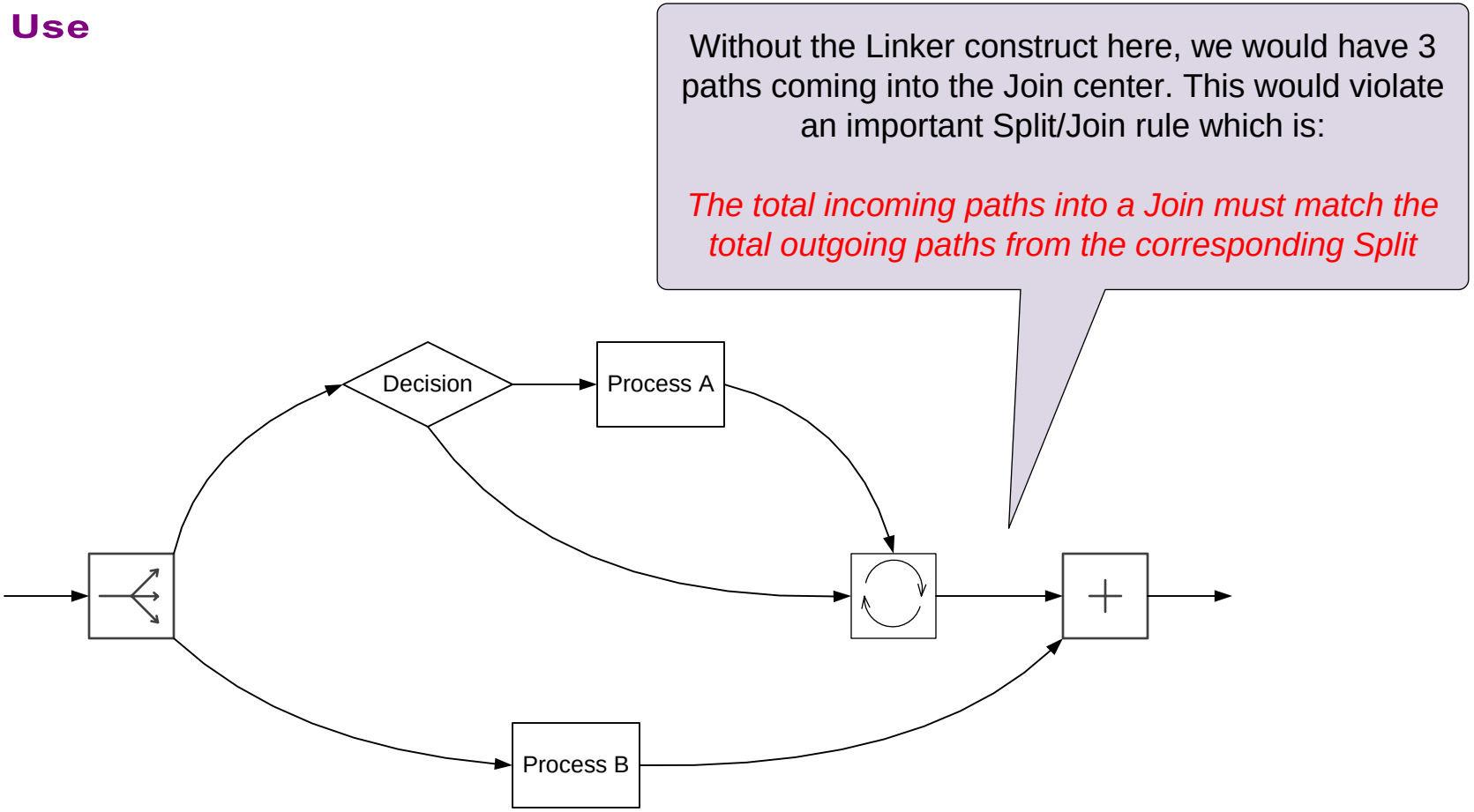
- ☐ Number of outgoing/incoming arrows between Split/Join does not match
- ☐ Some work is being terminated within the Split/Join pair
- ☐ The percentages outgoing from the decisions do not add up to 100%
- ☐ Loop back from within the Split/Join pair
- ☐ There are more than one termination centers on this map



Linker Construct

The linker construct is a pass-through junction which allows work items to simply pass through or merge into a single path. It can have one or more incoming paths and only one out-going path. The traffic in the incoming arrows is added together and sent out through the outgoing arrow.

Example Use



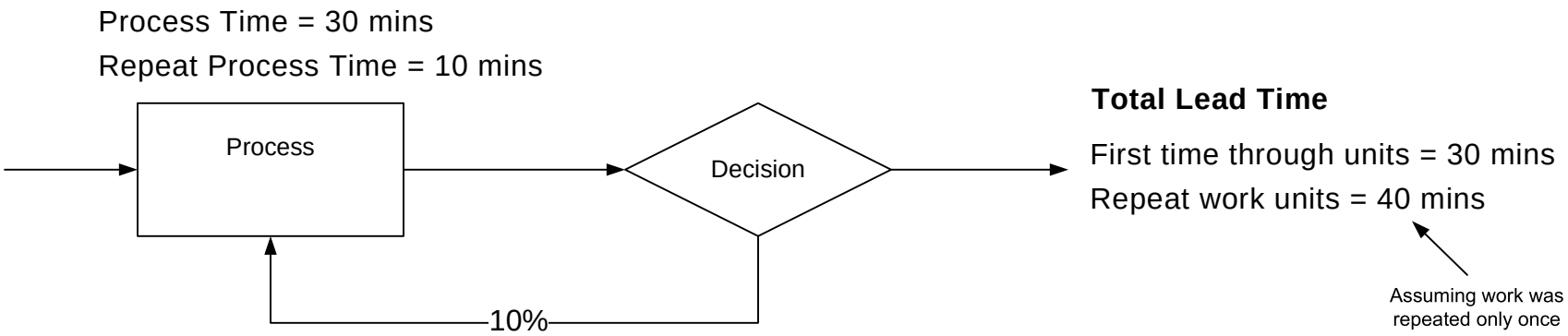
Q. Which of these statements are True? (Select ALL that are True)

- [ ] Linker construct must have two or more incoming paths
- [ ] Linker construct merges the demand from all incoming paths into a single outgoing path
- [ ] Linker construct can have one or more out going paths
- [ ] Linker construct does not have any time metrics

First Time vs Repeat Work

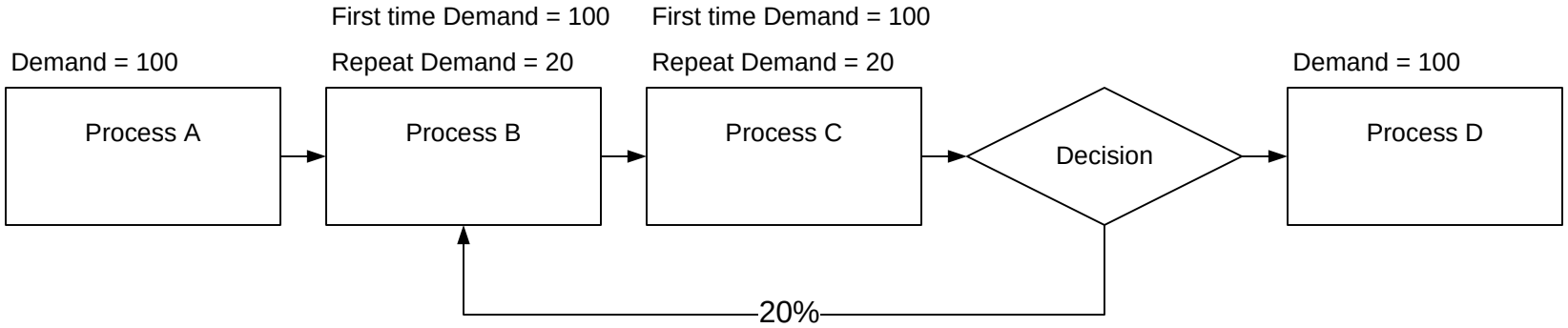
When work units go through an activity first time it may take a different time to process compared to when the same unit comes through again (because of iteration or rework).

Example



Demand due to repeat work

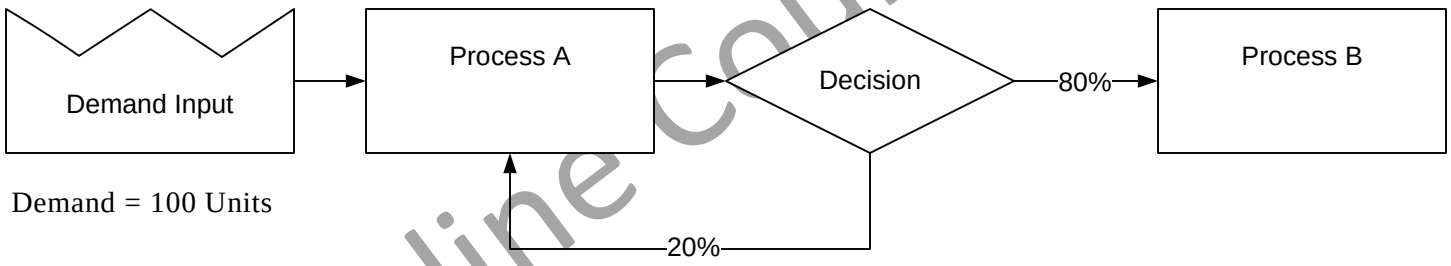
Repeat works increases demand, but only on the activities in it's path.



Assume loop back only allowed once per item

Q. What is the demand (first time + repeat) at process A if entities only ever loop back a maximum one time?

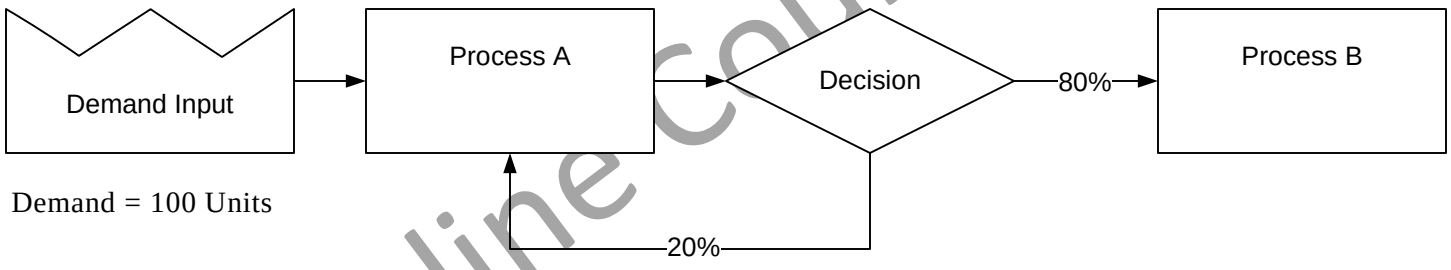
- ◎ 100 Units
- ◎ 120 Units
- ◎ 124 Units



Demand = 100 Units

Q. What is the demand at process B?

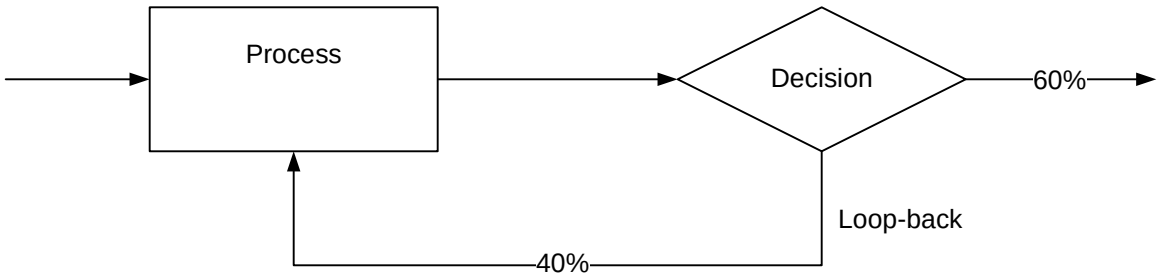
- ◎ 100 Units
- ◎ 80 Units
- ◎ 120 Units



Demand = 100 Units

Max Traversals

Maximum number of times a work unit can traverse a leg



Max Traversals = 1

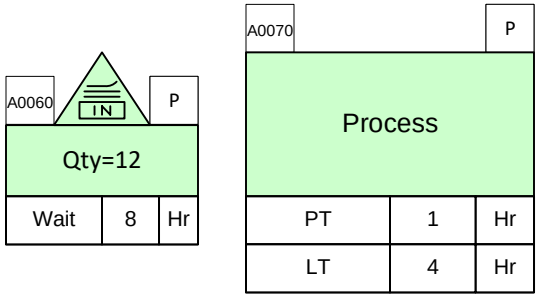
So 40% of the units when they come to the decision box loop back. Those same units when they come back to the decision box again never loop again because max traversals for the loop back is set to 1.

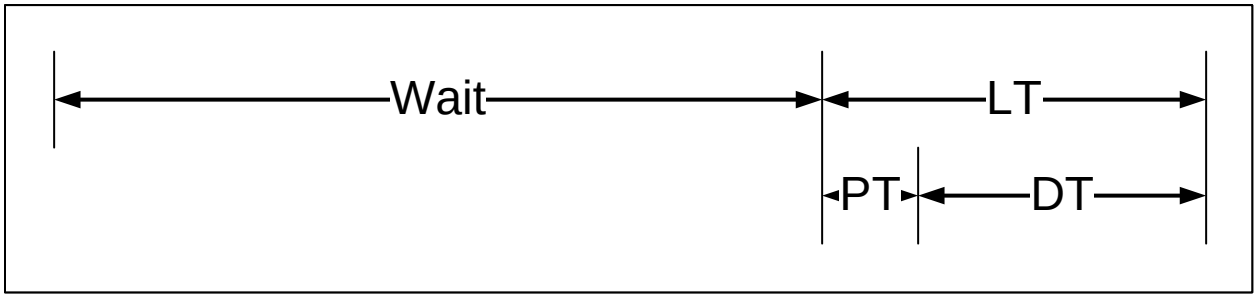
Max Traversals should be set to a minimum reasonable value for loop-back arrows. This is to minimize the total possible routes on the map which in-turn minimizes the solver time.

Lead Time

Process Time, Lead Time, Wait Time, Delay Time

- Wait time (Wait) = queue or wait time ahead of an activity
- Process time (PT) = the actual clock time the item was worked on
- Lead time (LT) = elapsed time from when it enters an activity to when it leaves it
- Delay time (DT) = idle time within an activity calculated as LT-PT

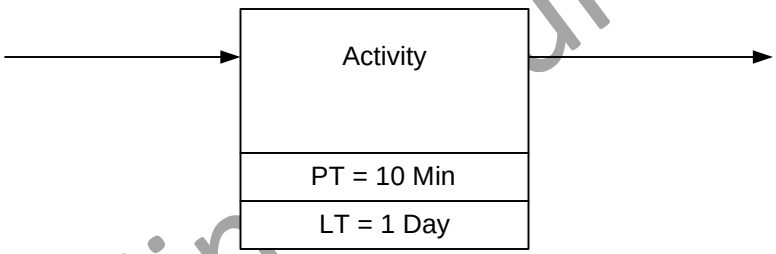




Note: PT is the actual clock time the item was worked on. It is not the human resource time. E.g. If a presentation is reviewed by 6 people in a meeting which took 15 minutes, then PT is 15 minutes. The resource time may be 90 minutes (6 people X 15 minutes).

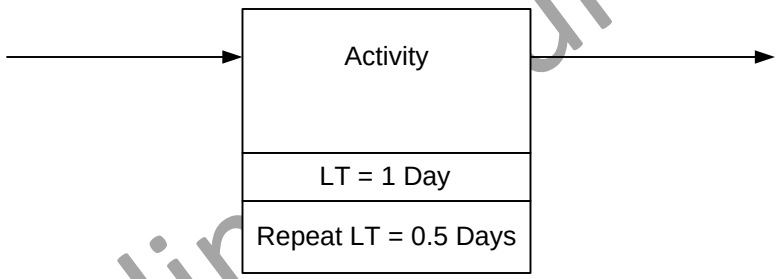
Q. What is the 'Lead Time' contribution to any work unit passing through this activity?

- ◎ 1 Day
- ◎ 10 Min
- ◎ 1 Day, 10 Min



Q. What is the 'Lead Time' contribution to a work unit that passes through the same activity a total of 4 times?

- ◎ 1 Day
- ◎ 1.5 Days
- ◎ 2.5 Days



Cost Calculations

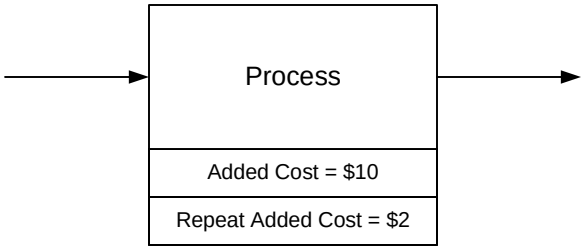
First Time vs Repeat Work Costs

An item of work incurs cost at each activity it goes through. If the work has to be repeated (because it was incorrect or incomplete the first time), then it incurs repeat work cost. Repeat work cost may be different from the first time cost. These are represented with:

Added Cost = First time cost per item

Repeat Added Cost = Cost of Repeat work per item

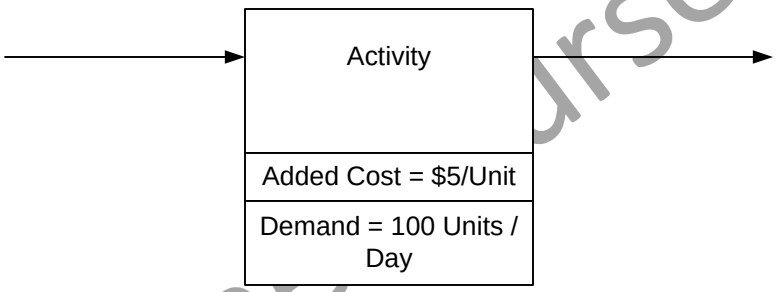
Example



1. If the item is goes through the process with no repeat cycles, the cost = $10
2. If the item returns for 2 repeat cycles, the total = $10 + $2 + $2 = $14

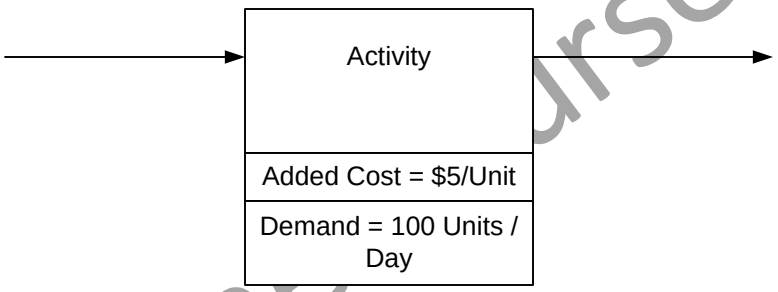
Q. What is the added cost to any work unit that passes through this activity?

- ◎ $500 / Unit
- ◎ $5 / Unit
- ◎ $100 / Unit



Q. What is the daily cost of this activity?

- ◎ $500 / Day
- ◎ $5 / Day
- ◎ $100 / Day

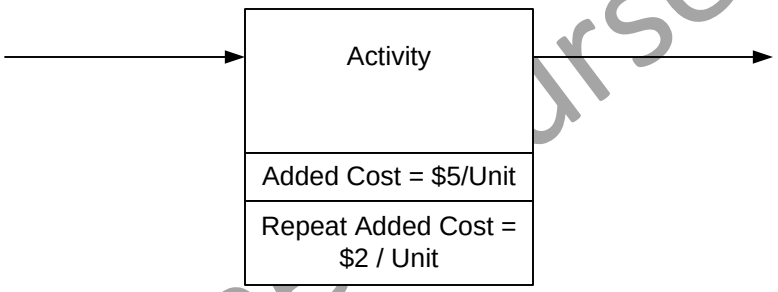


Q. What is the added cost contributed to a work unit that passes through this same activity a total of 4 times?

◎ $7 / Unit

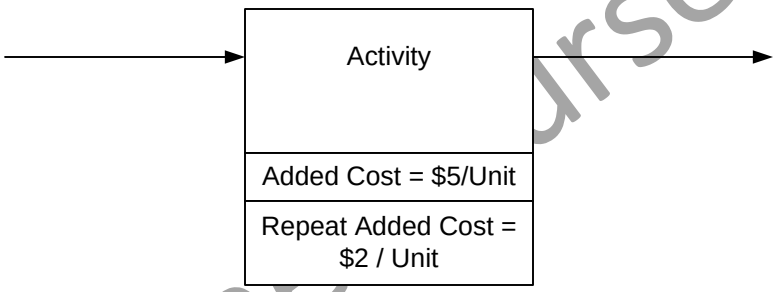
◎ $5 / Unit

◎ $11 / Unit



Q. What is the percent reduction in added cost if the work item only passes through 3 times total as opposed to 4 times total?

- ◎ 15%
- ◎ 18%
- ◎ 22%
- ◎ 20%



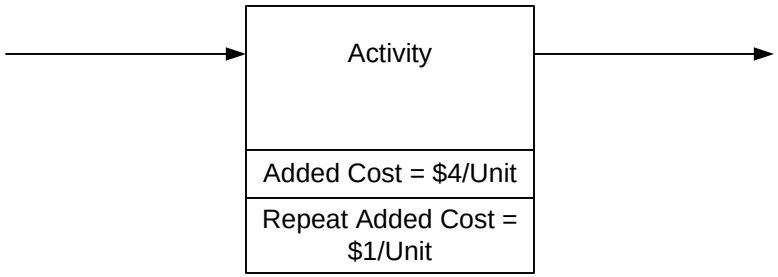
Total Cost

If Demand = 500 / Day and Repeat Demand = 200 / Day, what is the total cost of the activity per day?

= (Demand * Added Cost) + (Repeat Demand * Repeat Added Cost)

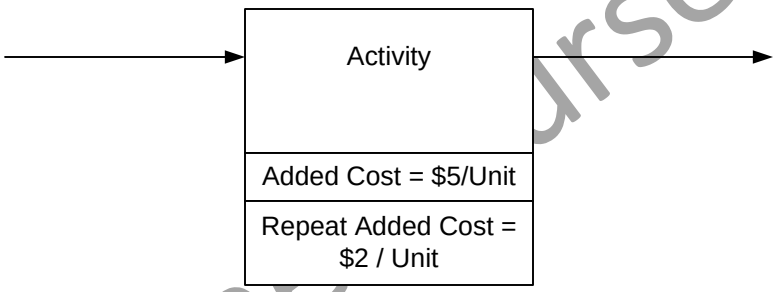
= (500 * 4) + (200 * 1)

= $2200 / Day



Q. If Demand = 300 / Day and Repeat Demand = 150 / Day, what is the total cost of the activity per day?

- ◎ $1500 / Day
- ◎ $1000 / Day
- ◎ $1800 / Day



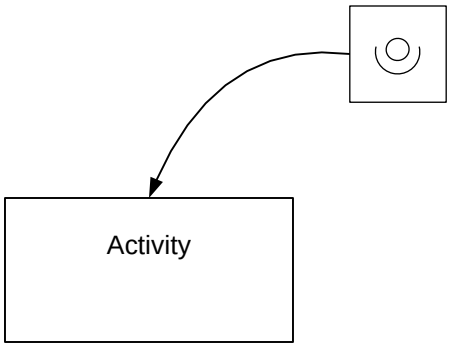
Resource Analyses

Resource Time

How much of the resource time is used each day?

$$\text{Resource Time} = \frac{\text{Demand} * \text{Resource Process Time}}{\text{Efficiency}}$$

Example



Demand = 200 Unit/Day

Staff

Available Time = 4 Hrs/Day

Resource Process Time = 6 Min/Unit

Cost = $45/Hr

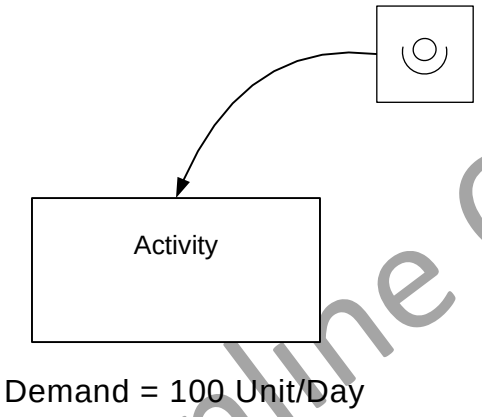
Efficiency = 90%

# of staff = 4

$$\text{Resource Time} = \frac{200 * 6}{0.9} = \frac{1200}{0.9} = 1333.33 \text{ Mins/Day}$$

Q. How much of the resource time is used each day?

- 1000 Mins / Day
- 4 Hrs / Day
- 8 Mins



Staff

Available Time = 4 Hrs/Day (per staff)

Resource Process Time = 8 Min/Unit

Cost = $40/Hr

Efficiency = 80%

# of staff = 4

Used Time & Available Time

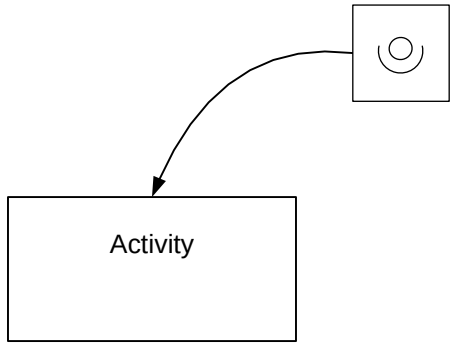
What are the costs of the used time and the available time?

$$\text{Used Time} = \frac{\text{Demand} * \text{Resource Process Time}}{\text{Efficiency}}$$

$$\text{Cost of Used Time} = \frac{\text{Used Time}}{\text{Min per hour}} * \text{Cost}$$

$$= \frac{(200 * 3) / 0.90}{60} * 45$$

$$= \$500 / \text{Day}$$



Demand = 200 Unit/Day

Resource

Available Time = 4 Hrs/Day

Resource Process Time = 3 Min/Unit

Cost = $45/Hr

Efficiency = 90%

# of staff = 4

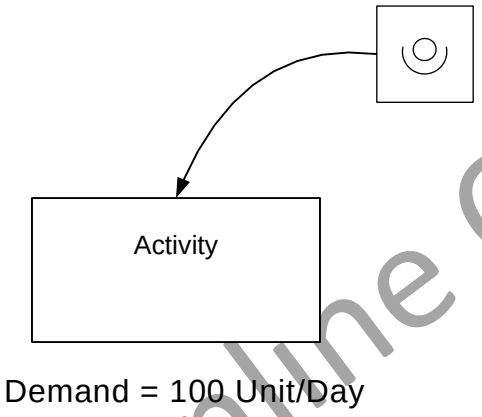
Cost of Available Time = Available Time * # of staff * Cost

= 4 * 4 * 45

= $720 / Day

Q. What are the costs of the used time and the available time?

- Used Cost = $700, Available Cost = $650
- Used Cost = $667, Available Cost = $640
- Used Cost = $640, Available Cost = $667



Staff

Available Time = 4 Hrs/Day (per staff)

Resource Process Time = 8 Min/Unit

Cost = $40/Hr

Efficiency = 80%

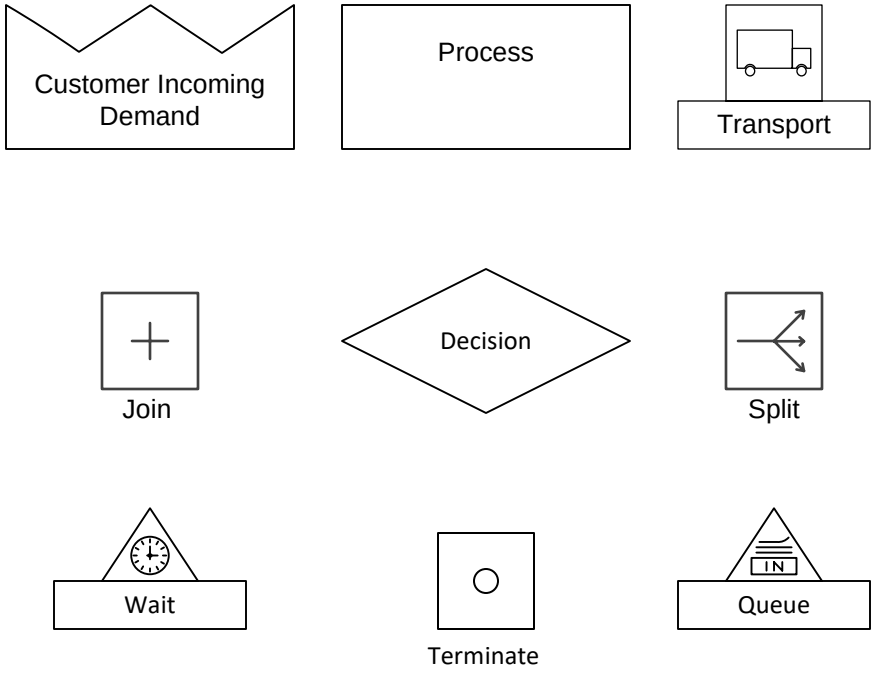
# of staff = 4

Lesson Summary: Transactional Mapping Concepts

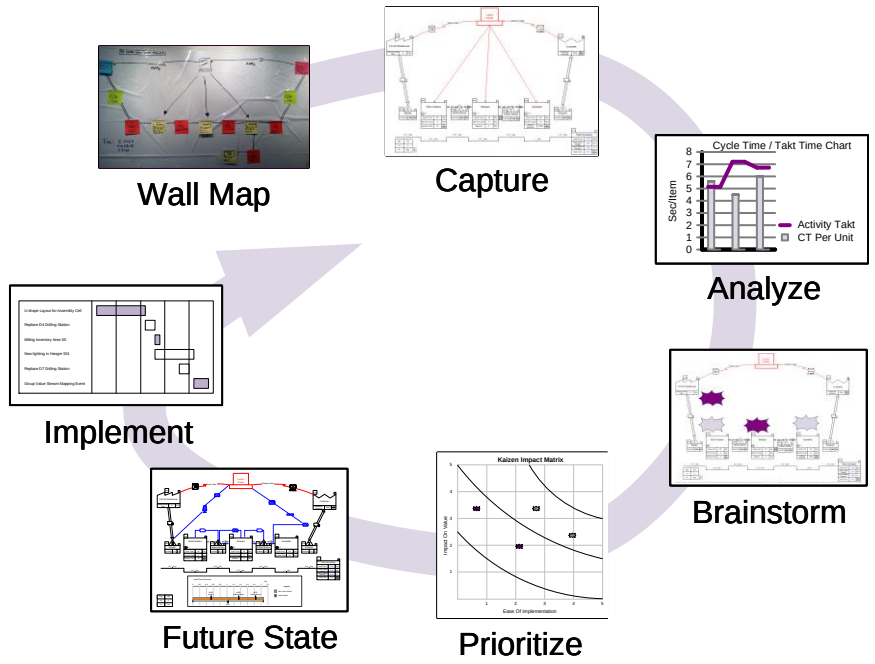
You learned that:

- Mix Transactional VSM combines concepts from value stream mapping and business process modeling.
- Mapping allows loop-backs, decision points, splits, and joins. These are all common in transactional processes.

Transactional Icons



Continuous Improvement Cycle



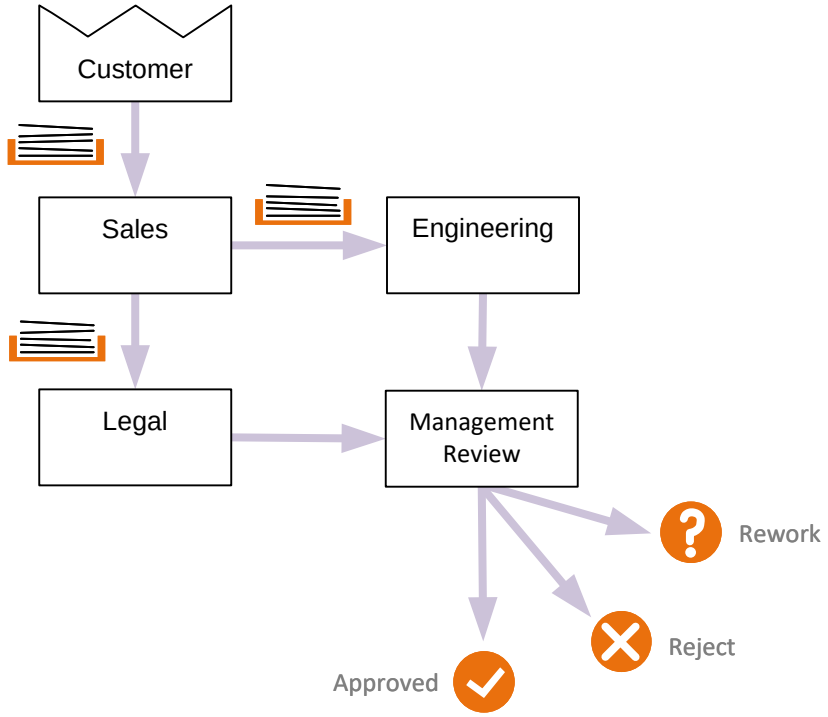
What's next:

We will apply the concepts learned to the ACME company's proposal fulfillment process.

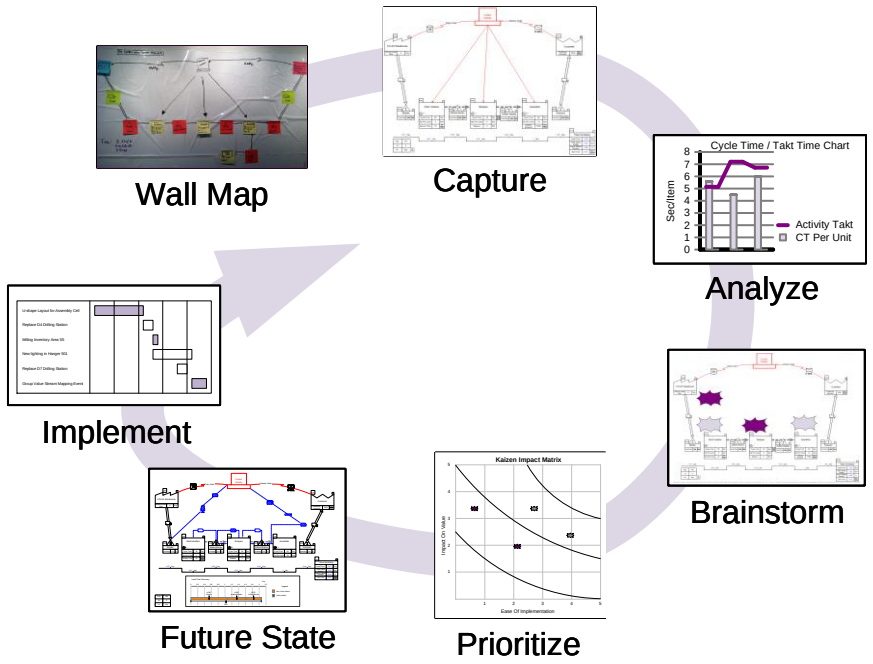
ACME Case Study

The previous lesson introduced icons, terminology, and concepts used in Mix Transaction value stream mapping. This lesson will apply the concepts to a case study.

ACME Case Study



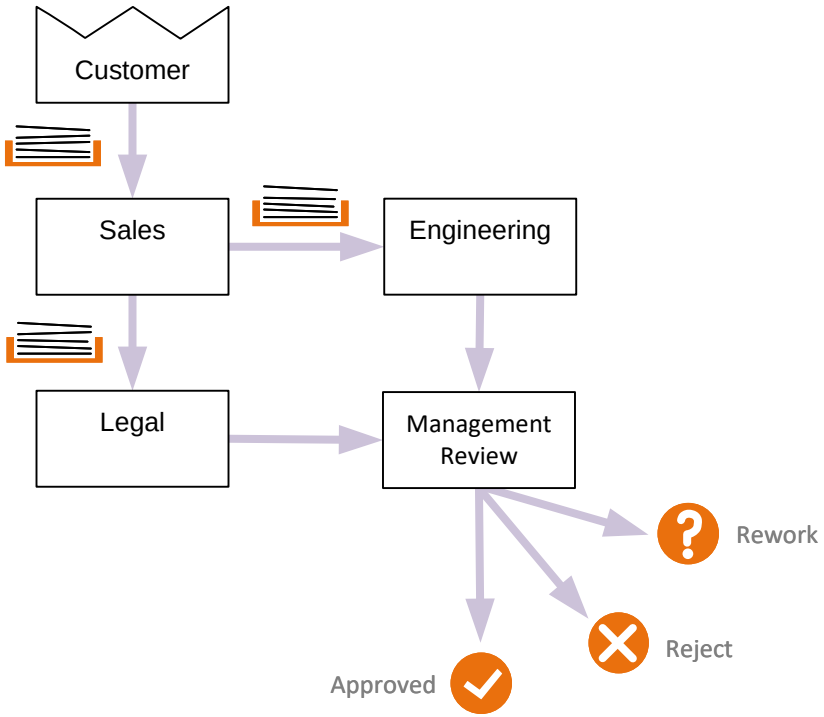
Continuous Improvement Cycle



ACME Case Study : Proposal Fulfillment Process

The leadership at ACME Industries has become increasingly concerned about the time taken to respond to customers' RFQ's (Request for quotation) with proposals. Customer complaints have been received about the long turn-around times. They have tasked a team to investigate and make recommendations towards improving the process, increasing customer satisfaction, and closing more sales.

You are the team leader and have built a cross-functional team to include representative staff involved in the process. The team has "walked" through the value stream to collect representational data. This is shown on the following pages.



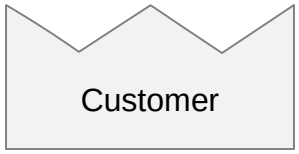
ACME Case Study : Proposal Fulfillment Value Stream

ACME

5 Days / Wk

8 Hrs / Day

The exercises in the following pages will require data from this diagram. A hardcopy of this page will be helpful. You can also access a PDF copy of this page by clicking the Reference button in the eLeanor control panel when active.



100 RFQ's / Wk

Queue

Qty= 80
Wait= 2 Wk

Sales

Process Time: 10 Min
Lead Time: 1 Wk
Repeat Process Time: 5 Min
Repeat Lead Time: 1 Day

Queue

Qty=50
Wait=1 Wk

Engineering

Process Time: 45 Min
Lead Time: 1 Wk
Repeat Process Time: 30 Min
Repeat Lead Time: 2 Days

Queue

Qty= 200
Wait= 2 Wk

Legal

Process Time: 1 Hr
Lead Time: 1 Wk
Repeat Process Time: 45 Min
Repeat Lead Time: 3 Days

Whole Day Management Review

Meeting frequency: Once a week
Meeting duration: 1 Day
Process Time: 5 Min/RFQ

30%

Loop back To Sales
Max 1 Time

10%

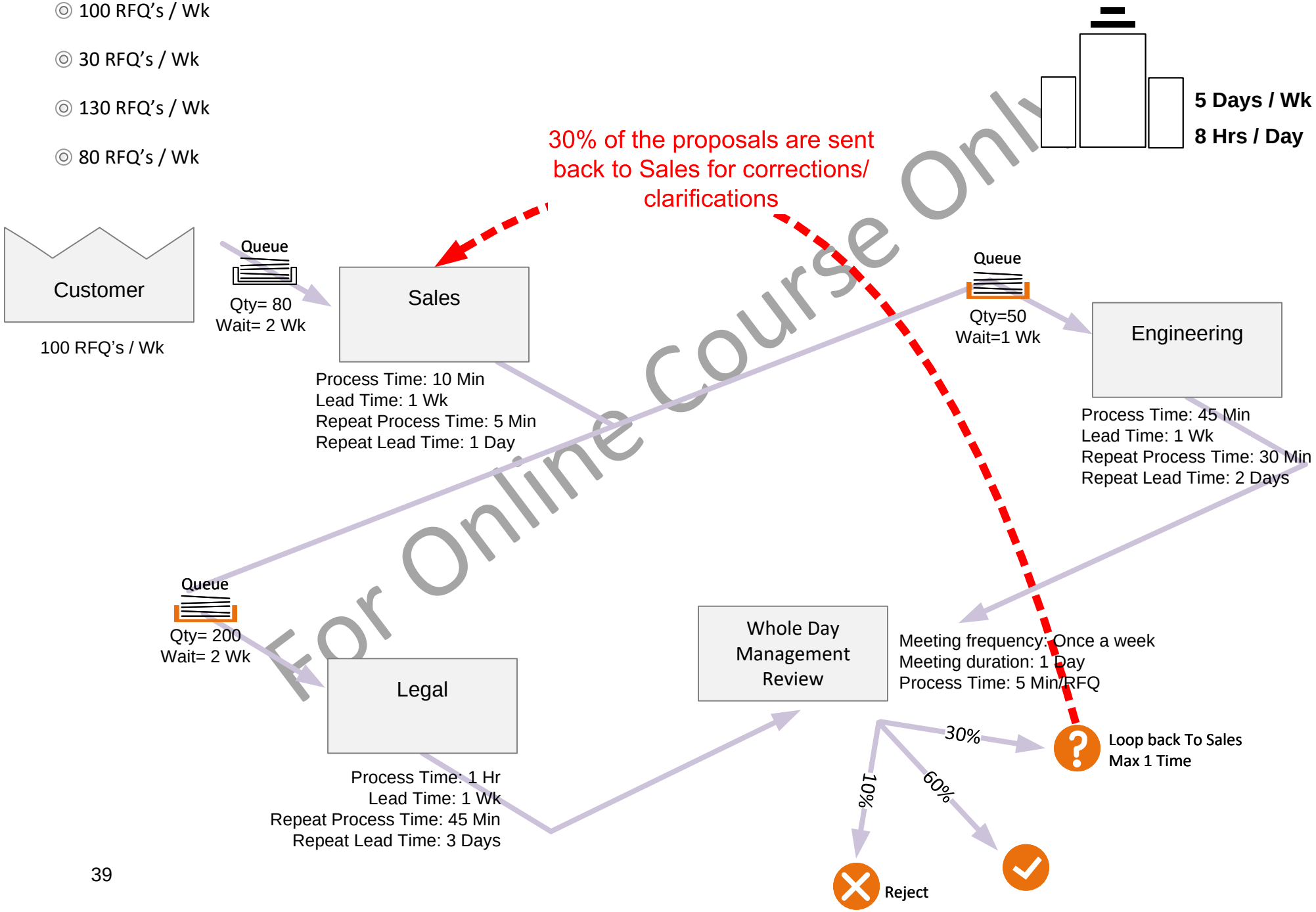
60%

Reject

Approve

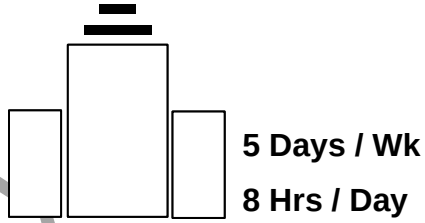
Q. If 30% of the proposals are sent back to Sales one time, what is the total demand for Engineering?

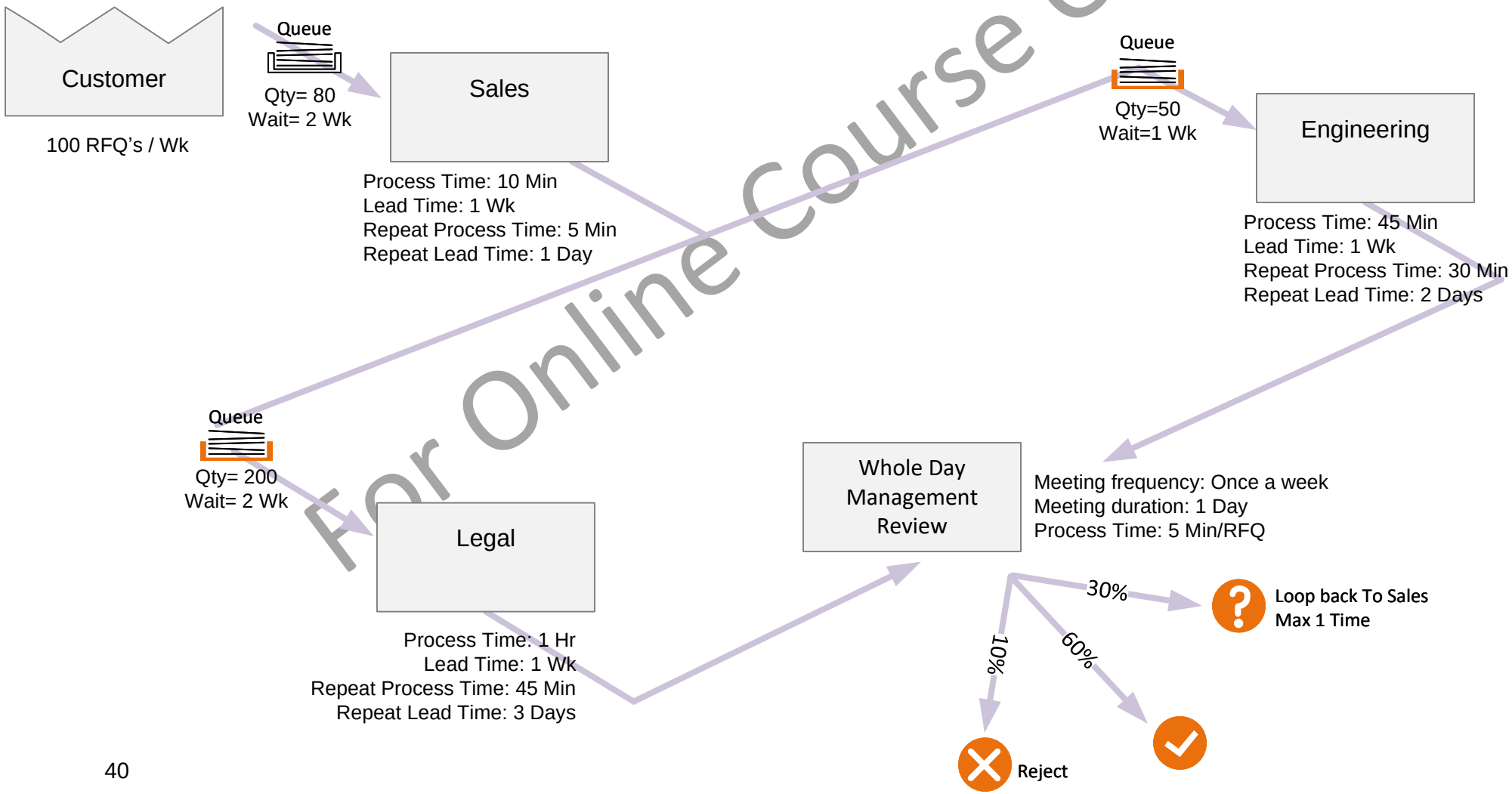
- 100 RFQ's / Wk
- 30 RFQ's / Wk
- 130 RFQ's / Wk
- 80 RFQ's / Wk



Q. What is the lead time for a proposal (without any loop backs)?

- ~5 Weeks
- ~7 Weeks
- ~9 Weeks

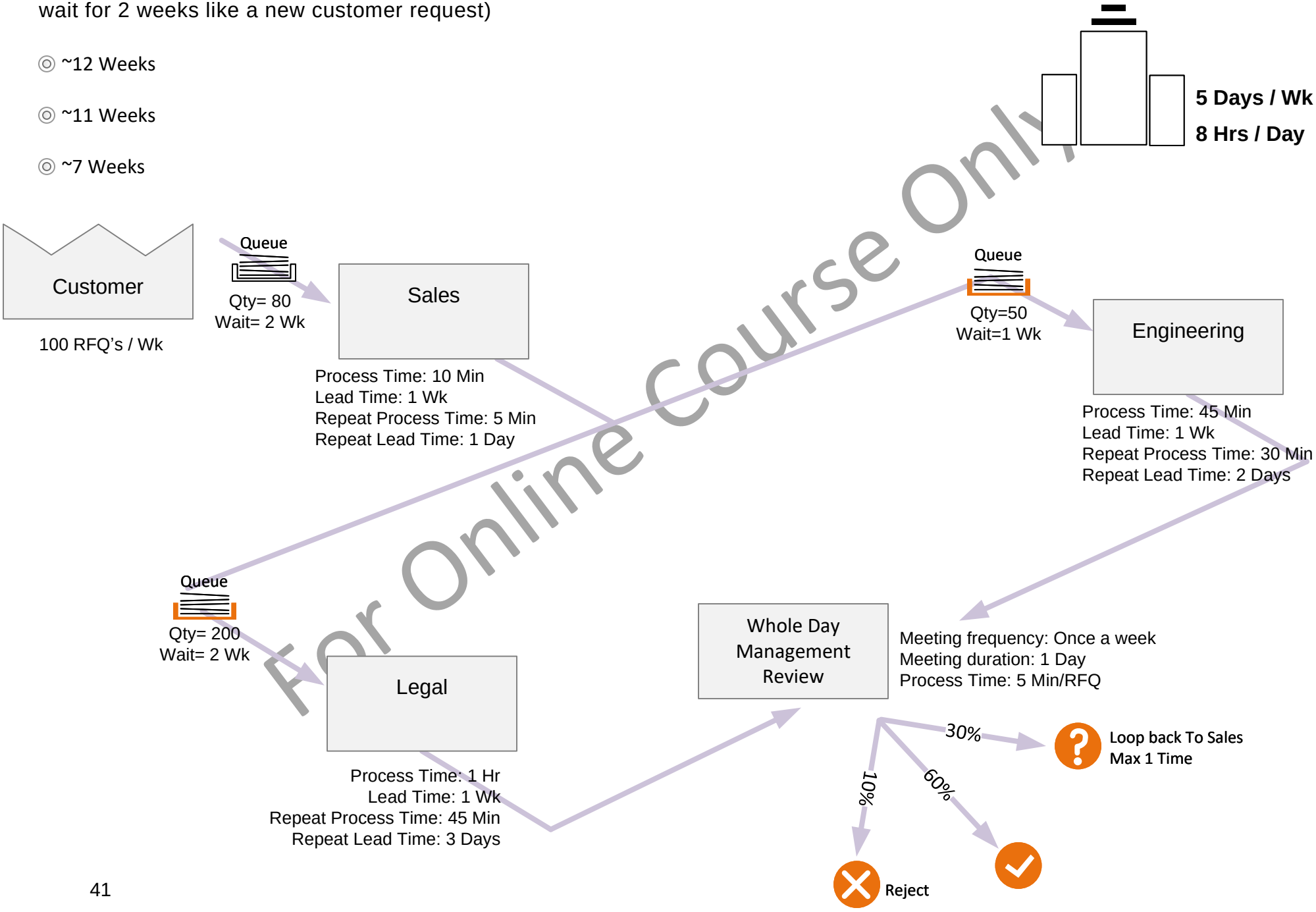




Q. What is the lead time for a proposal with one loop back?

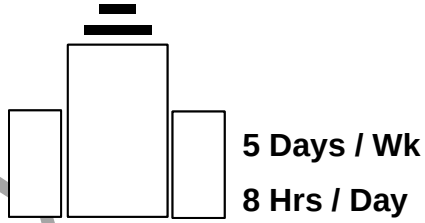
(Assume loop back goes to the front of the Sales queue, i.e.. Does not need to wait for 2 weeks like a new customer request)

- ~12 Weeks
- ~11 Weeks
- ~7 Weeks



Q. What is the 'Processing Time' for a proposal (without any loop backs)?

- ~120 Mins
- ~2 Weeks
- ~65 Mins



5 Days / Wk
8 Hrs / Day

Customer

100 RFQ's / Wk

Queue
Qty= 80
Wait= 2 Wk

Sales

Process Time: 10 Min
Lead Time: 1 Wk
Repeat Process Time: 5 Min
Repeat Lead Time: 1 Day

Queue
Qty=50
Wait=1 Wk

Engineering

Process Time: 45 Min
Lead Time: 1 Wk
Repeat Process Time: 30 Min
Repeat Lead Time: 2 Days

Queue
Qty= 200
Wait= 2 Wk

Legal

Process Time: 1 Hr
Lead Time: 1 Wk
Repeat Process Time: 45 Min
Repeat Lead Time: 3 Days

Whole Day Management Review

Meeting frequency: Once a week
Meeting duration: 1 Day
Process Time: 5 Min/RFQ

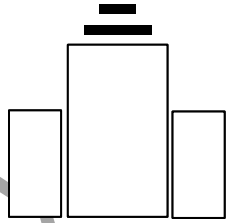
30%
Loop back To Sales
Max 1 Time

10%
60%

Reject

Q. What is the 'Processing Time' for a proposal (with one loop back) including Management Review?

- ~205 Mins
- ~2 Days
- ~1 Week



5 Days / Wk
8 Hrs / Day

Customer

100 RFQ's / Wk

Queue
Qty= 80
Wait= 2 Wk

Sales

Process Time: 10 Min
Lead Time: 1 Wk
Repeat Process Time: 5 Min
Repeat Lead Time: 1 Day

Queue
Qty=50
Wait=1 Wk

Engineering

Process Time: 45 Min
Lead Time: 1 Wk
Repeat Process Time: 30 Min
Repeat Lead Time: 2 Days

Queue
Qty= 200
Wait= 2 Wk

Legal

Process Time: 1 Hr
Lead Time: 1 Wk
Repeat Process Time: 45 Min
Repeat Lead Time: 3 Days

Whole Day Management Review

Meeting frequency: Once a week
Meeting duration: 1 Day
Process Time: 5 Min/RFQ

30%
Loop back To Sales
Max 1 Time

10%
60%

Reject

Resource Utilization Calculation

$$\text{Resource Utilization} = \frac{\text{Resource time used}}{\text{Resource time available}}$$

$$= \frac{[\text{Resource Process Time}] \times [\text{Demand}]}{[\text{Efficiency}] \times [\text{Available Staff Time}]}$$

Example Calculation:

- 3 Admins working 7 hours per day
- Resource Process Time per item of work = 12 minutes
- Efficiency = 80%
- Demand = 75 items per day

Staff Utilization $= \frac{[12] \times [75]}{[0.80] \times [3 \times 7 \times 60]} =$ **89%**

ACME Case Study : Additional Data

You will need data from the case study plus some of the data below for the following exercises.

Data for Capacity & Cost Analysis

Sales:

1 RFQ specialist, 6Hrs per day for this activity, $30/Hr, 80% efficiency

Engineering:

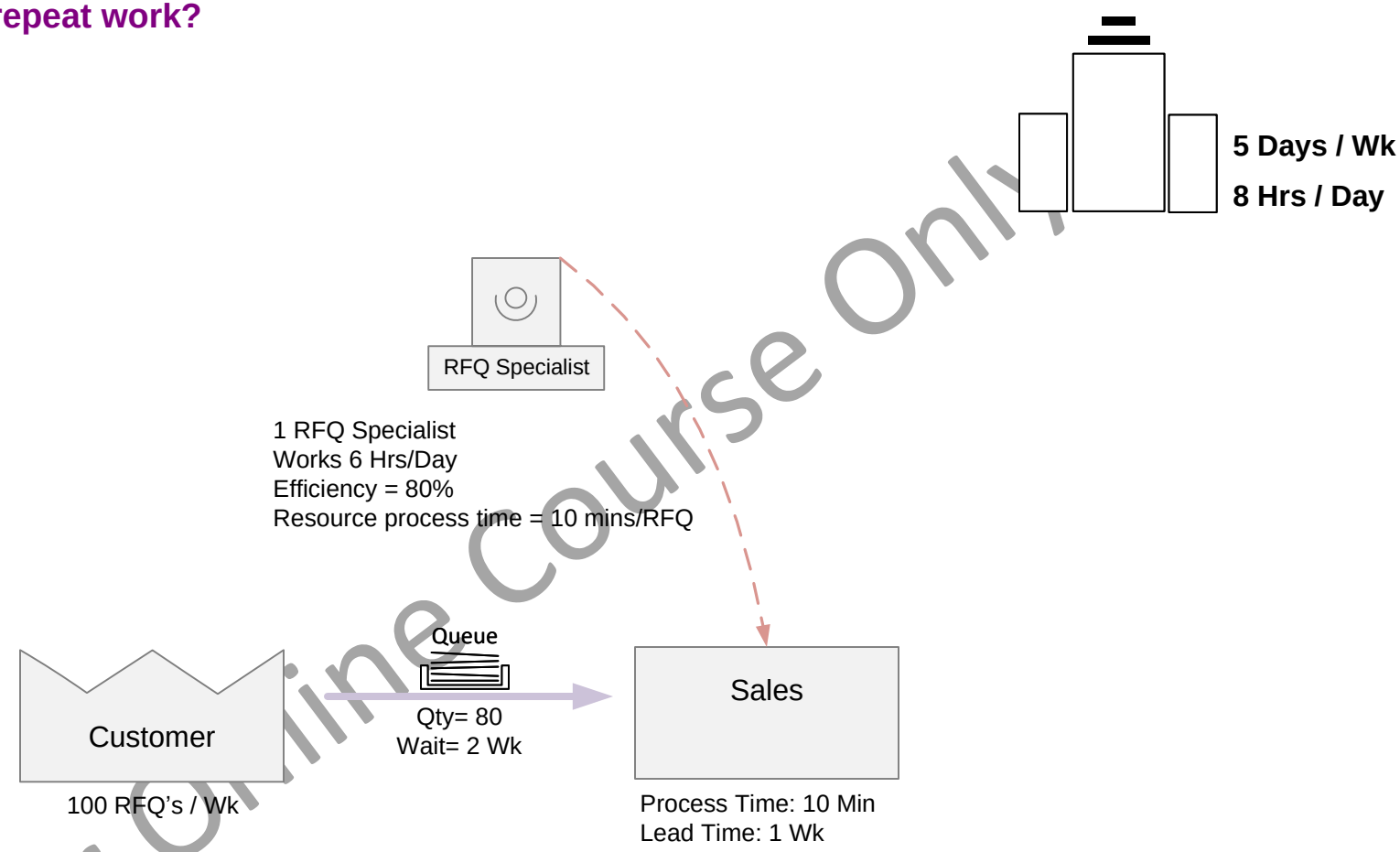
6 Engineers, 4Hrs per day for this activity, $30/Hr, 80% efficiency (to account for walking, interrupts etc..)

Legal:

5 Paralegals, 4Hrs per day for this activity, $30/Hr, 80% efficiency

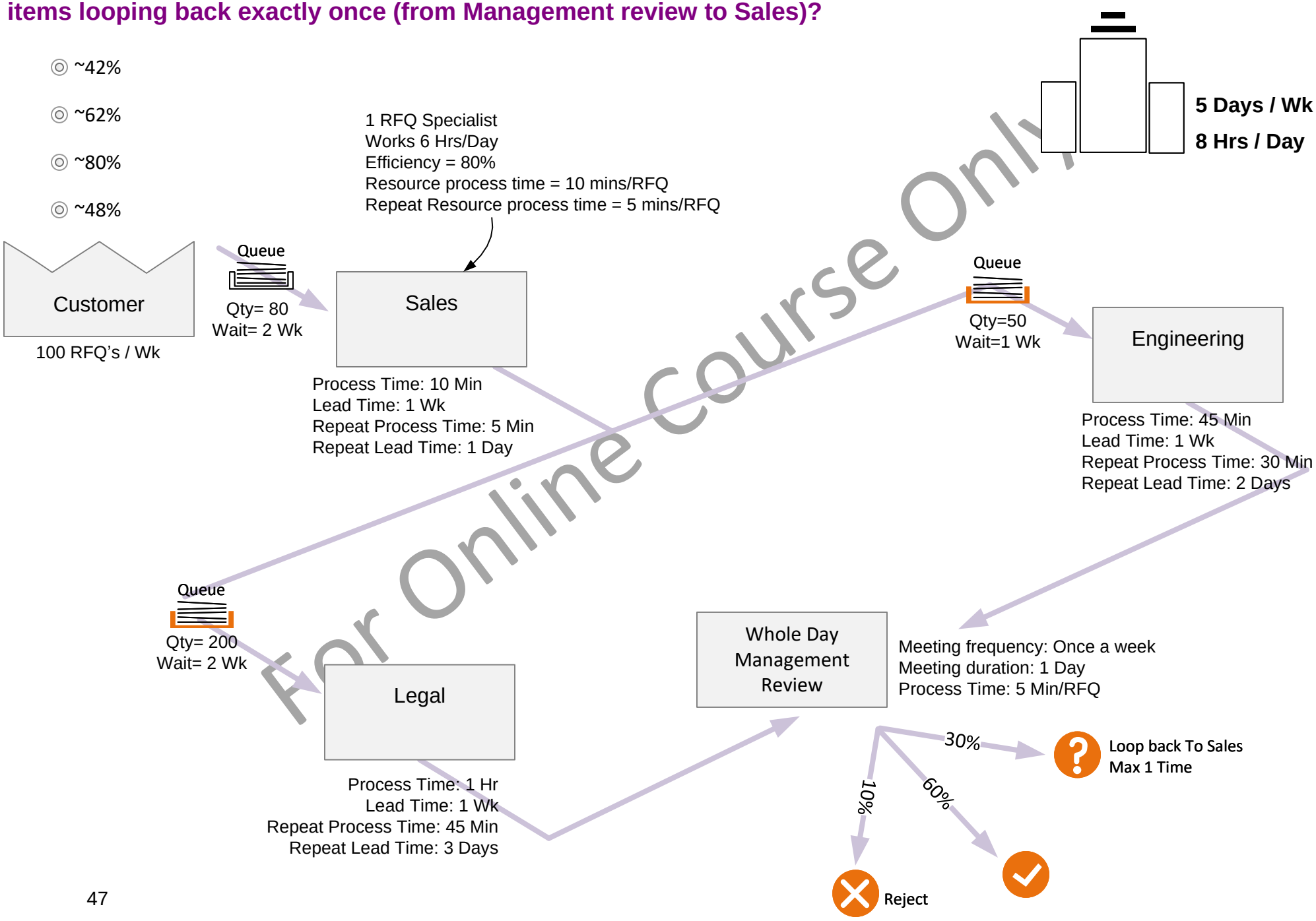
Q. What is the approximate utilization of the RFQ Specialist serving the sales process if there were no repeat work?

- ~57%
- ~69%
- ~82%
- ~95%



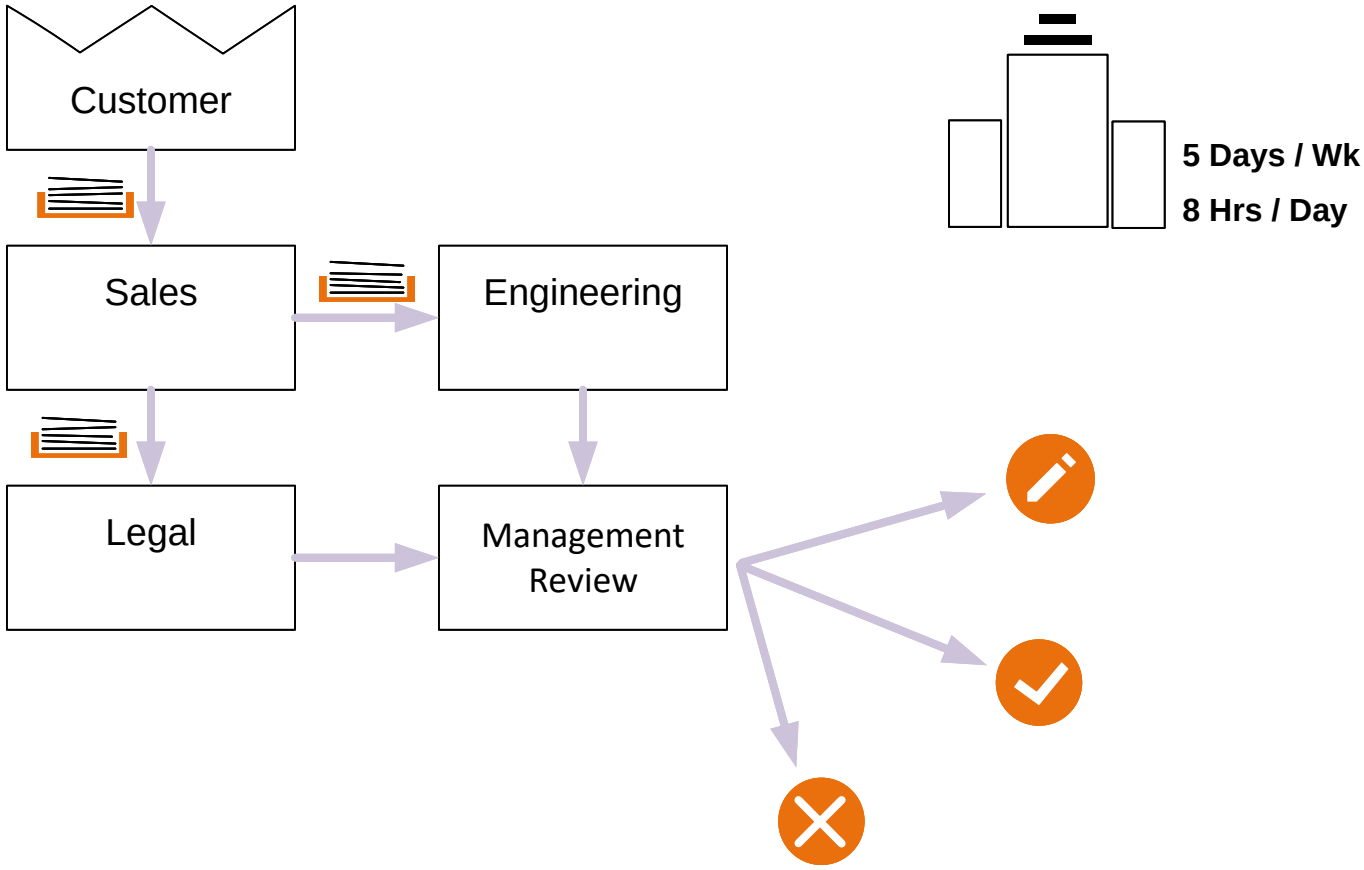
Q. What is the utilization of the RFQ Specialist at the sales process with 30% of items looping back exactly once (from Management review to Sales)?

- ~42%
- ~62%
- ~80%
- ~48%



You learned that:

- You learned to do simple calculations by hand on demand, lead time, resource utilization, and cost.



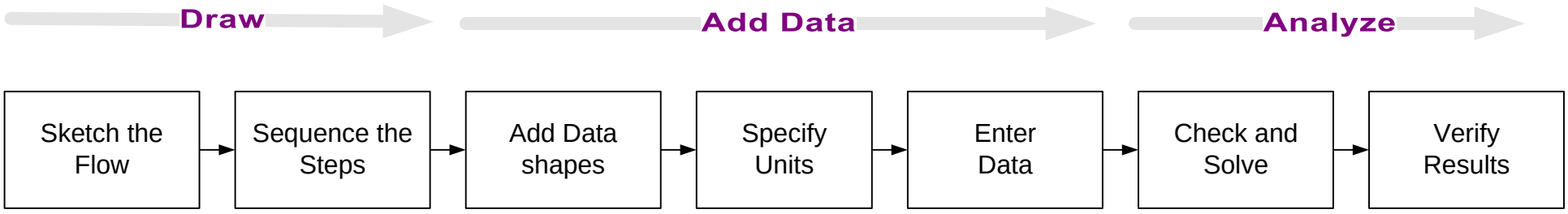
What's next:

You will use eVSM's Mix Transactional VSM stencil to map and analyze value streams.

Step by Step Guide

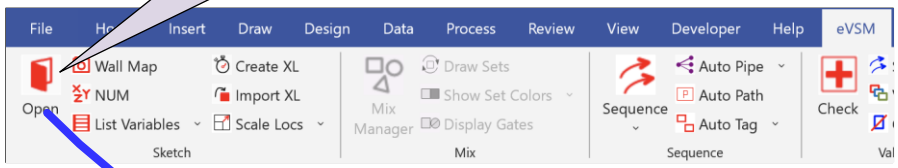
In the previous lessons we covered Mix Transactional concepts and some typical hand calculations with a simple case study. In this and the next lesson we will start using eVSM to draw simple transactional value stream maps.

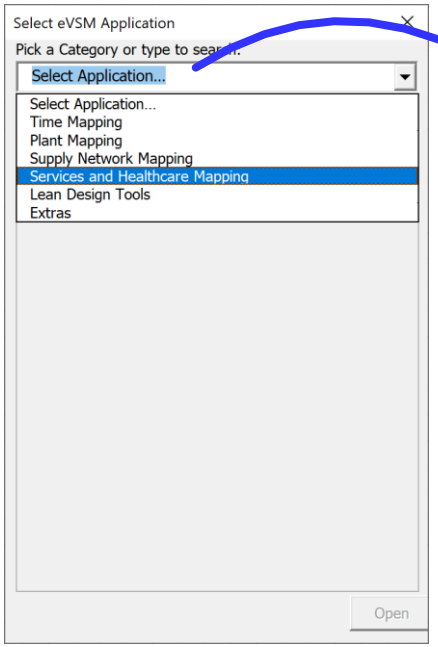
eVSM Mapping Process

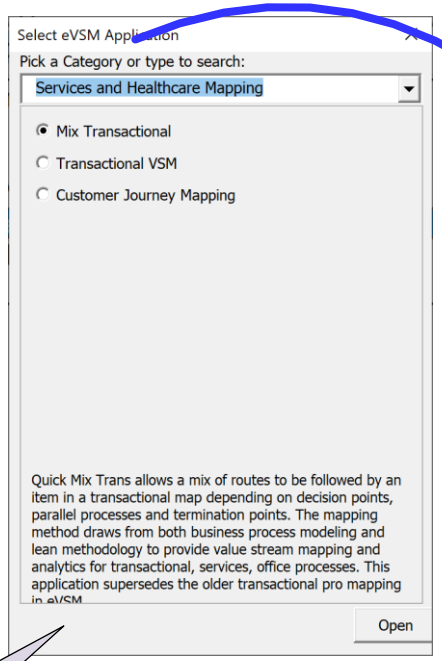


Opening the Mix Transactional Application

Click the Open button in the eVSM Toolbar

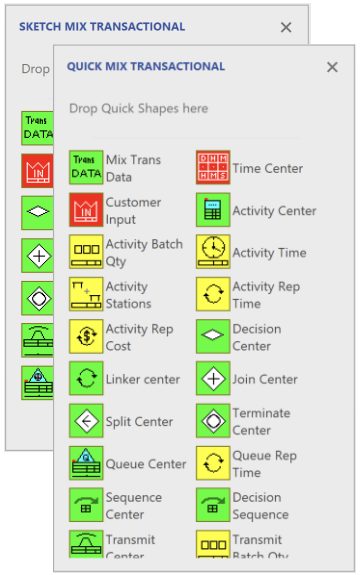






See the description of the selected application here

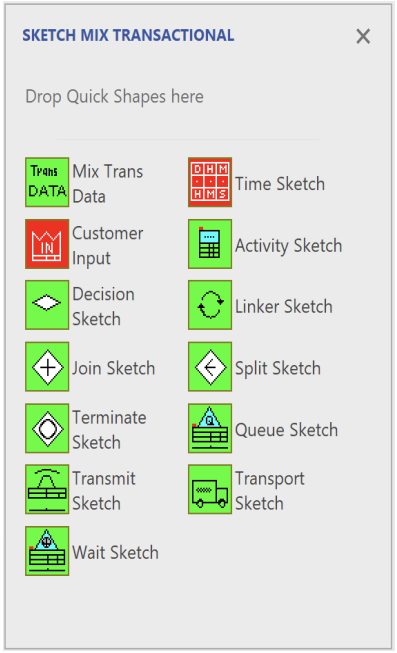
Mix Transactional Stencils will open on the left side of the Visio window



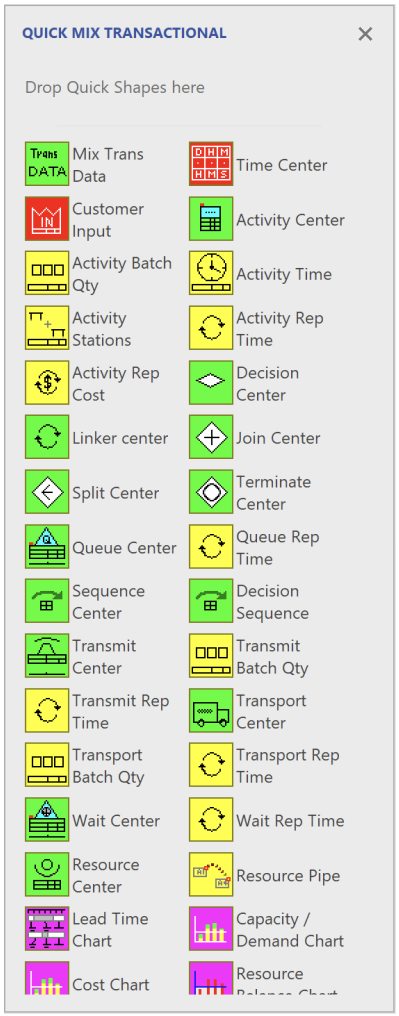
Mix Transactional Stencils

Mix Transactional has two Stencils.

1. The “Sketch Mix Transactional” stencil has the base transactional mapping icons, with no data shapes. These are used to quickly capture the flow of the value stream.



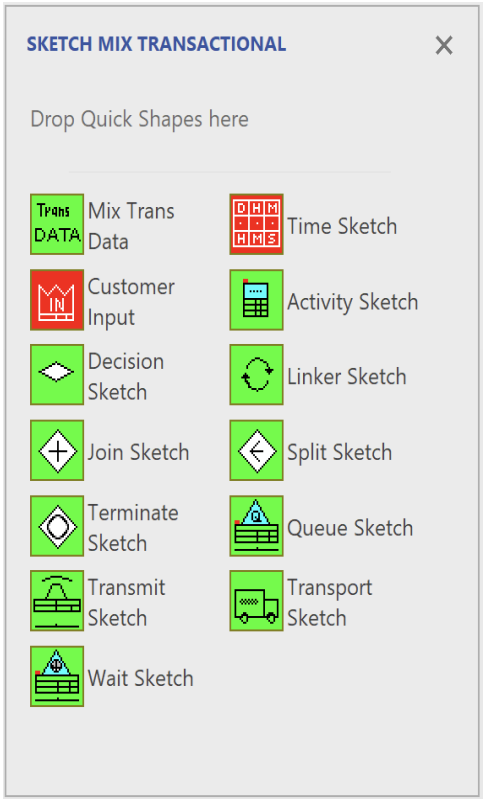
2. The “Quick Mix Transactional” stencil includes the same icons but with data shapes which can later be used for the value stream analysis.

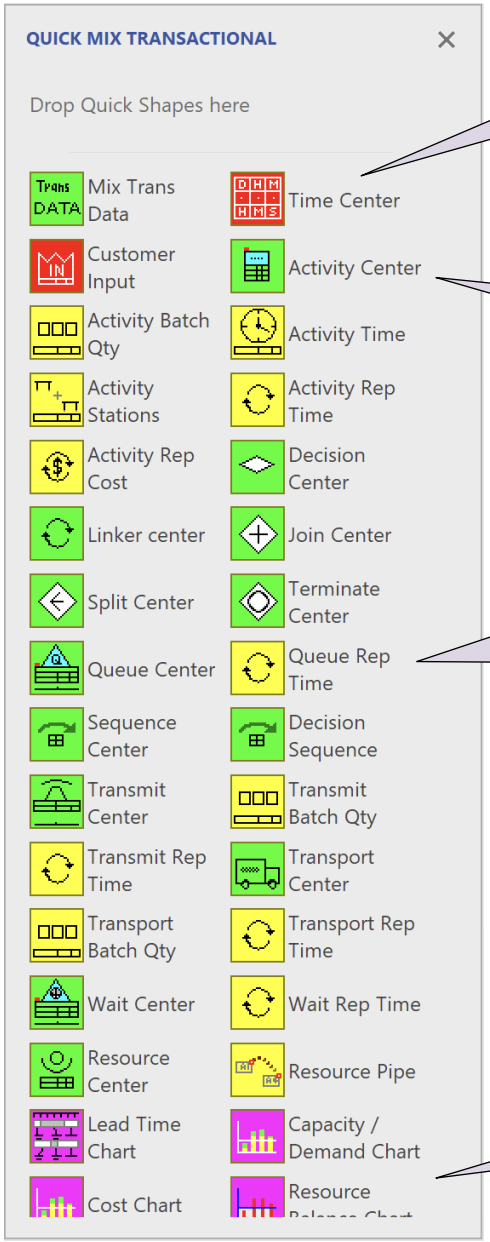


A flowchart drawn with the Sketch stencil can be converted to a full VSM model with all data shapes with a single command click.

Mix Transactional Stencils and Icon Color Coding

Mix Transactional Stencils





Red icons are required and must be the first icons put on a blank map

Green icons are for drawing the flow and are the “parent” shape

Yellow icons following EACH green icon represent optional “add-on” variables that can be glued to the bottom of that green icon. This “child” shape glues to the “parent” shape.

White icons represent summary centers

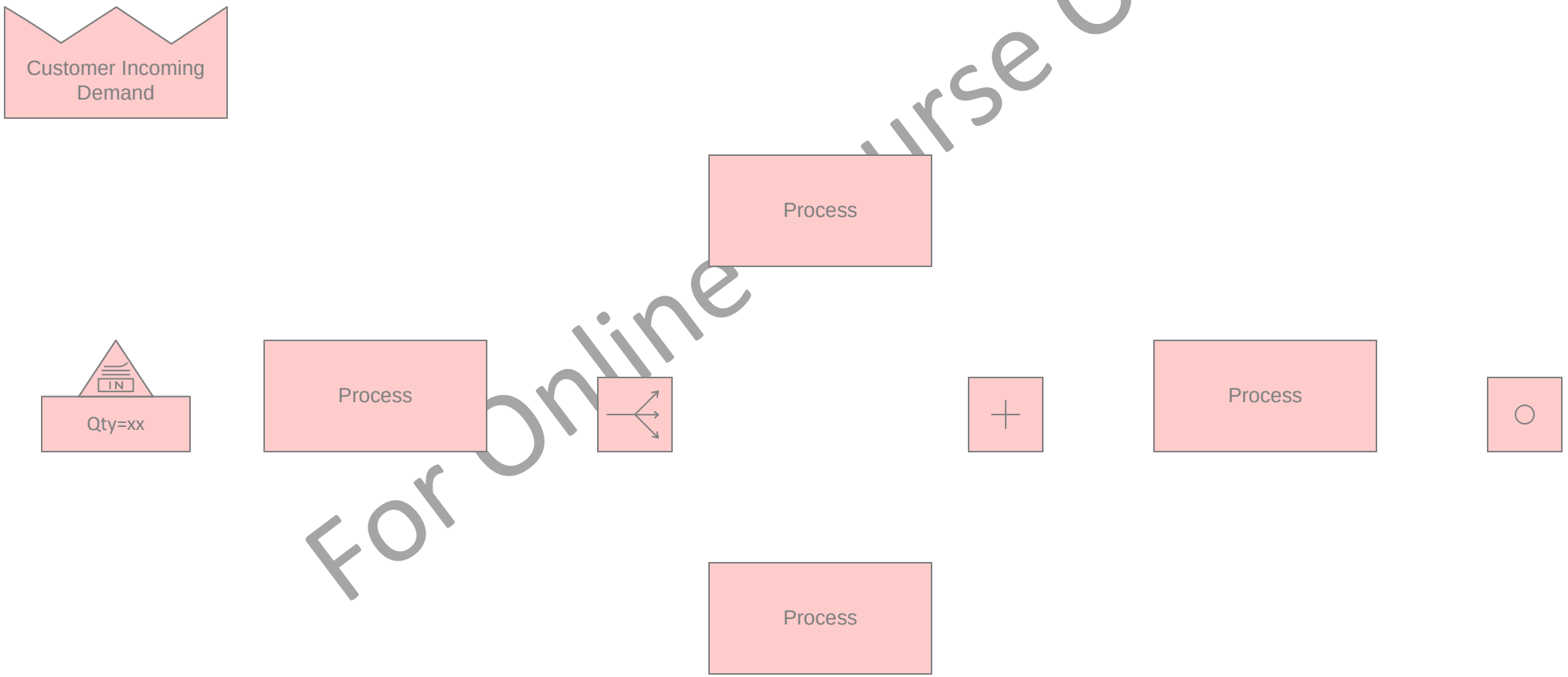
Magenta icons represent automated charts

Initialize this page for a Mix Transactional map

Open Mix Transactional stencils. Then drop the Customer Input center from the Sketch Mix Transactional stencil.

Drop icons from the Sketch Mix Transactional stencil on top of the pink shapes

Try and align the icons to the page background grid.



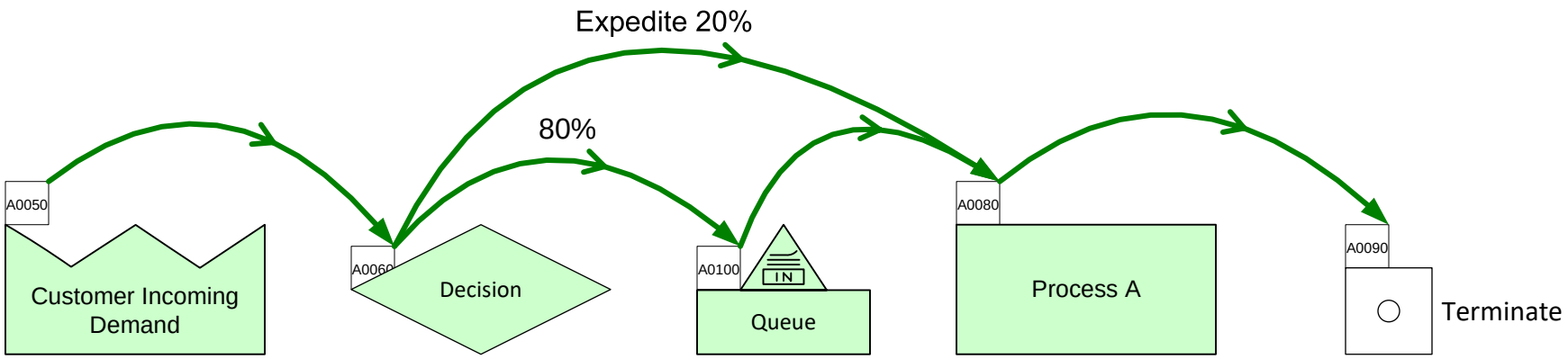
Using Sequence Arrows

To build a value stream model, the eVSM Sequence arrows must be used to specify the information flow between activities and other centers. Sequence arrows are used to:

1. Calculate demand at any point in the value stream from customer center to each termination point
2. Establish unique product routings
3. Label activities from upstream to downstream (useful for charting)

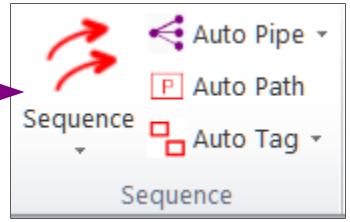
Example

In this simple example, the green Sequence arrows show that100% of the customer demand goes through the Decision and Process A. 80% works through the normal Queue while 20% is expedited to by-pass the Queue.



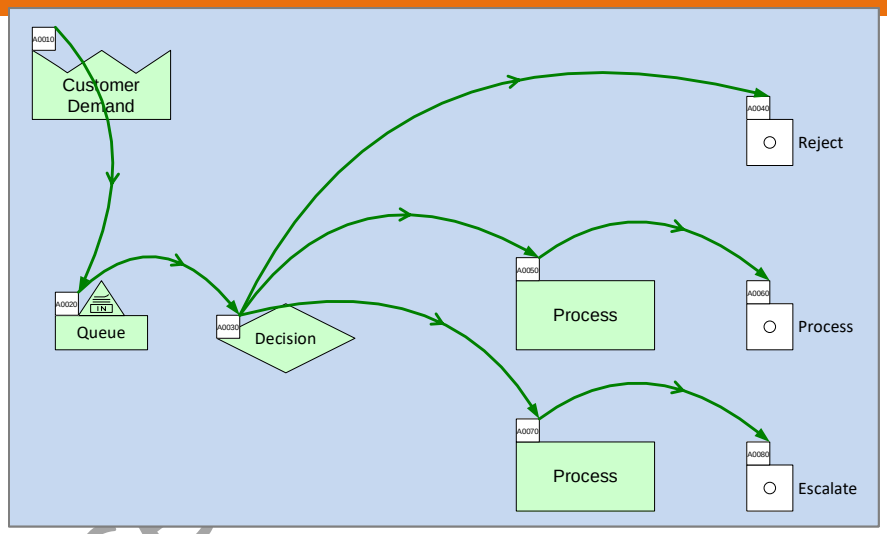
How do you create the sequence arrows?

Pick two or more centers in the correct sequence (holding down the shift key) in the order of the information flow. Then click the “Sequence” button in the eVSM toolbar.

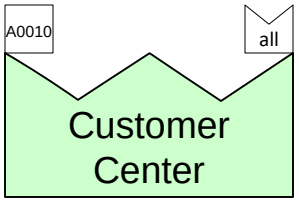


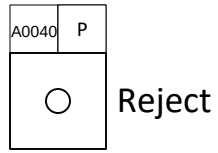
Sequencing mistakes are easily rectified by deleting unwanted arrows, and adding and missing arrows.

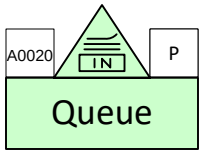
Add Sequence Arrows as shown in the thumbnail image on the right.

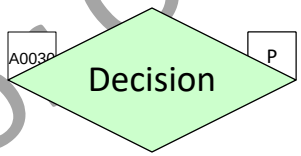


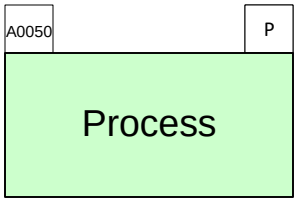
First open Mix Transactional stencils. Then initialize the page for Mix Transactional by dropping the Customer Input center from the Sketch Mix Transactional stencil. Then add all of the icons shown in the thumbnail. Try and align all icons to the grid.

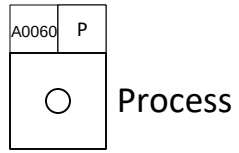


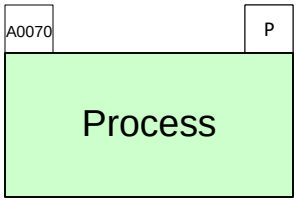


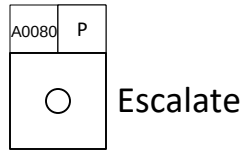












Add Sequence arrows to show all three routes

Route 1:

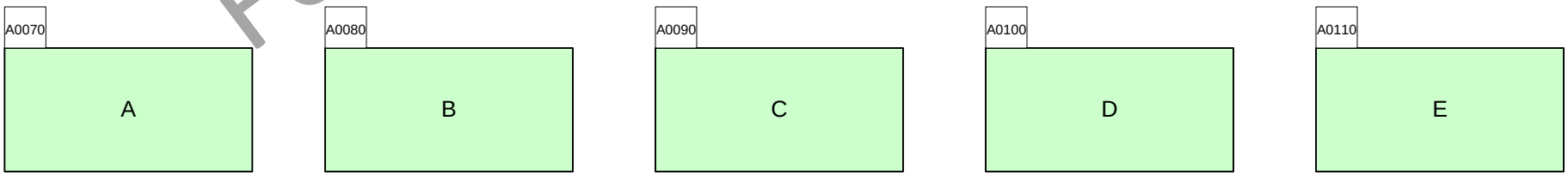
A > B > C > D > E

Route 2:

A > B > E

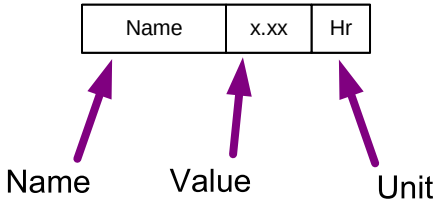
Route 3:

A > C > D > E

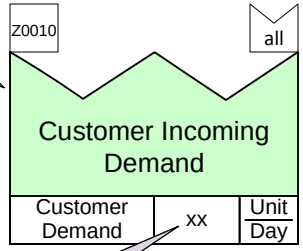


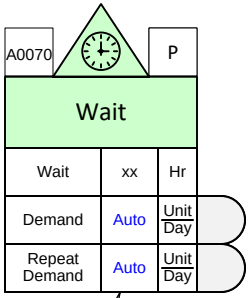
Working with Data on a Map

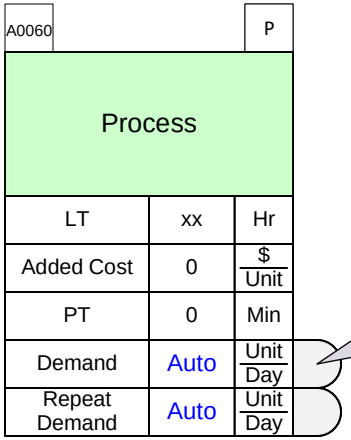
- Map data is stored in special data shapes which consist of a name, value, and unit.
- To change any field, double-click and then follow the on-screen instructions.
- To move or delete a data shape, you must select the value field.
- The Views (accessed with the  Views) button allows you to hide/show 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.







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

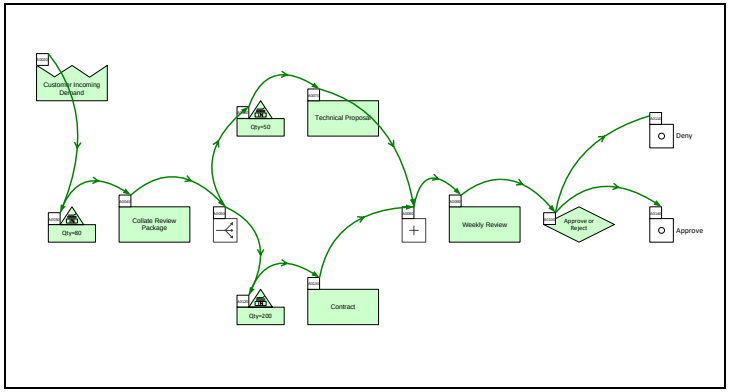
Blue values are automatically calculated by eVSM. Just leave these alone.

These tabs allow you to see/edit the route specific values for the variable. Just double-click the tab.

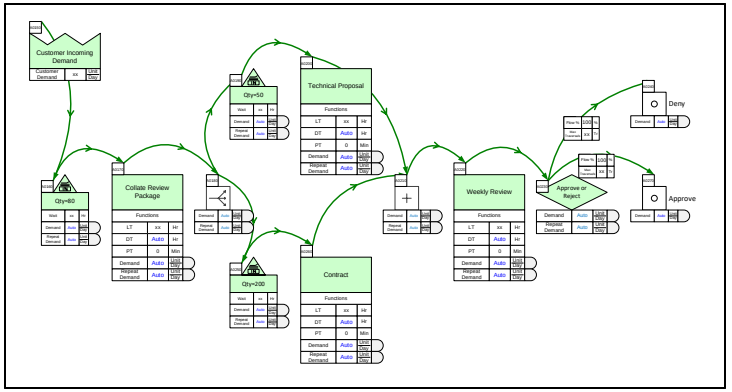
Data on Sketch Centers

If the flow has been drawn with a Sketch stencil, then you can automatically turn the flowchart into a data based value stream model. Just right-mouse click on any Sketch Mix Transactional shape on the page and use the Add All Data commands.

Sketch Map



After "Add all data"



Right-mouse menu, available on all the center's parent shapes (green shapes)

. . . .

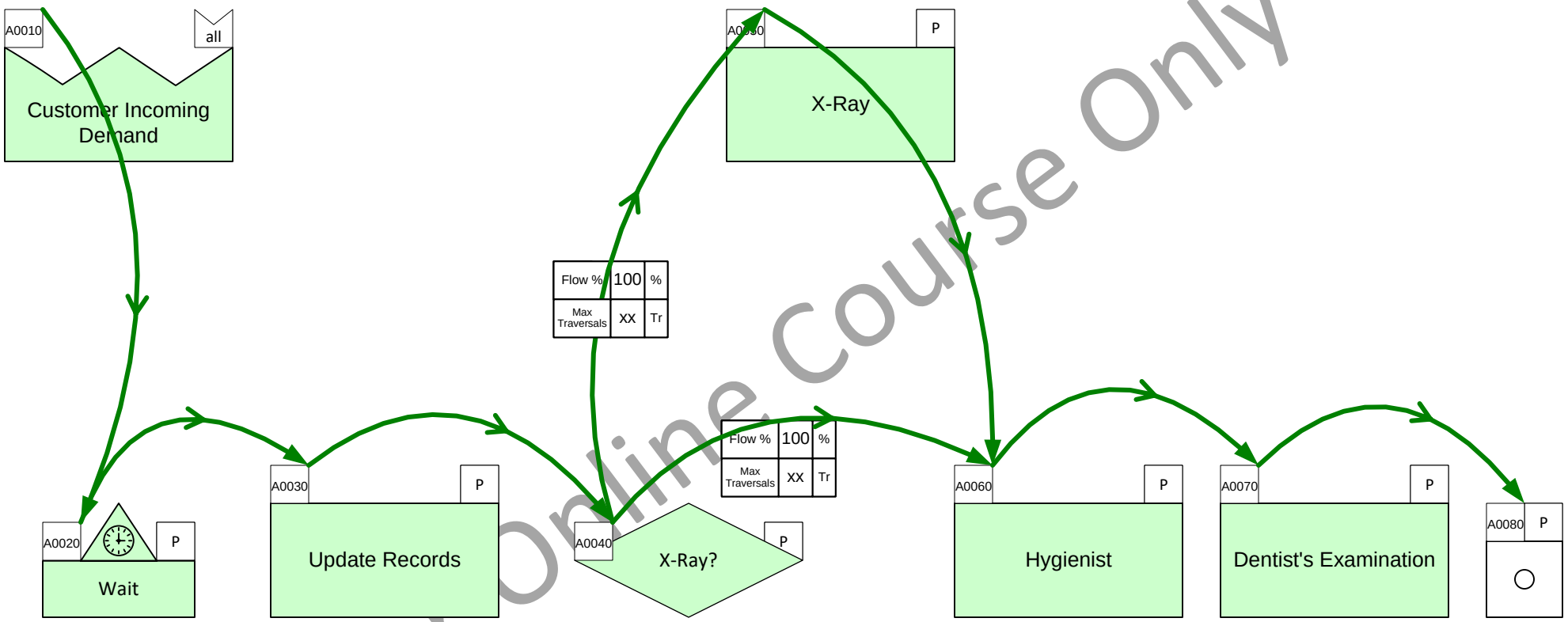
Add all data (shape)
Add all data (page)

Remove all data (shape)
Remove all data (page)

Click this command to automatically add data shapes to all centers on the page.

Data shapes can be removed too. Note that this will delete any entered and calculated values.

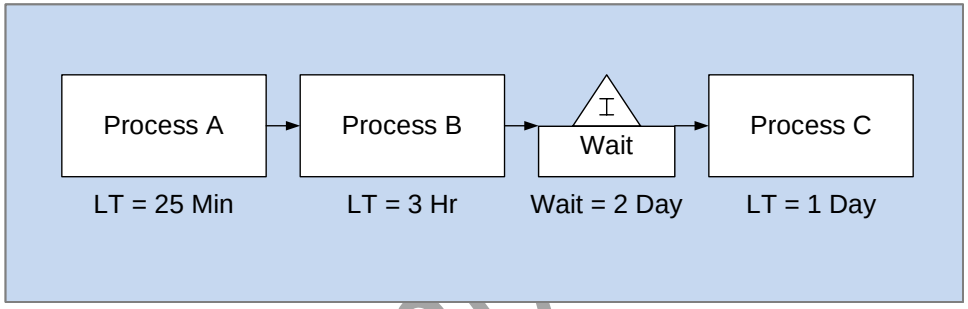
Add Data shapes to this Sketch

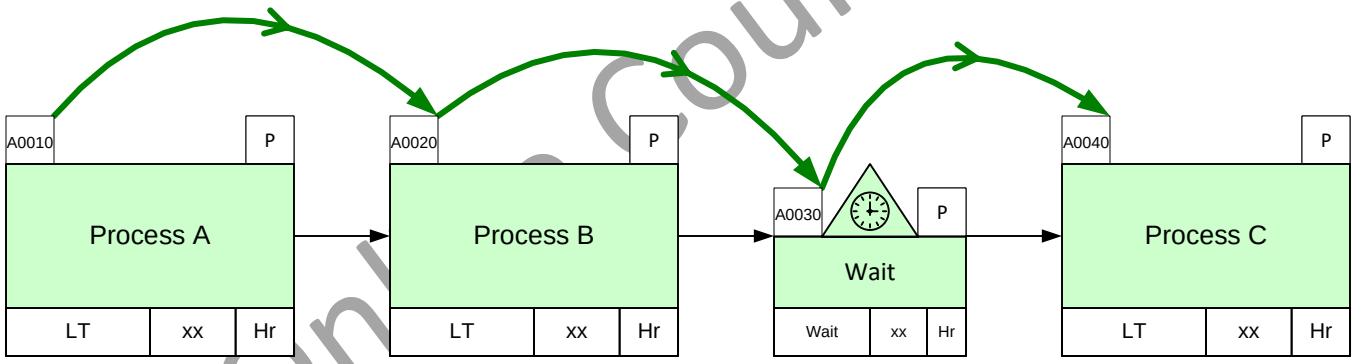


Units	Year	Wk	Day
	52	5	8
	Wk	Day	Hr

Enter Data Values

In the flow below, enter the data values shown in the thumbnail. Note, the units must match.



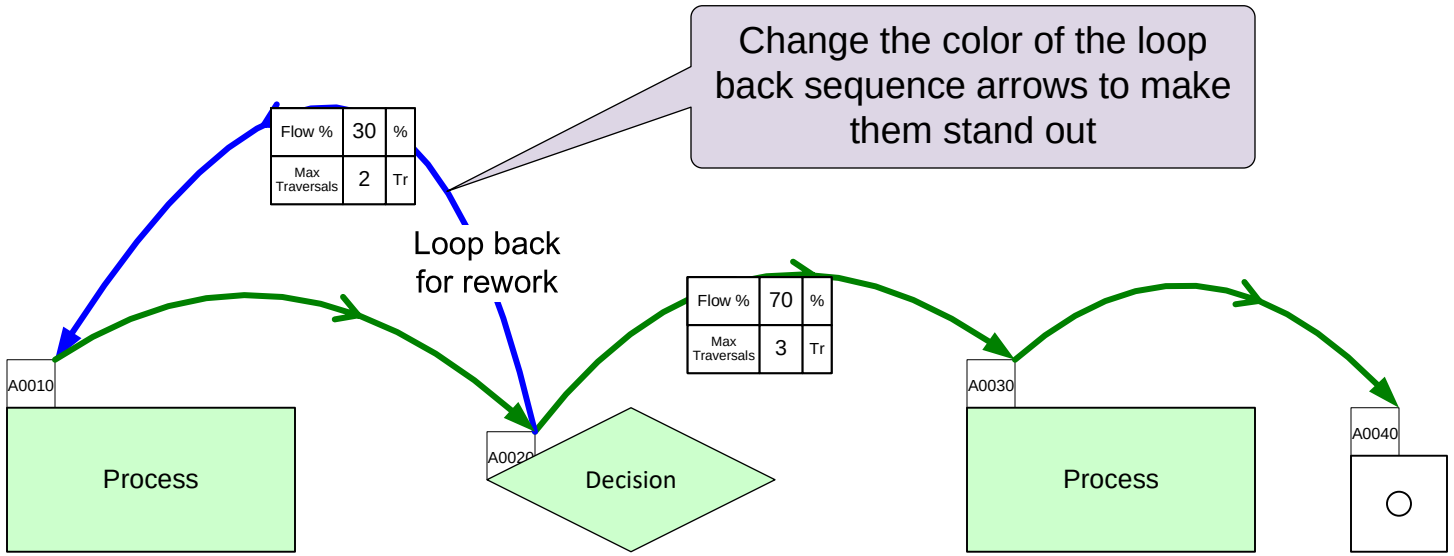


Units	Year	Wk	Day
	52	5	8
	Wk	Day	Hr

Max Traversals for Loop Backs

The output sequence arrows from the Decision center automatically get the two data shapes shown here. The Flow% variable allows you to specify the percentage of total incoming demand that will go through that route. The total for all outputs from a decision must add up to 100%.

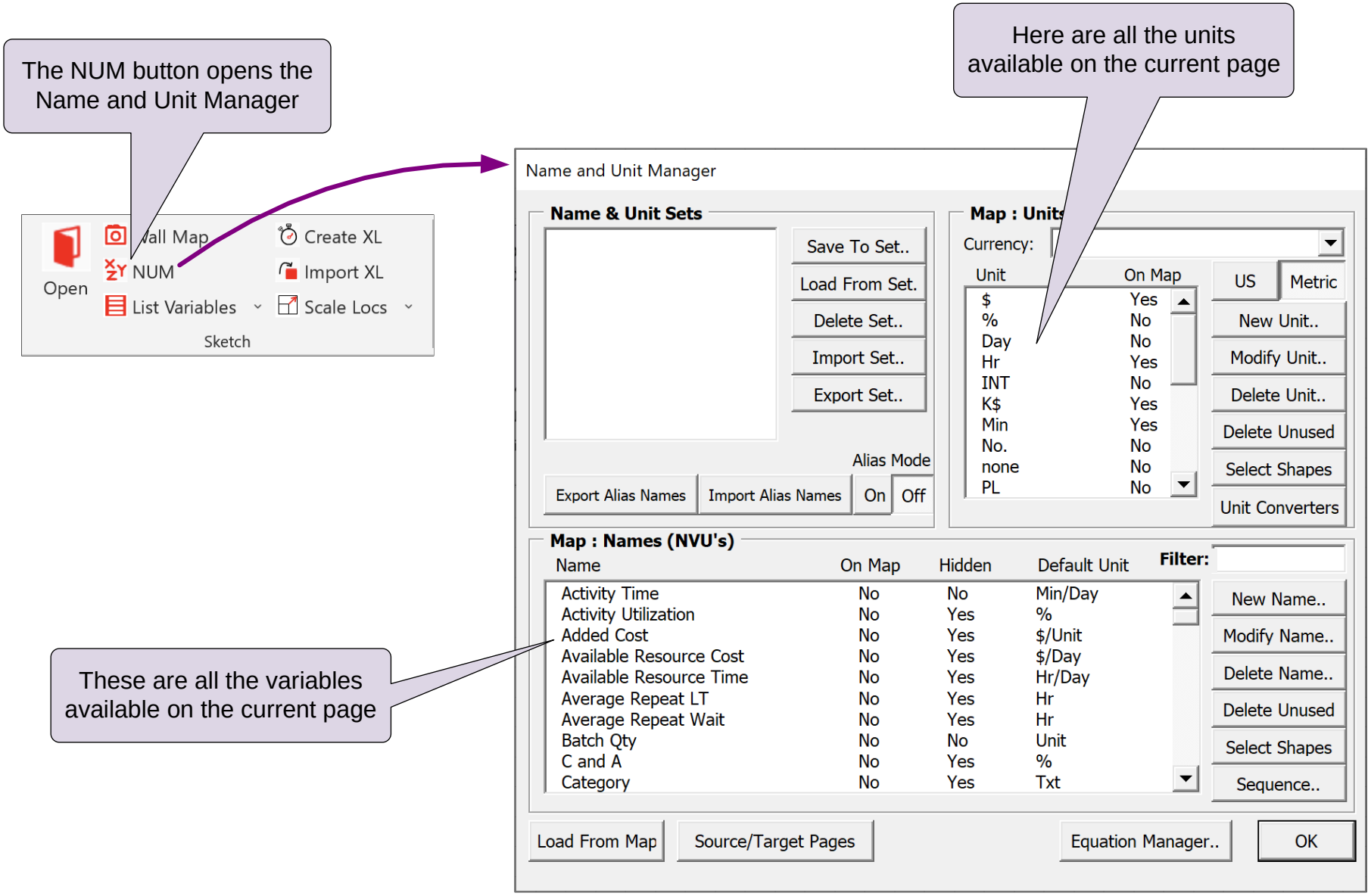
Loop backs are used when incomplete or incorrect work needs to be sent back upstream to be fixed. Loop backs add routes and complexity to the model, so it is prudent to limit number of times work has to be sent back upstream. The Max Traversals variable allows you to place a limit on the number of times the work will loop back upstream for each route.



Max Traversals on the downstream flow can be a high number and should always be greater than the sum of all loop back routes.

Working with Units

Consistent use of names and units is essential for the automated analysis to work. So, these are stored in a single vault called the Name Unit Manager (NUM). The NUM form is opened with the NUM button in the toolbar.



For details on all NUM functionality dee https://evsm.com/toolbarguide

Units Converters

eVSM includes many standard built-in units such as minutes, meters, etc. It also allows you to add your own units in local terminology such as totes, trays, palettes…

Units are organized in families such as weight, time, etc. Units Converter shapes are used to designate the family and conversion factors.

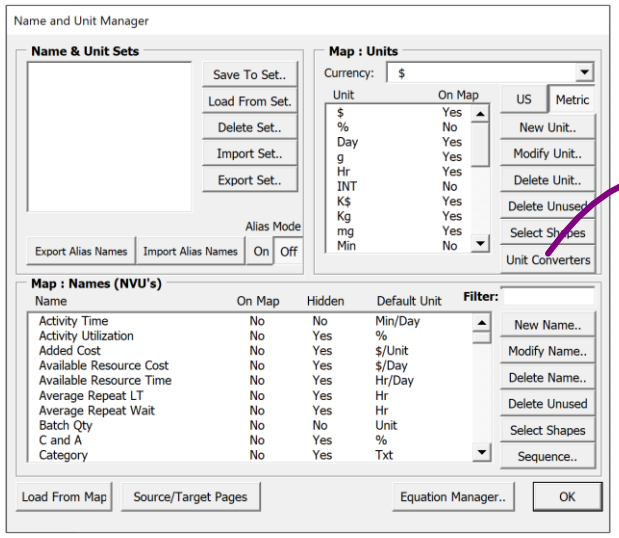
Units	Year	Wk	Day
	52	5	8
	Wk	Day	Hr

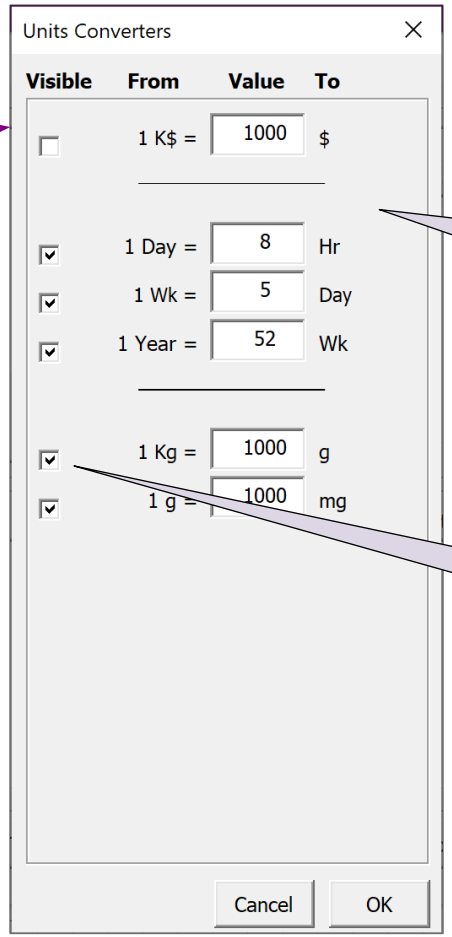
g
1000
mg

Bigger unit is always at the top

Kg
1000
g

Conversion factor

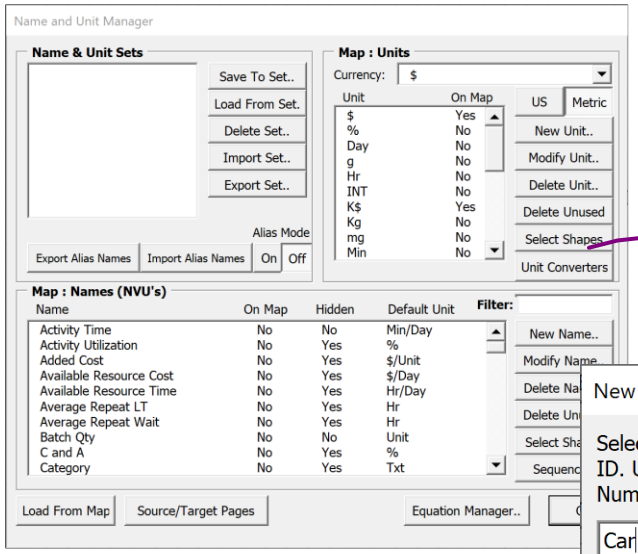


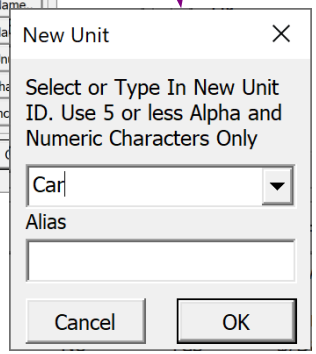


All current Units Converters can be viewed here.

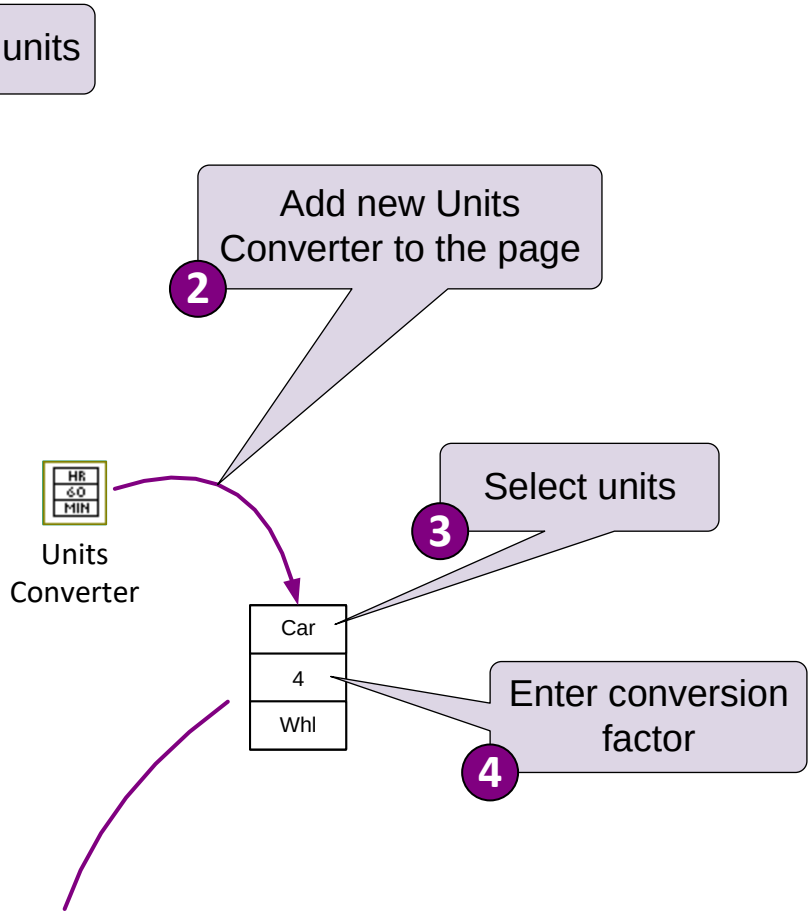
You can control what converters are visible on the page with these switches

Steps to Add New Units and Units Converters





Abbreviate units names to 3-4 characters since they have to display in very tight spaces on the map.



This example may mean that there are 4 wheels (Whl) per Car.

Create New Units and Specify Conversion Value

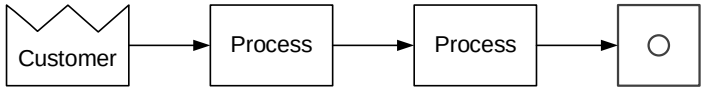
Add two new units: “Box” and “File”. Then using a units converter show that there are 12 files per box.

Routes and Paths

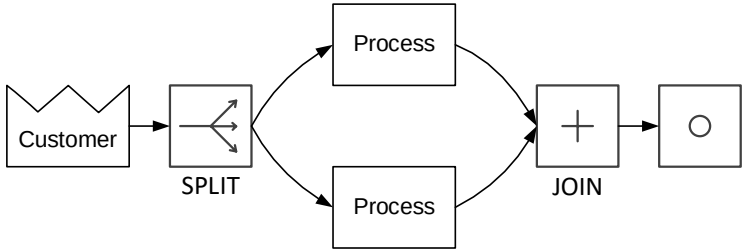
A route is a unique sequence of steps that a work token originating at the customer passes through. Each route has one or more paths, depending on parallel work in the flow shown with the Split/Join centers.

Routes and Paths Examples

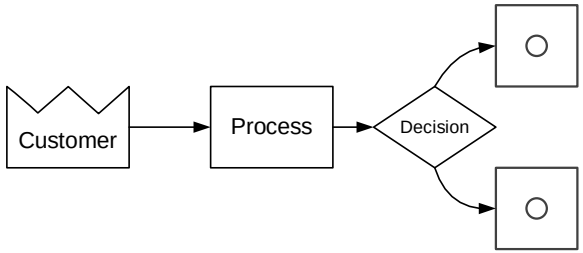
Routes = 1, Paths = 1



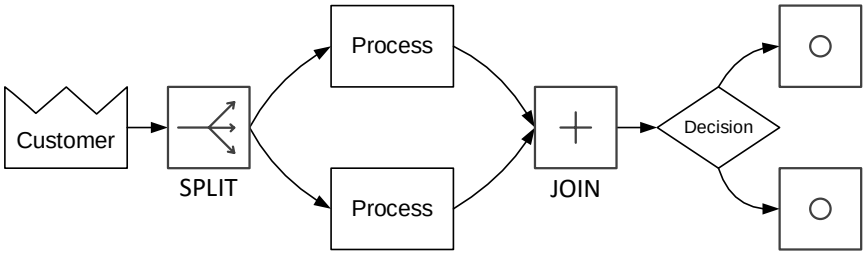
Routes = 1, Paths = 2



Routes = 2, Paths = 2



Routes = 2, Paths = 4

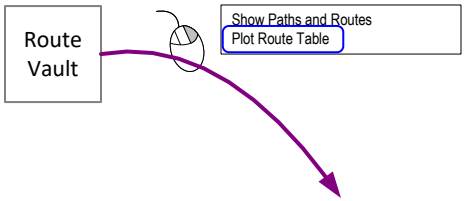


Working with Routes and Paths

A Route Vault shape will appear automatically on the page on Solve. Right mouse commands on this shape allow you plot the Route Table and to open the Route and Paths Explorer form.

Route Table

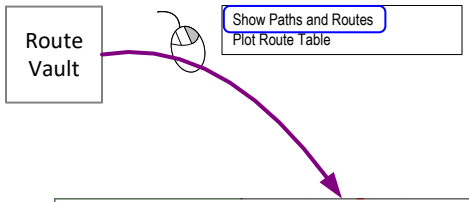
The Route table provides a summary of the routes. It is limited to showing the top 20 routes and is sorted by highest to lowest demand routes. Use the right-mouse menu to plot the table.

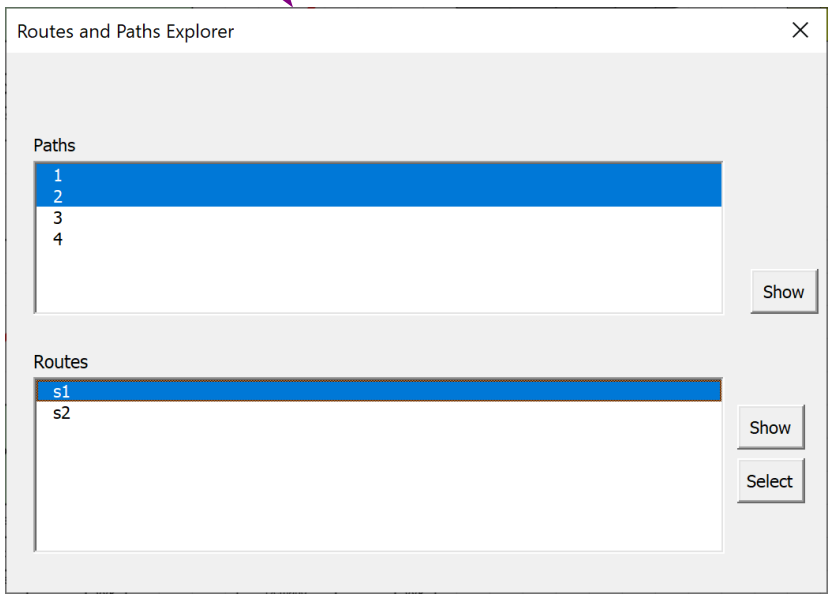


Route Number	Demand %	Longest Path ID	Longest Path Name	Longest Path Lead Time	Longest Path PT	Longest Path PT %
INT	%	INT	Txt	Day	Hr	%
1	60.00	1.00	Sales|Legal|Review|Approve	31.00	1.25	0.50
2	25.70	3.00	Sales|Legal|Review|Sales|Legal|Review|Approve	56.00	2.17	0.48
3	10.00	7.00	Sales|Legal|Review|Reject	31.00	1.25	0.50
4	4.30	9.00	Sales|Legal|Review|Sales|Legal|Review|Reject	56.00	2.17	0.48

Routes and Paths Explorer

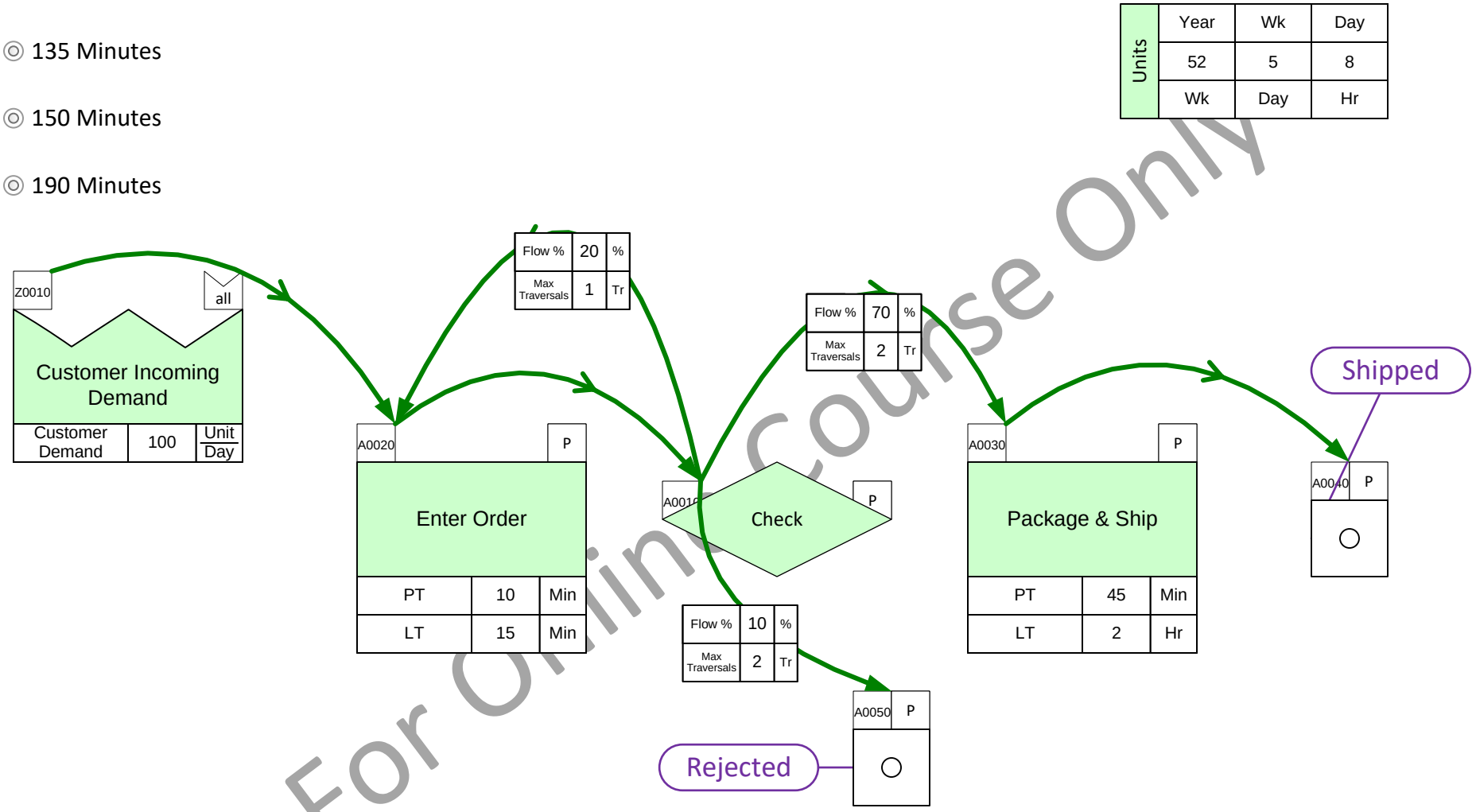
Routes and paths can be explored with the Route Vault which gets created automatically on the page when the map is solved. Use the right-mouse menu to open the Routes and Paths form.





What is the Lead Time for the longest route?

- 2 Hours
- 135 Minutes
- 150 Minutes
- 190 Minutes



Check the map for errors

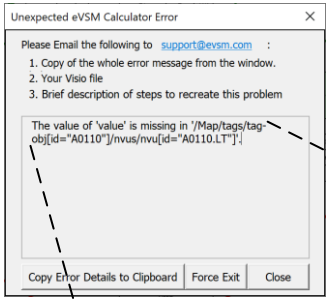
Some things need to be exact on the map for it to solve successfully. Many common errors are detected by the solver and reported in an error message.

Examples of common mapping errors

- Unconnected Sequence arrow
- Missing mandatory data
- Missing units convertors
- Unglued data shapes
- Disconnected operation tags
- Output demand on decision centers

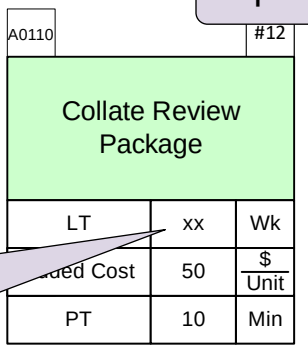
Many of the above and other errors will be detected and reported by the Solver.

Example error message



The value of 'value' is missing in '/Map/tags/tag-obj[id="A0110"]/nvus/nvu[id="A0110.LT"]'.

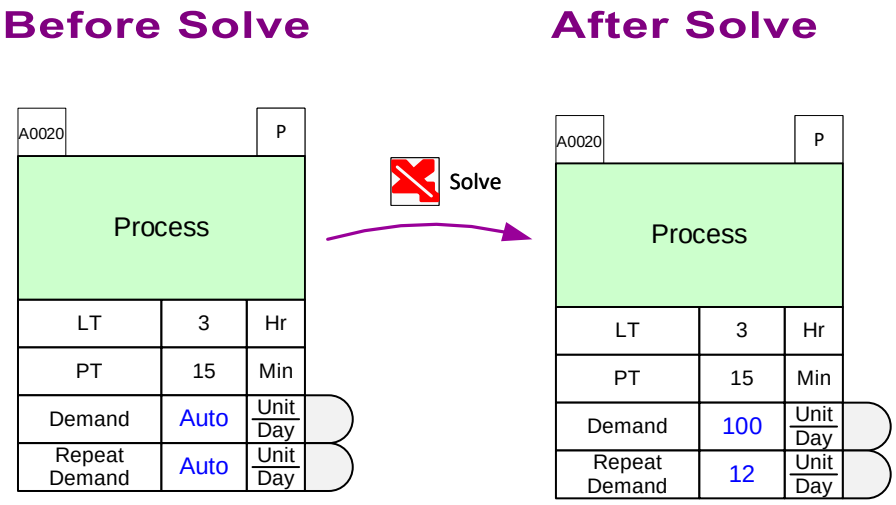
The message provides the operation tag number (A0110) to help locate the problem on the map



The above error message is reporting that the mandatory value here is missing.

Solving the Map

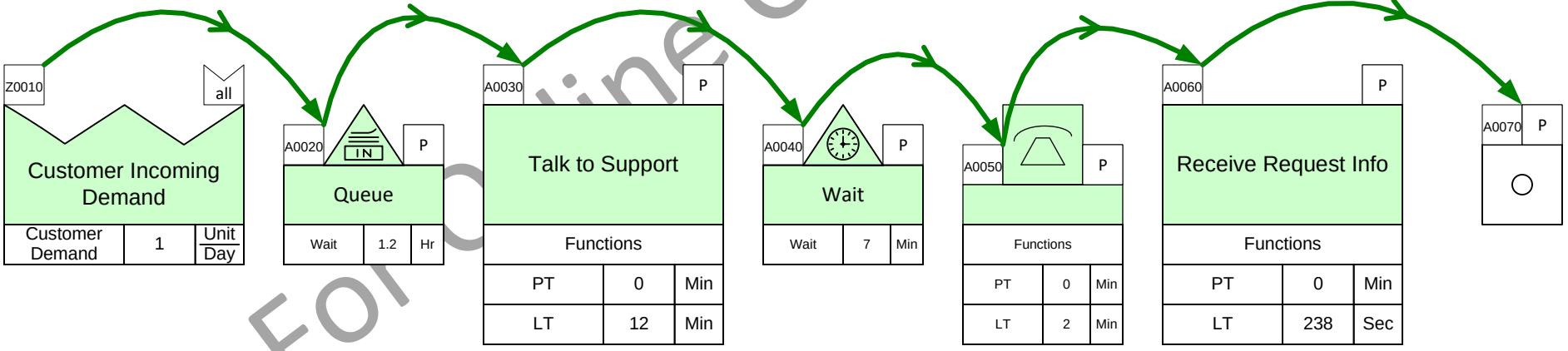
The Solve button checks the map for common errors, and reports any problems detected. If there are no problems, it completes the solve. When complete, the blue values will show the calculation results.



What is the Lead Time for this map?

Solve the map and then plot the Route Table

- ◎ 1.62 Hr
- ◎ 325 Min
- ◎ 128 Min
- ◎ 2.1 Hr



Units	Day	Wk	Year
	8	5	52
	Hr	Day	Wk

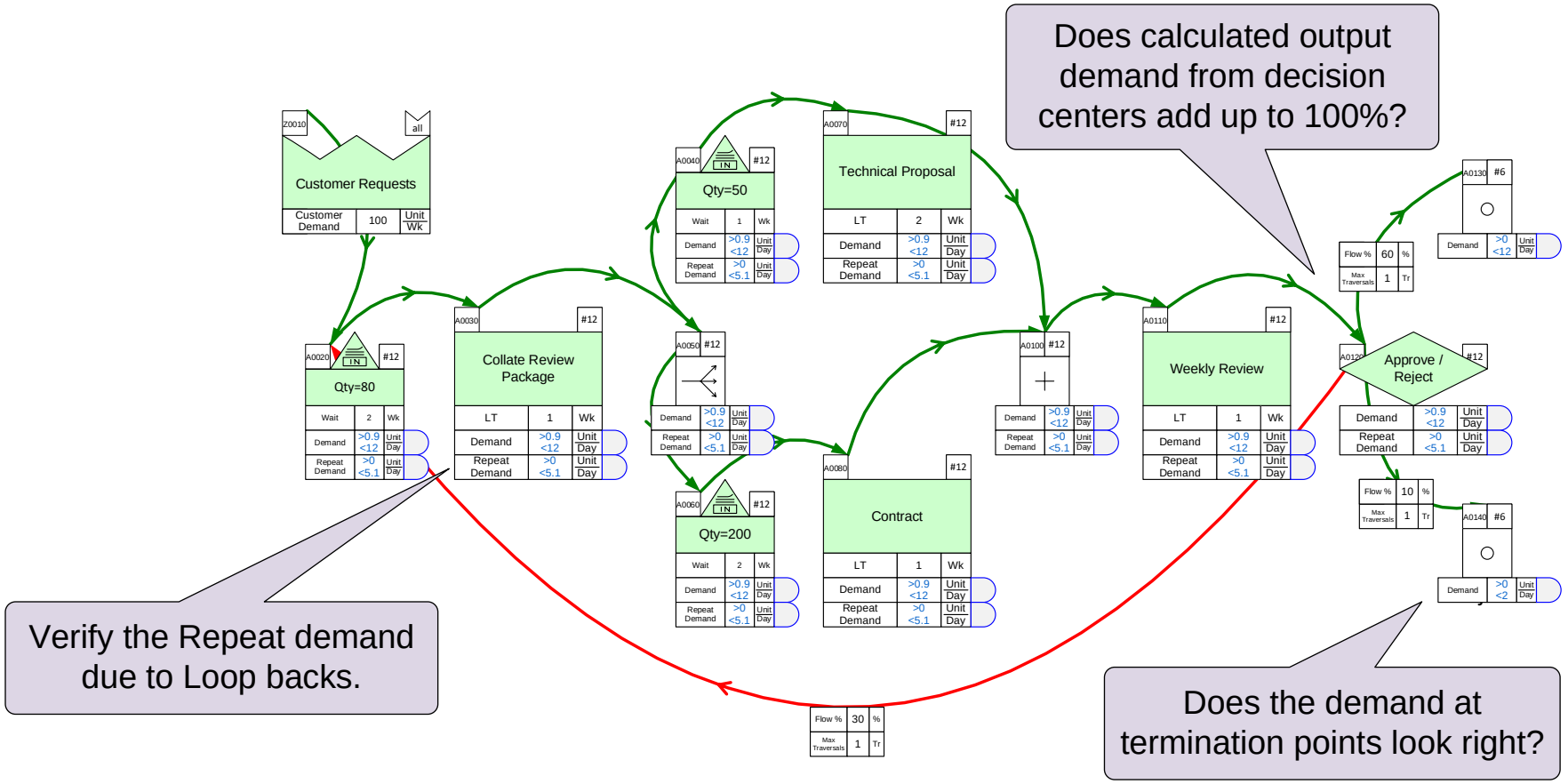
Checking Calculation Results

After a success Solve, it is a good idea to verify the results make sense and agree with the actual value stream. Checks may include:

- Do the number of routes and paths look right? - See the Route and Path Explorer
- Do the overall lead times look right? – See the Route Table
- Is the Demand calculation at key nodes in the right ball-park?

Check Demand Calculations

Many subsequent calculations are based on the initial demand calculation at each center. To check this, make the "Demand" and "Repeat Demand" variables visible on the map through the "Views" button.

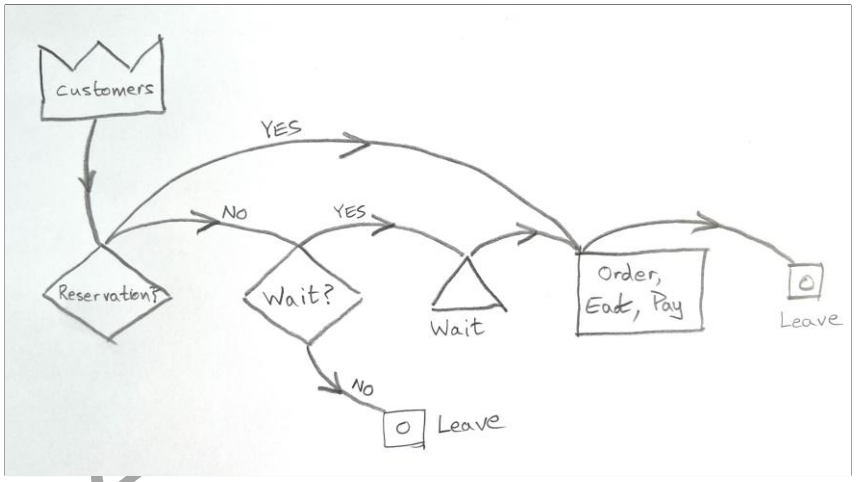


Practice Map

Draw the map shown in the hand sketch

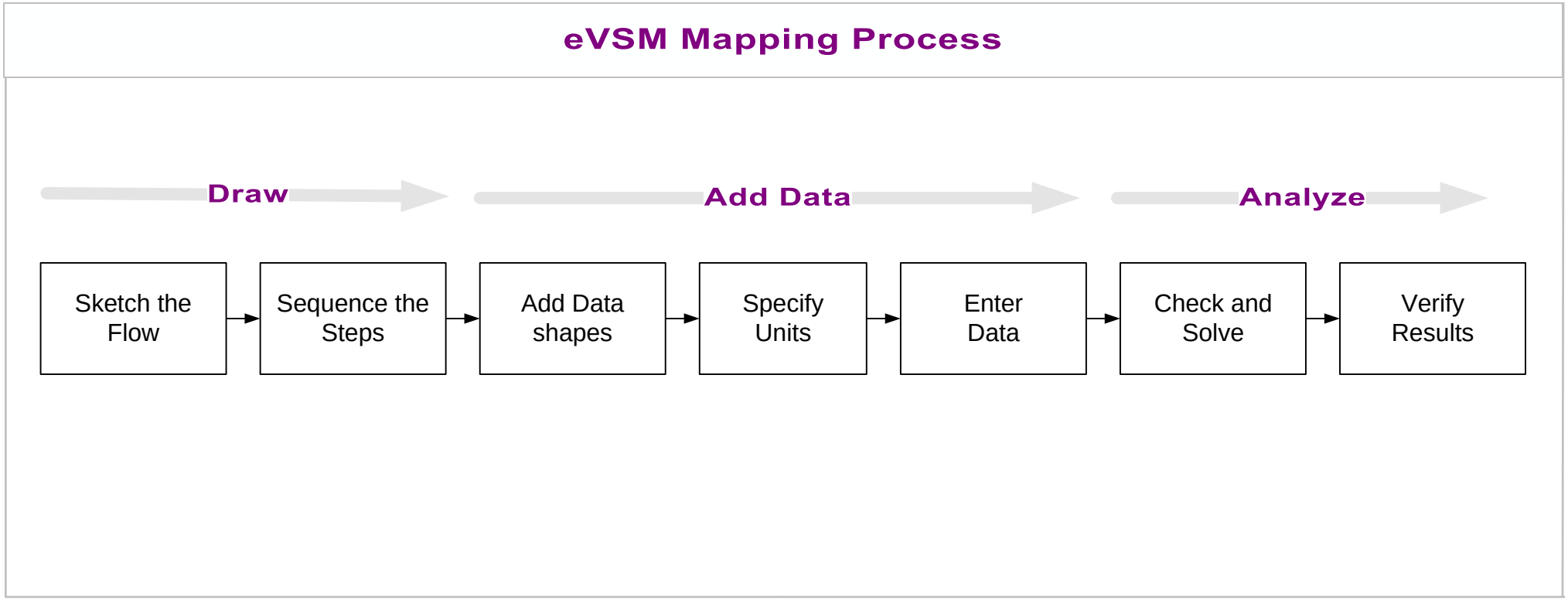
1. Initiate the page for a Mix Transactional map
2. Draw the flow with the Sketch Mix Transactional stencil
3. Connect with Sequence arrows and annotate
4. Use the right-mouse-button menus to add the default data shapes
5. Submit the exercise to Grade It.

No need to enter any data values or solve the map.



You learned:

- How to sketch a transactional VSM
- How to convert the sketch into a value stream model with data
- How to use the automated calculations in eVSM to analyze the value stream



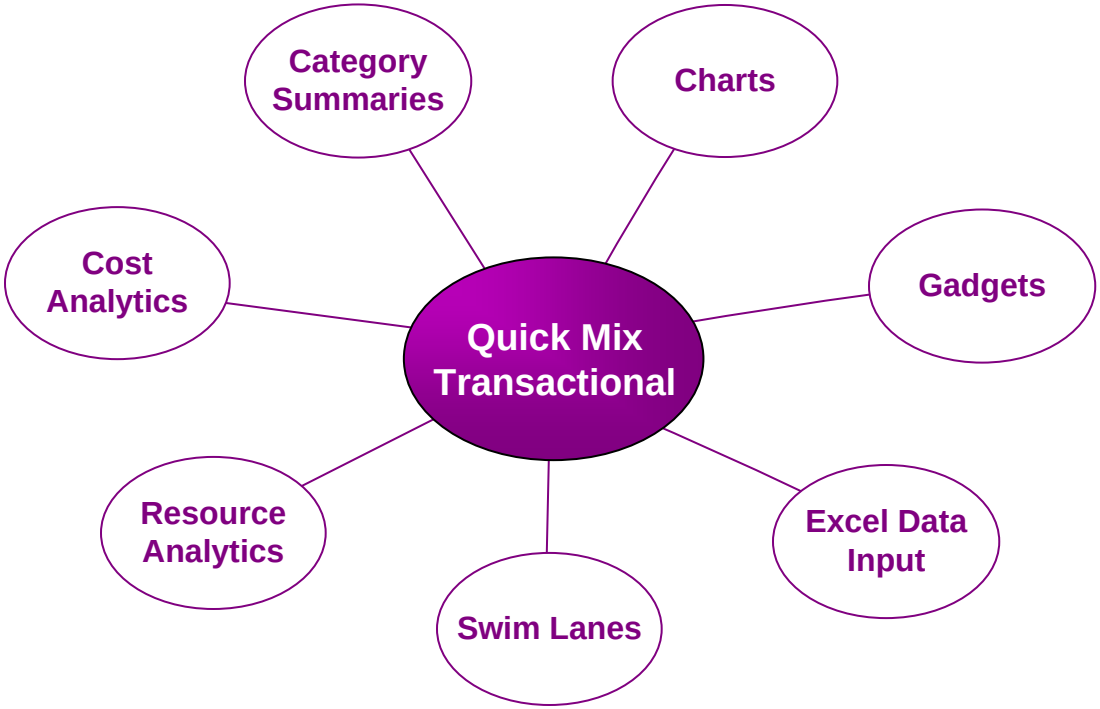
What's next:

You will see how to add visuals, additional calculations, resource analysis, and cost analysis

Supplementary Functions

This lesson is a continuation of the previous one. You will learn additional transactional mapping functions step by step followed by another practice map.

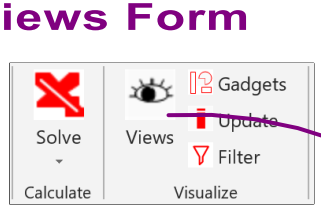
Quick Transactional VSM Supplementary Functions



Using "Views" to control visibility of data shapes

The Mix Transactional 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



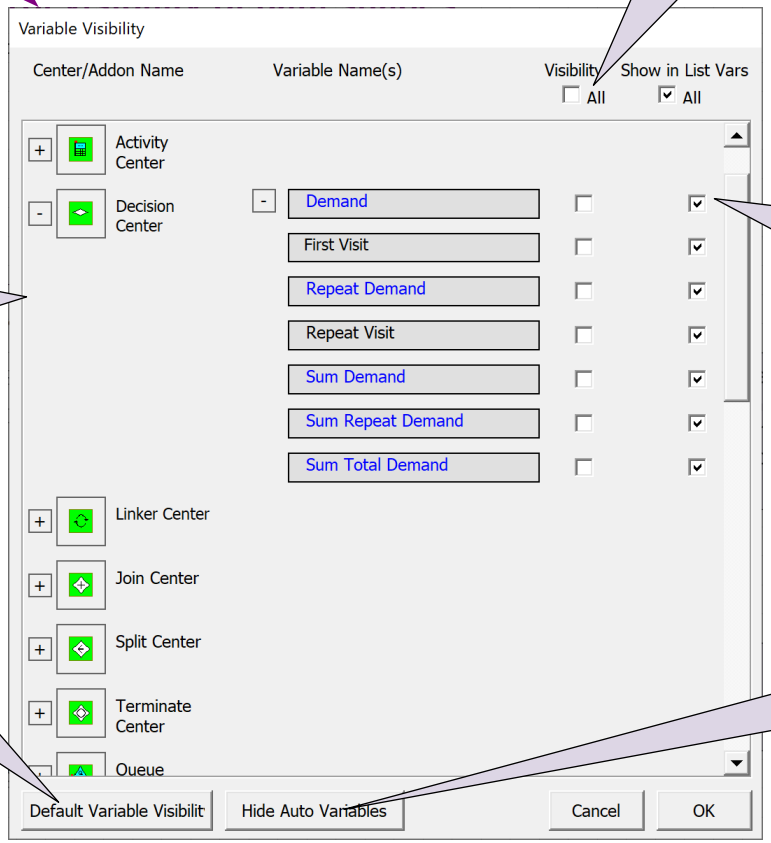
Use this checkbox to hide ALL or show all data shapes on the map

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

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

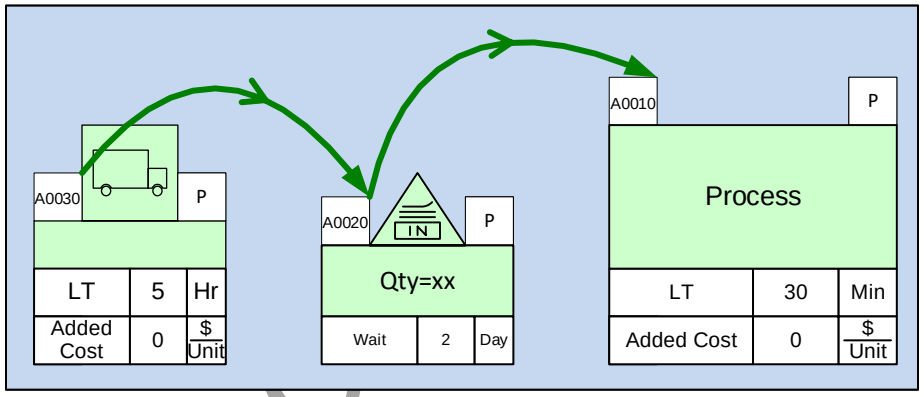
This button reverts the switches back to the default state (as it was for a new map)

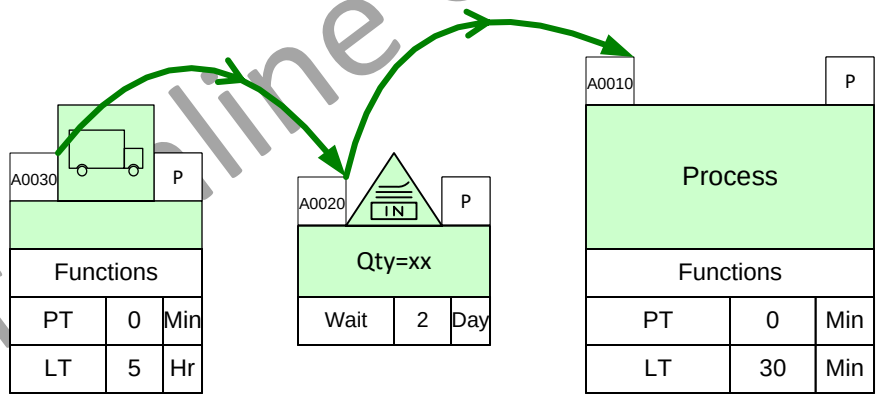
Use this button to hide all data shapes containing calculated values



Hide/Show Data shapes

Use the “Views” button to Hide/Show data shapes and match the blue thumbnail image

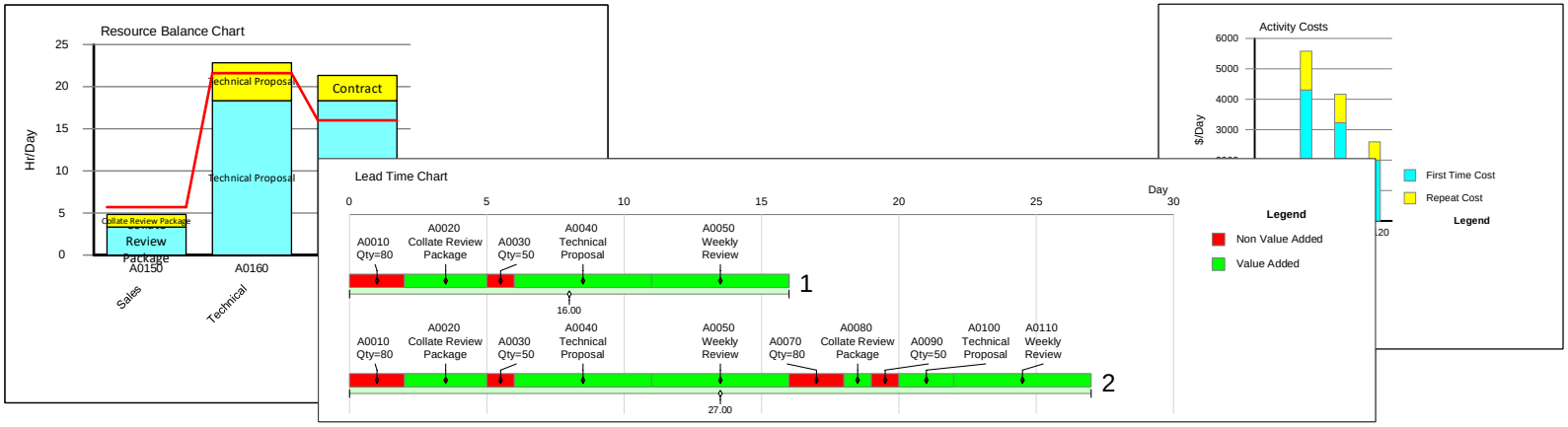




Units	Year	Wk	Day
	52	5	8
	Wk	Day	Hr

Charts

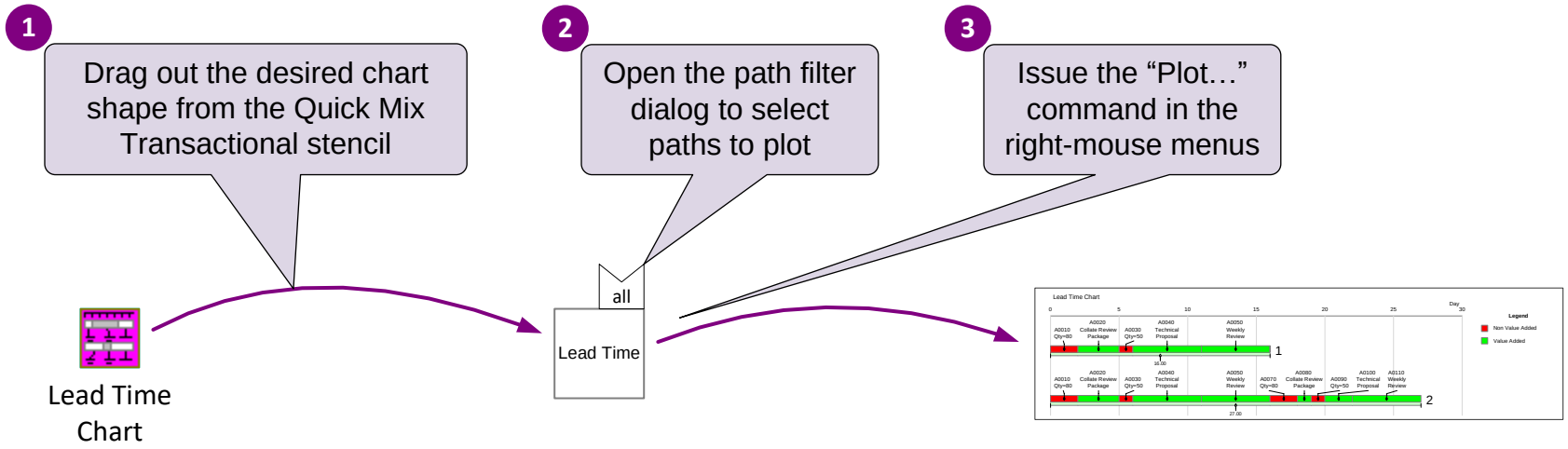
Mix Transactional includes several built in charts.



Plotting Charts...

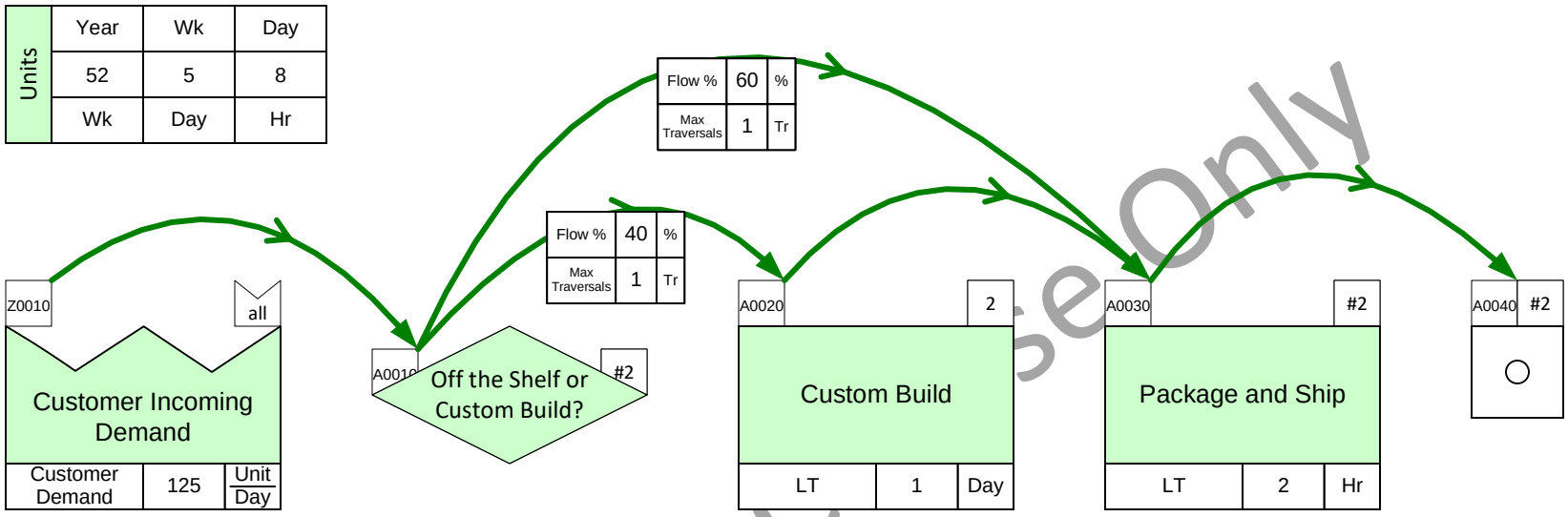
These charts can only be plotted if the required data is available on the map and after the model has solved successfully.

To plot a chart, simply drop the chart icon on the drawing page, and use the plot command in the right mouse menus of the chart. Some charts (e.g. Lead time chart) include a filter to remove unwanted paths from the chart.



For more information on creating new and customizing existing charts, see https://evsm.com/productivity.

Plot the Lead Time chart for the "Custom build" path

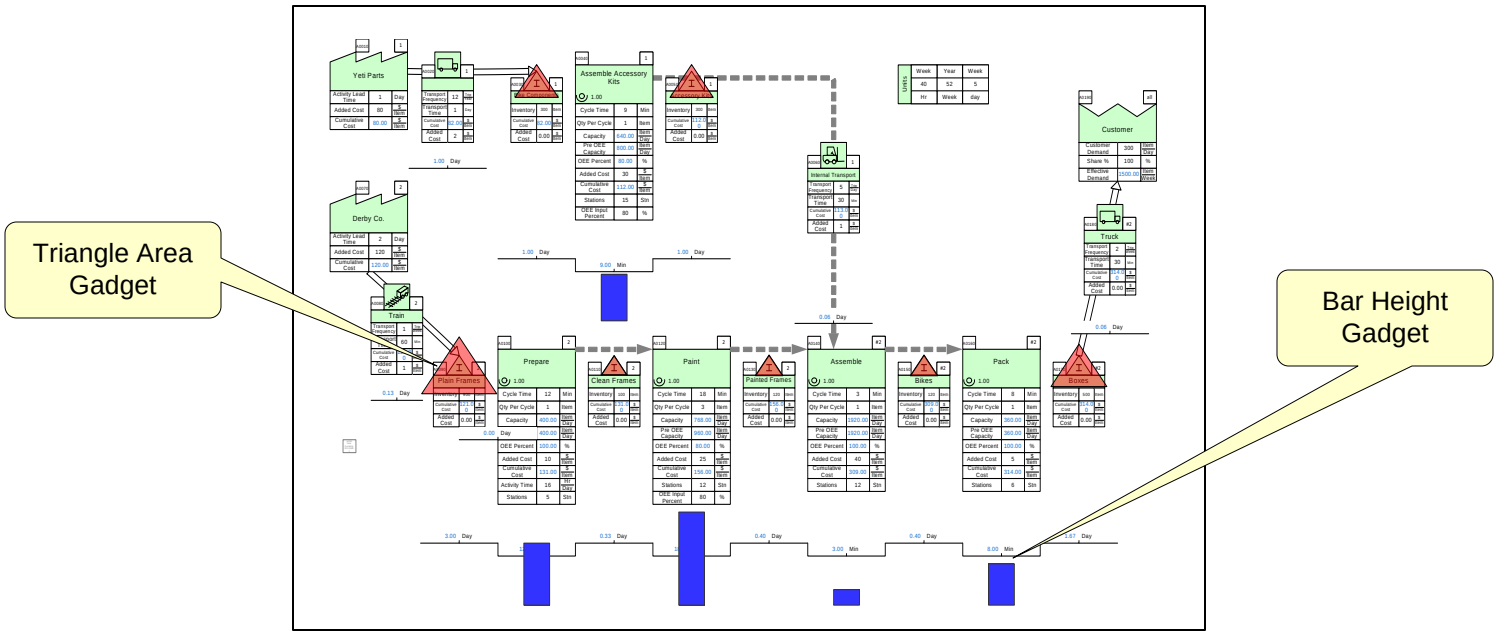


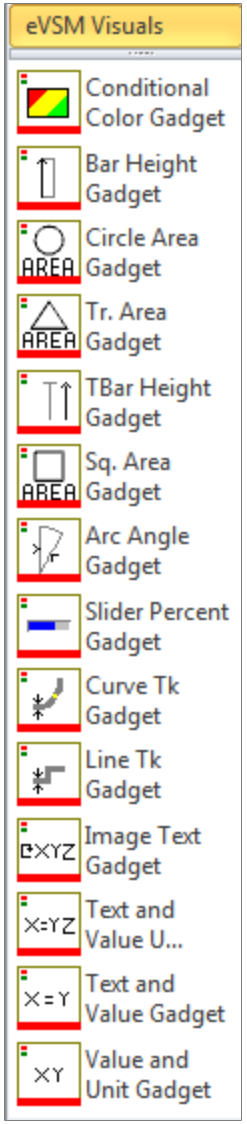
Using Gadgets to Visualize Data

In addition to charts, you can use geometric gadgets to visualize data with the gadget positioned near the data block they represent. Any NVU (data shape in Name-Value-Unit format) variables on the map can be linked to visual gadgets whose size and color changes in proportion to the value. This allows you to visualize values “in-place” on the map.

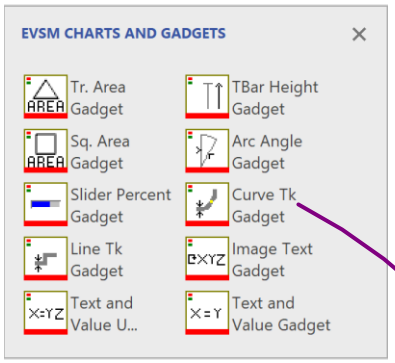
Gadgets are available in many shapes as shown on the right. Each gadget has exactly one parameter (e.g. length, area, thickness, etc.) which can be tied to represent a data value. Different gadgets can be used to represent different variables on the same map. Gadgets size/color will update automatically for any changes in data when the “Solve” is run. Gadgets may also be updated with the Update button in the eVSM ribbon.

Gadget properties (scale, colors, visibility) can be managed with the Gadgets button in the eVSM ribbon.





Line Thickness Gadget Steps

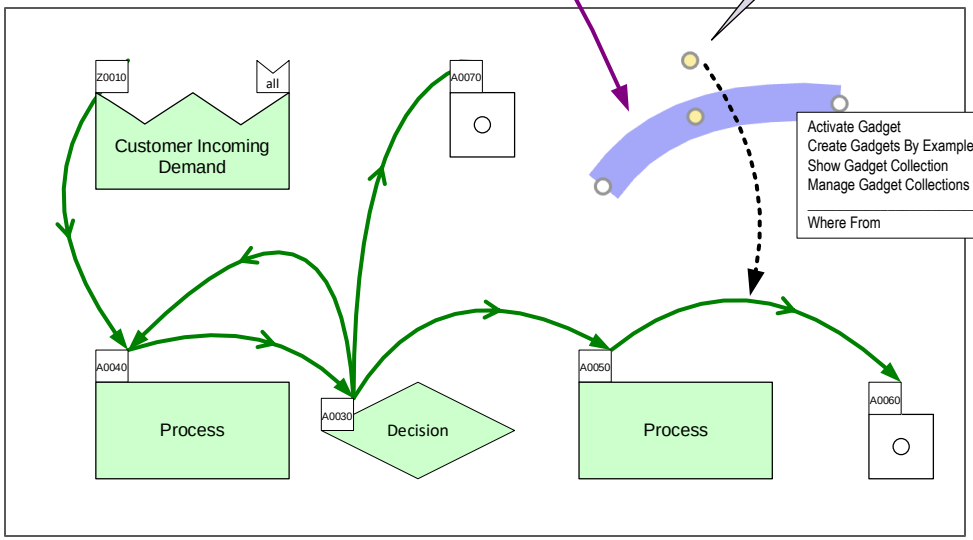


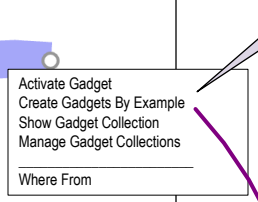
1 Drop a Curve Thickness gadget anywhere on the page

2 Glue it's floating glue-point to any one sequence arrow

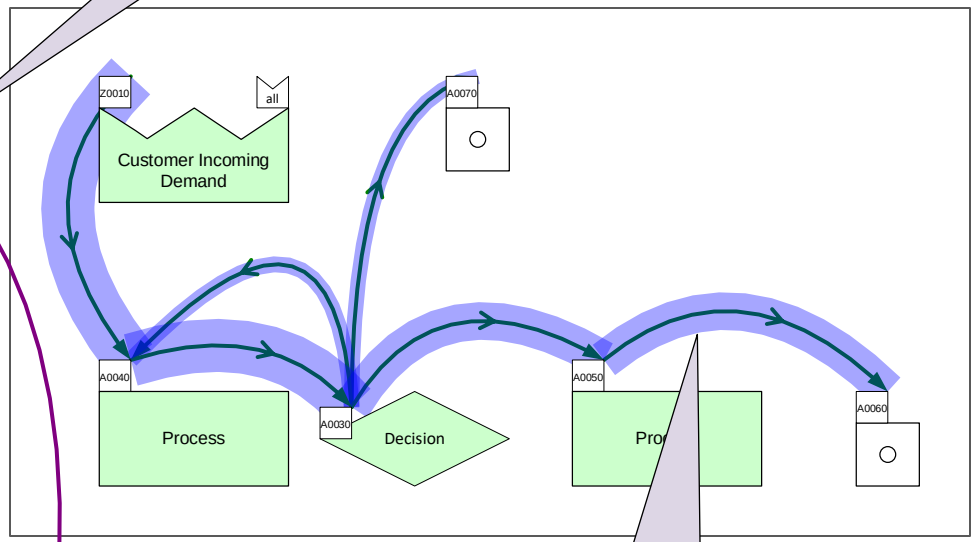
3 In the right-mouse-button menus, click the "Create Gadget By Example" command

Before

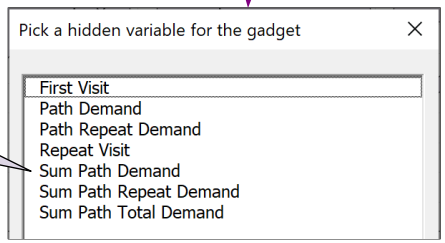




After



4 Select the Sum Path Demand variable and click OK



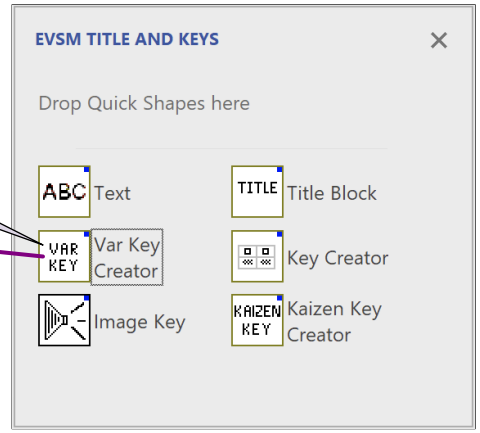
The gadget thickness represents the total demand flowing through each sequence arrow

Default Variables

There is a long list of default variables included in each of the centers. Most are normally hidden from view. The Views button is used to expose them. While a variable is visible on the map, you can use the “Name Help” command in the NVU’s right mouse menus to see a description. The example here shows all the data input variables for the activity center.

A0030		P
Activity Center		
Functions		
PT	0	Min
LT	xx	Hr
Target LT	0	Hr
Target PT	0	Min
First Visit	SIM	INT
Repeat Visit	SIM	INT
Added Cost	0	$/Unit
C and A	100	%
PT NVA	0	Min
PT NNVA	0	Min
Category name		
Information Systems		

The Variables Key Creator can be used to show descriptions of all the variables currently visible on the map



Added Cost : Cost added at this activity to process first time entities that is not explicitly modeled by resources connected to this activity

C and A : Complete and Accurate %. This should be added to the activity that is the root cause of any C&A problem found in the value stream

Category : This is a text field identified one or more category names (comma separated)

First Visit : This has a value of 1 for routes that include this node. Zero otherwise

Functions : Roles or functions contributing to this activity

Info Systems : IT systems used by this activity

LT : Time that the first time entity is within the activity

PT : “hands-on” Time to process a first time entity

PT NNVA : Processing time that is necessary non value added

PT NVA : Process time that is non value added

Repeat Visit : Number of repeat visits associated with this route

Target LT : Target Lead Time

Target PT : Target for processing time

Units	Year	Wk	Day
	52	5	8
	Wk	Day	Hr

Optional Add-on Variables

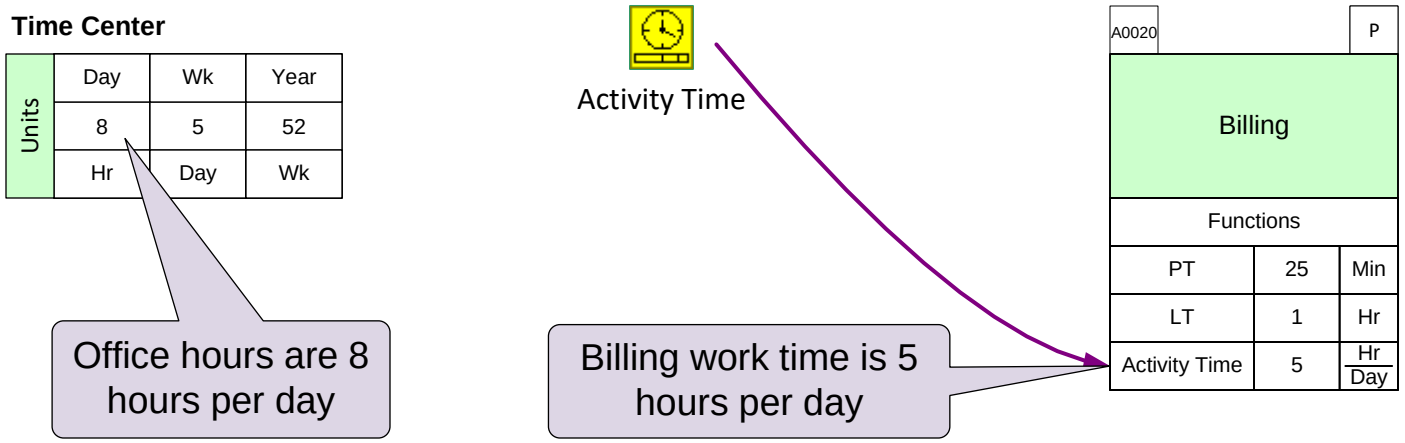
In addition to the default variables, the Mix Transactional VSM stencil also includes additional variables which facilitate additional and modifications to the default calculations. These optional extra variables are called Add-ons and are the yellow icons in the stencil. The add-ons must be glued to the bottom of the data shapes stack for the center they are assigned for.

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 8 hours per day as indicated in the Time Center. However, Process B works part-time at 5 hours per day. 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 the Activity Center

In addition to the default variables, the Mix Transactional VSM stencil also includes additional variables which facilitate modifications to the calculations. These optional extra variables are called Add-ons and are in the yellow icons in the stencil.

Activity Centre

A0050		P
Process		
Functions		
PT	0	Min
LT	xx	Hr

Represents a high level process step

Activity Time

Activity Time	xx	Min / Day

Use when the available time for an activity is different from that specified in the Time Center

Activity Stations

Stations	xx	Stn

Use when there are multiple stations working in parallel, performing exactly the same task, and having the same operational parameters

Activity Repeat Cost

Repeat Added Cost	xx	$ / Unit

Repeat work comes with the repeat cost, to represent the repeat cost this add-on is used

Activity Repeat Time

Repeat PT	xx	Min
Repeat LT	xx	Hr

This Add-on represent the time taken for repeat work, use this add-on whenever there is a work content get repeated for recheck or rework

Activity Batch Qty

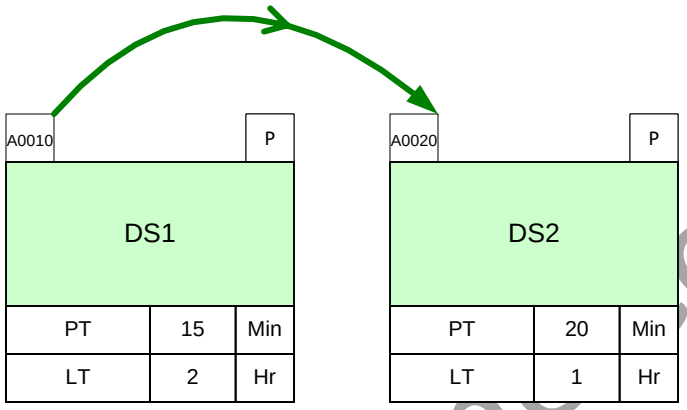
Batch Qty	xx	Unit

Use when a collection of work items are processed as a batch

Using Add-ons

Make the following two changes to these activities with Add-ons.

1. Activity DS1 works overtime and is available 10 hours per day
2. Activity DS2 has 3 stations

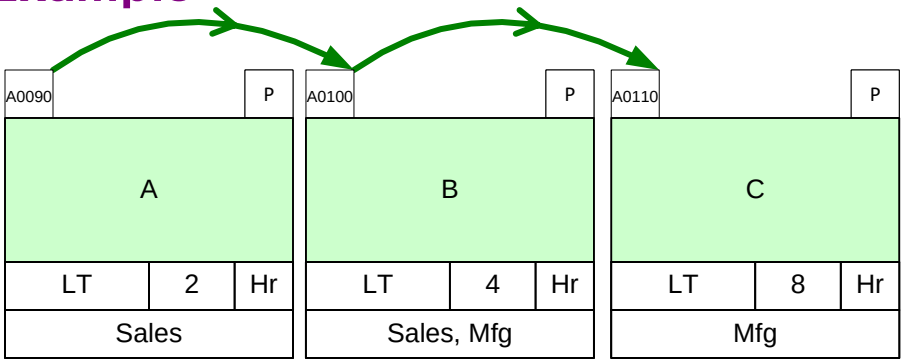


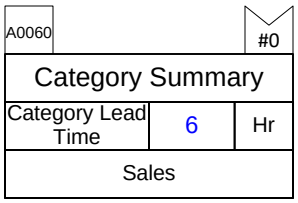
Units	Year	Wk	Day
	52	5	8
	Wk	Day	Hr

Category Function

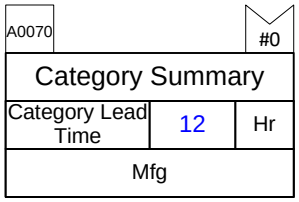
The eVSM Category capability allows you to create summaries for a subset of the value stream. You can specify exactly which operations are included in the category

Example

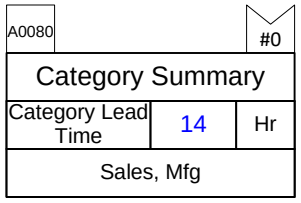




Summary for the Sales activities

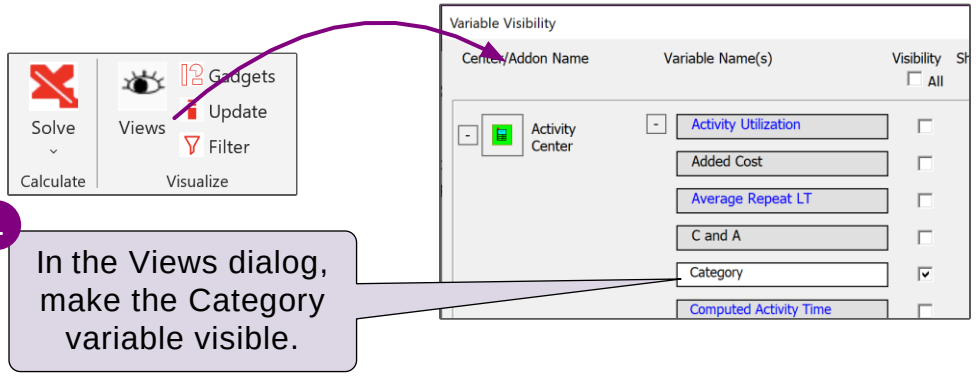


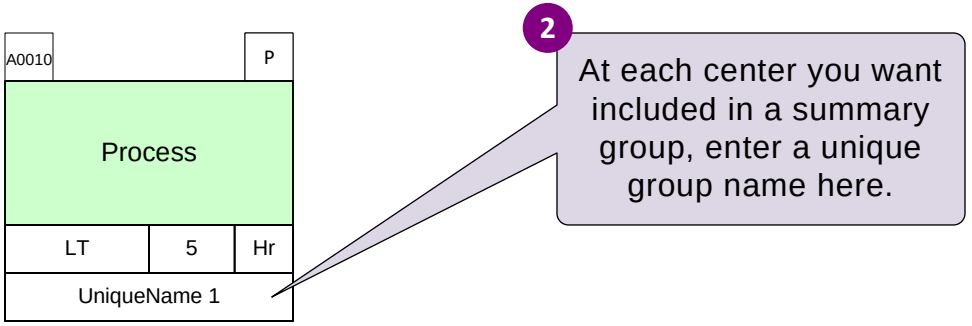
Summary for the Mfg activities

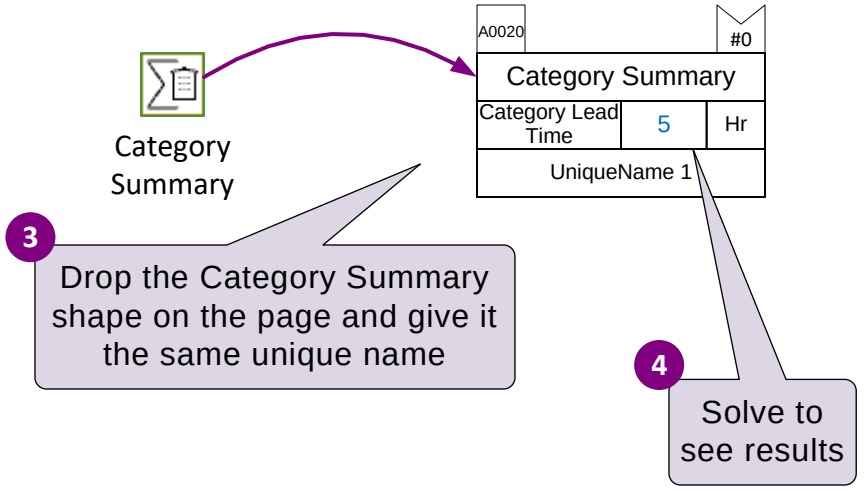


Summary for the Sales and Mfg activities

How to Use...

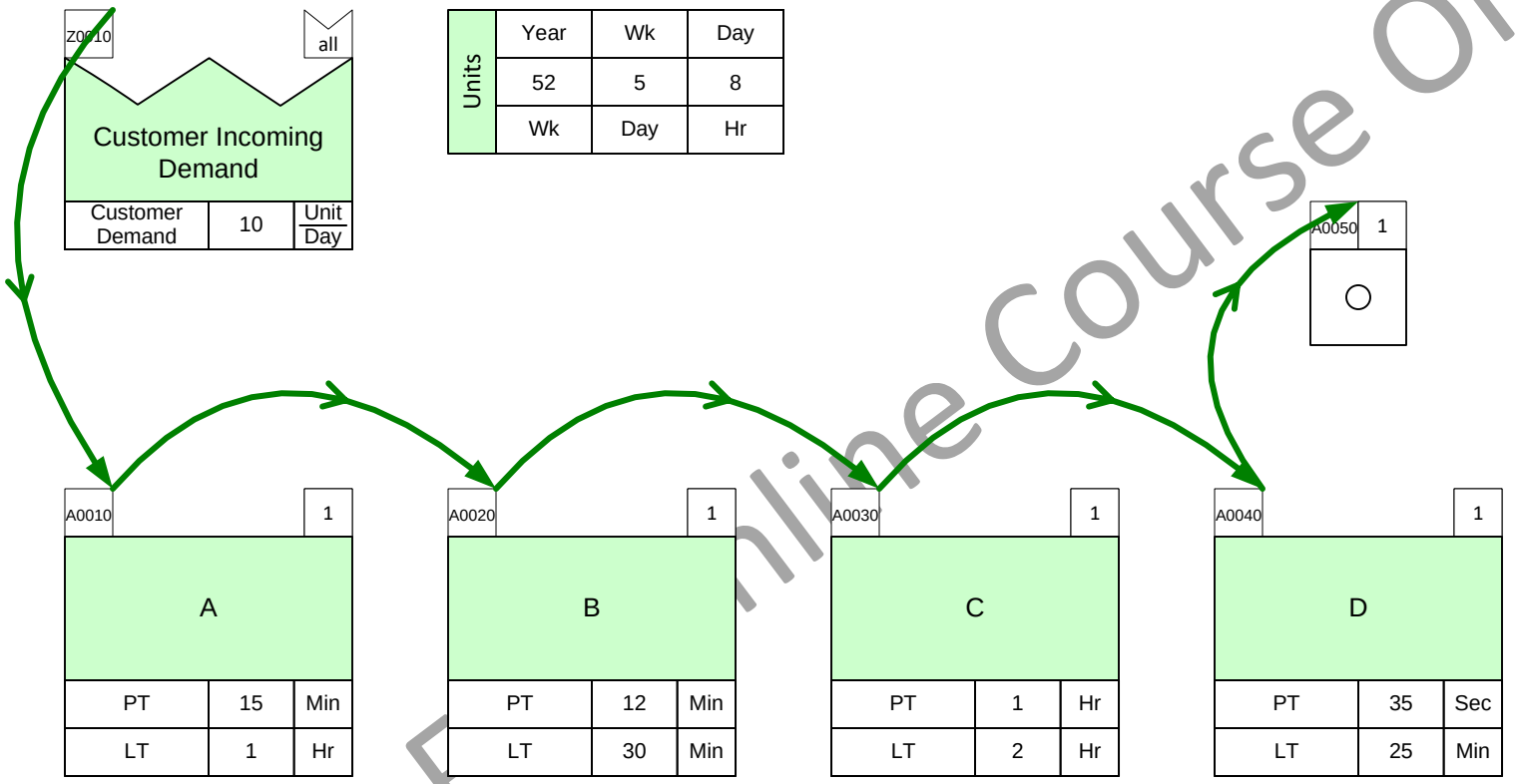






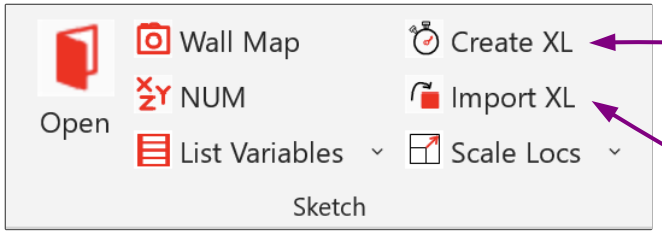
Category Exercise

Use the Category summary center to calculate the ‘category lead time’ for activities B+C+D



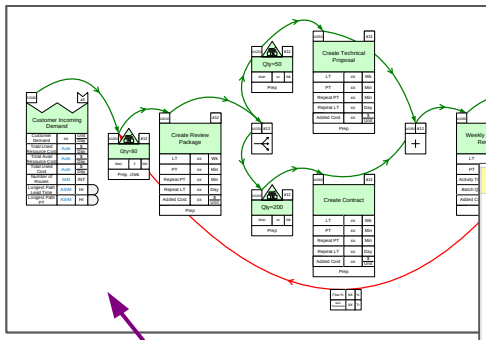
Data Input through Excel

When you have a significant amount of data to enter, you can do it through Excel.



Creates an Excel file which represents all the data input values for the current map.

Import XL pulls the data in from Excel to the map.



Create XL

Import XL

The columns represent the variables on the map, sorted in alphabetic order.

Only the input values are shown in Excel. No calculated values.

Tag	Center Type	Operation	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data	Data
			Activity Time	Added Cost	Batch Qty	C and A	Category	Customer Demand	Efficiency	Functions	Info Systems	LT	PT	PT NNVA	T NVA
			Day/Wk	$/Unit	Unit	%	Txt	Unit/Day	%	Txt	Txt	Wk	Min	Min	Min
A0200	Queue Center	Qty=80					Prep, chek								
A0210	Activity Center	Create Review Package		xx		100.0%	Prep			Functions	Information Systems	xx	xx		0
A0220	Queue Center	Qty=50					Prep								
A0230	Split Center														
A0240	Queue Center	Qty=200					Prep								
A0250	Activity Center	Create Technical Proposal		xx		100.0%	Prep			Functions	Information Systems	xx	xx	0	0
A0260	Activity Center	Create Contract				100.0%	Prep			Functions	Information Systems	xx	xx	0	0
A0280	Join Center														
A0290	Activity Center	Weekly Proposal Review		xx	xx	100.0%	Check			Functions	Information Systems	xx	xx	0	0

Units are locked and apply to the whole column.

Do not change the units here. Change them on the map if necessary.

The rows represent the centers. Sorted by Operation Tag number

Values entered in the white cells will appear on the map when the spreadsheet is imported.

Enter the product specific data using Create XL and Import XL

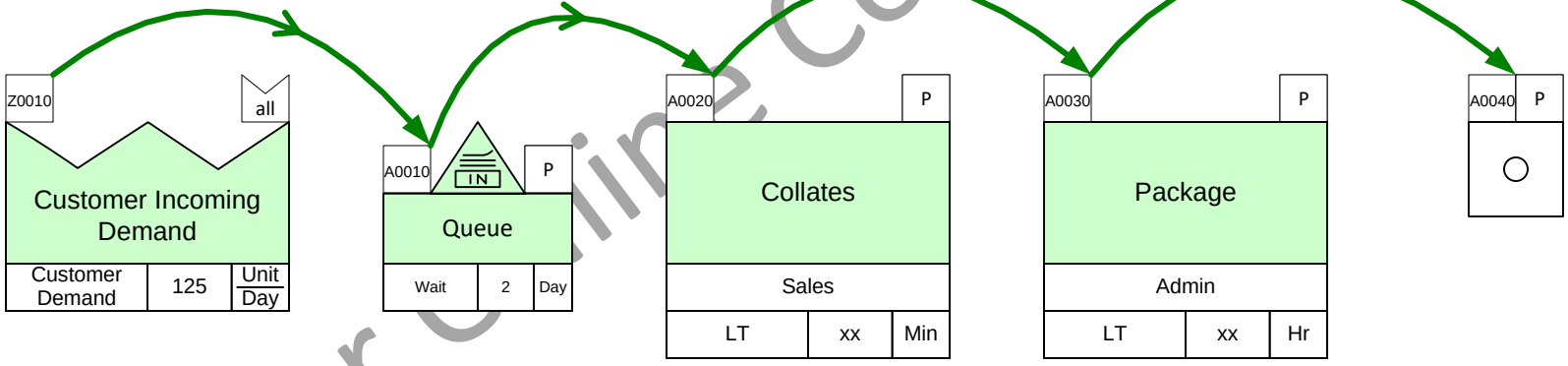
Enter the LT values through Excel. Steps:

1. Click Create XL. This will create and open an Excel worksheet.
2. In the Excel worksheet, enter the following values for LT

   Collate, LT= 30 Min

   Package, LT = 4 Hr

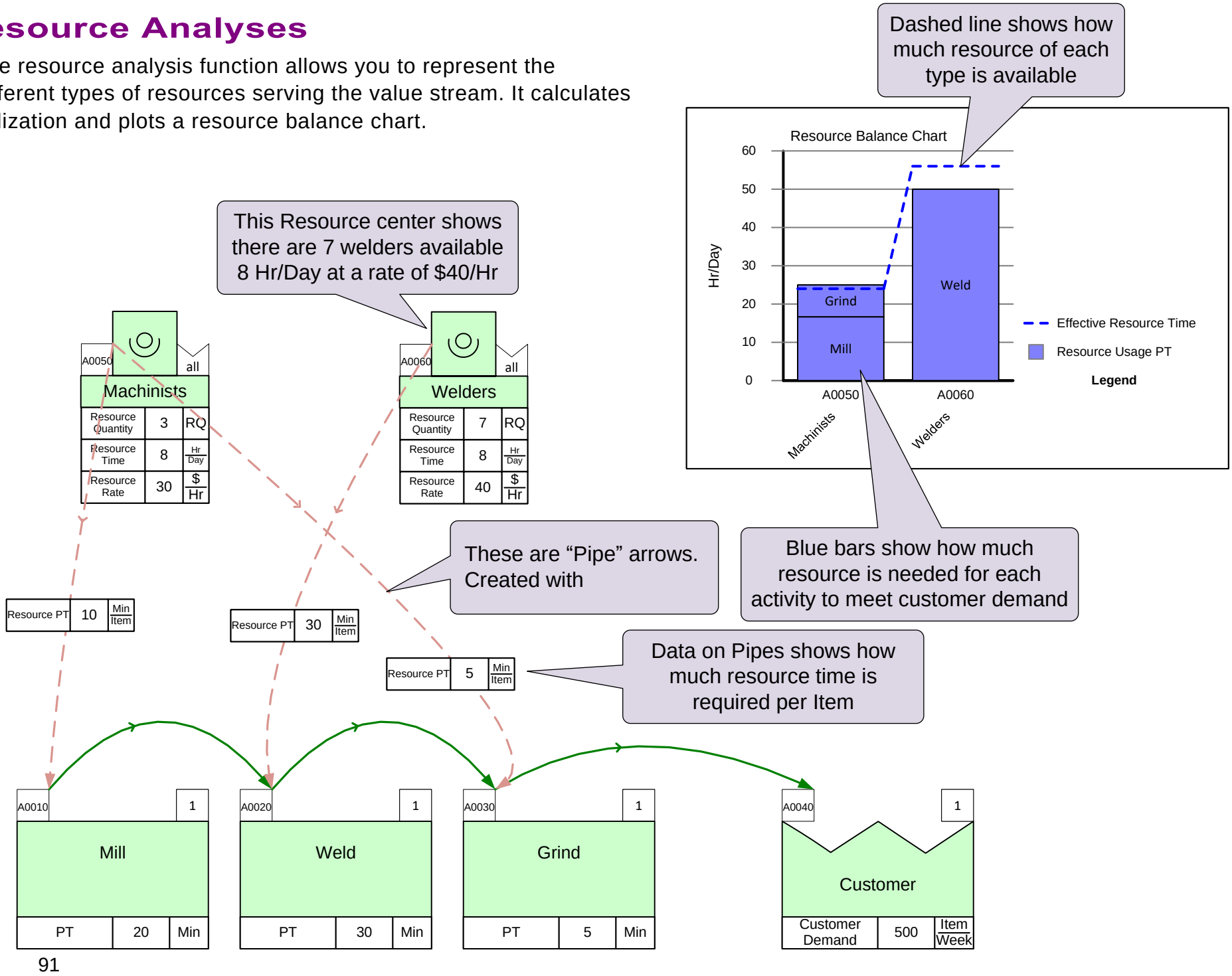
   Note: The column units in Excel are fixed and all values in each column have to use the same unit.
3. Use Import XL to populate the map with the entered LT values



Units	Year	Wk	Day
	52	5	8
	Wk	Day	Hr

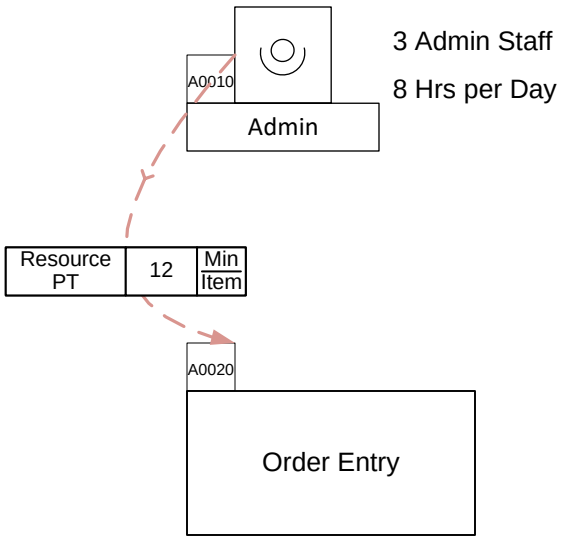
Resource Analyses

The resource analysis function allows you to represent the different types of resources serving the value stream. It calculates utilization and plots a resource balance chart.



Resource Calculations

Example 1

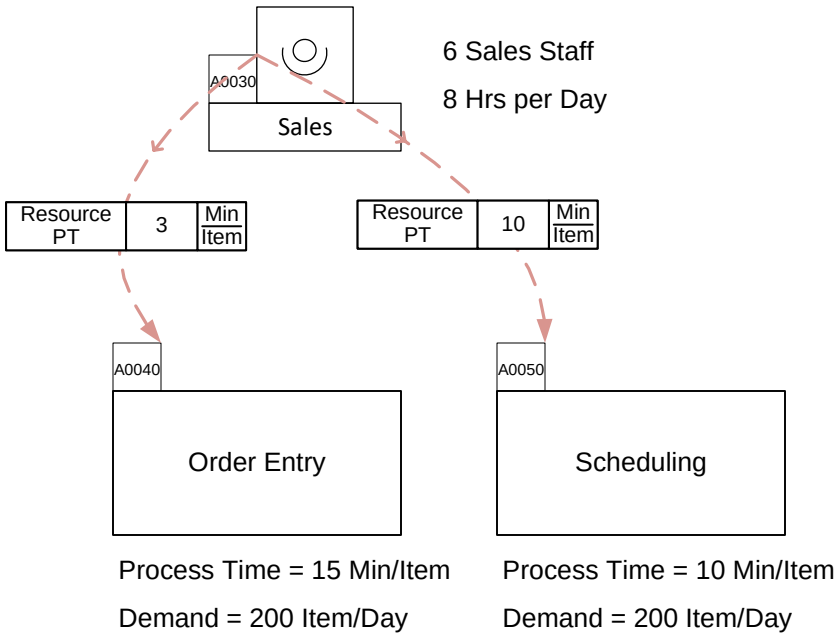


Available Resource Time = 3 x 8 x 60 = 1440 Min

Resource Used = 12 x 100 = 1200 Min

Resource Utilization = 1200/1440 = 86%

Example 2



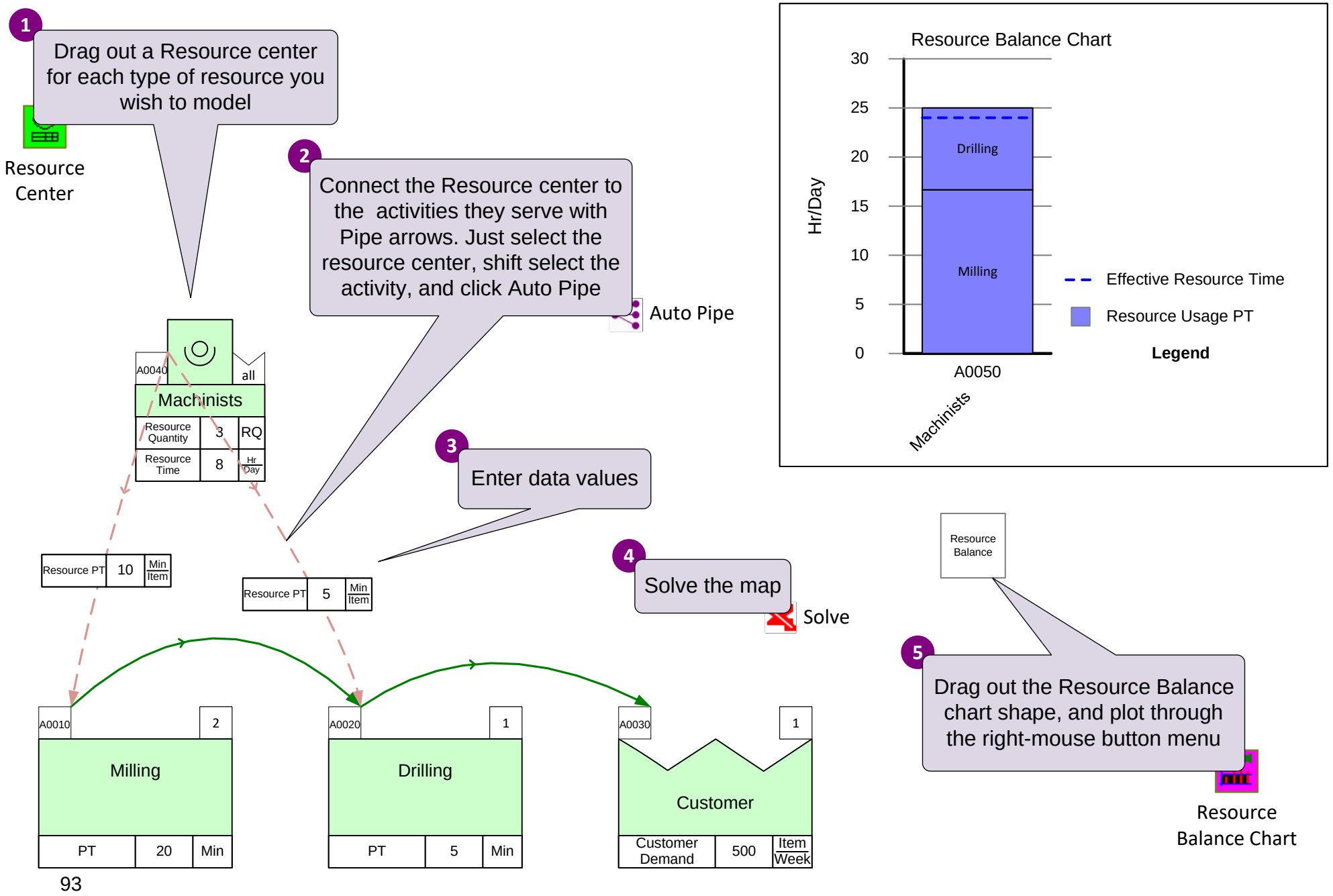
Available Resource Time = 6 x 8 x 60 = 2880 Min

Resource Used = (3 x 200) + (10 x 200) = 2600 Min

Resource Utilization = 2600/2880 = 90%

Note: resource process time (Resource PT) is not always equal to the activity Process Time. The Process Time reflects the clock time, the Resource PT reflects the person hours needed

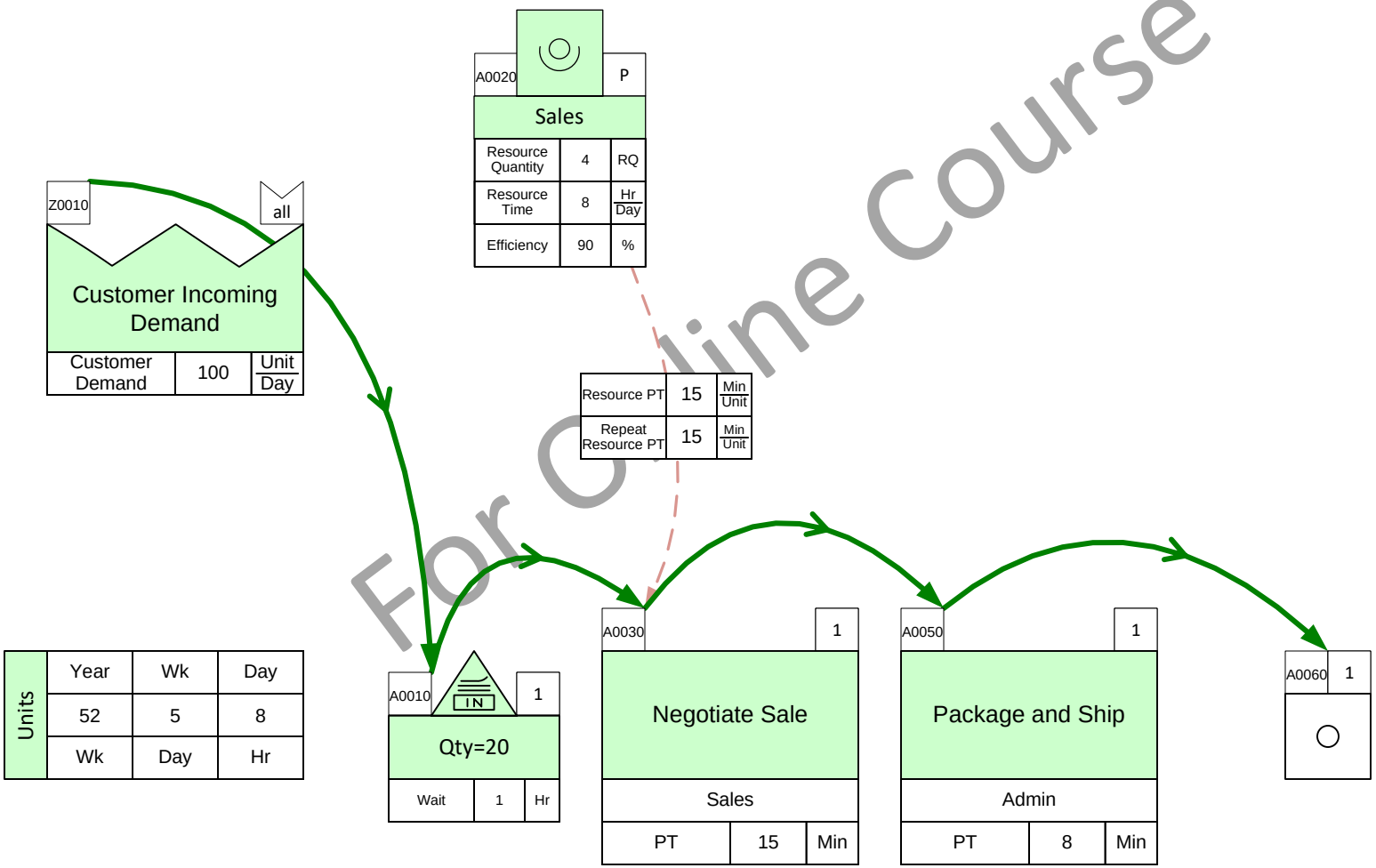
Resource Analyses Steps



Resource Analysis Exercise

Add a new resource called “Admin” with the data below and pipe it into the “Package and Ship” activity. Solve the model and plot a resource balance chart

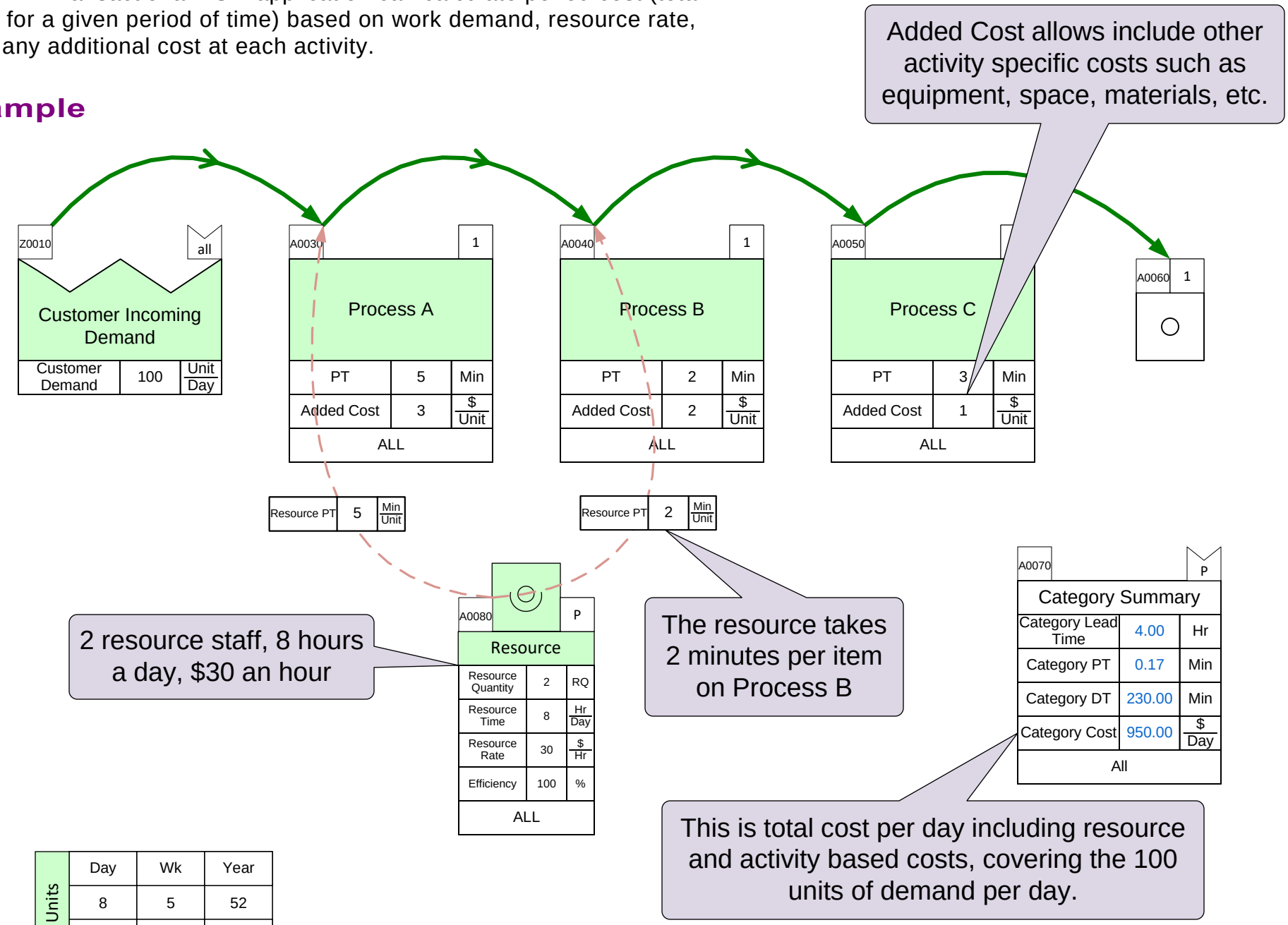
- Resource Quantity = 2 Admins
- Resource Time = 8 Hr/Day
- Resource PT = 8 Min/Unit
- Repeat Resource PT = 8 Min/Unit



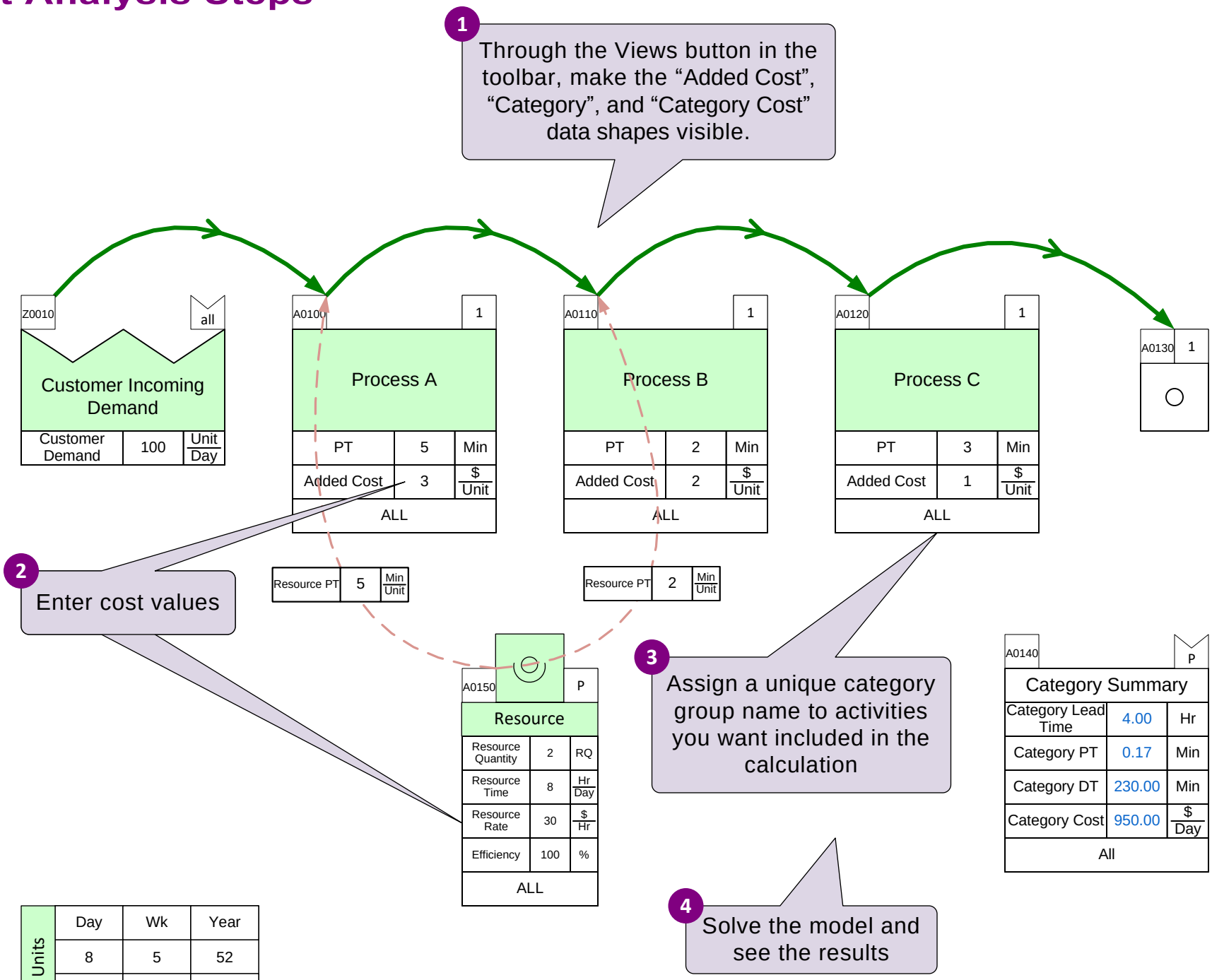
Cost Analysis

The Mix Transactional VSM application can calculate period cost (total cost for a given period of time) based on work demand, resource rate, and any additional cost at each activity.

Example



Cost Analysis Steps



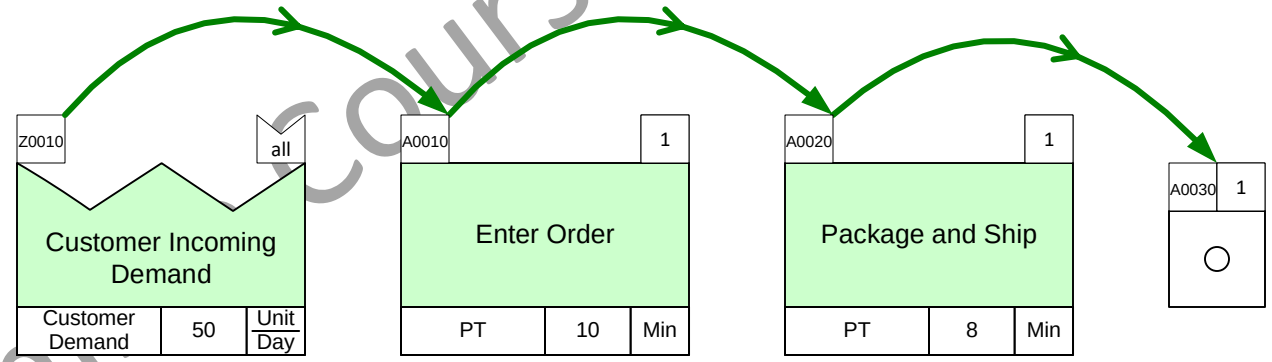
Resource Cost

Complete this model with the following data, then calculate the admins used resource cost

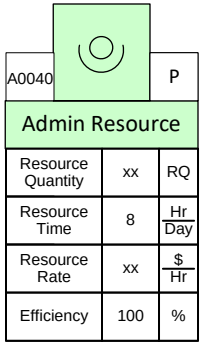
- Number of admins = 2
- Resource Rate = $20 per hour
- Admin time spent per unit is equal to the activity PT
- Any repeat work takes as long as the first time effort
- Both admins work on both activities
- Both admins efficiency rate is 100%

Select the correct answer here:

- ◎ $294
- ◎ $300
- ◎ $330
- ◎ $288

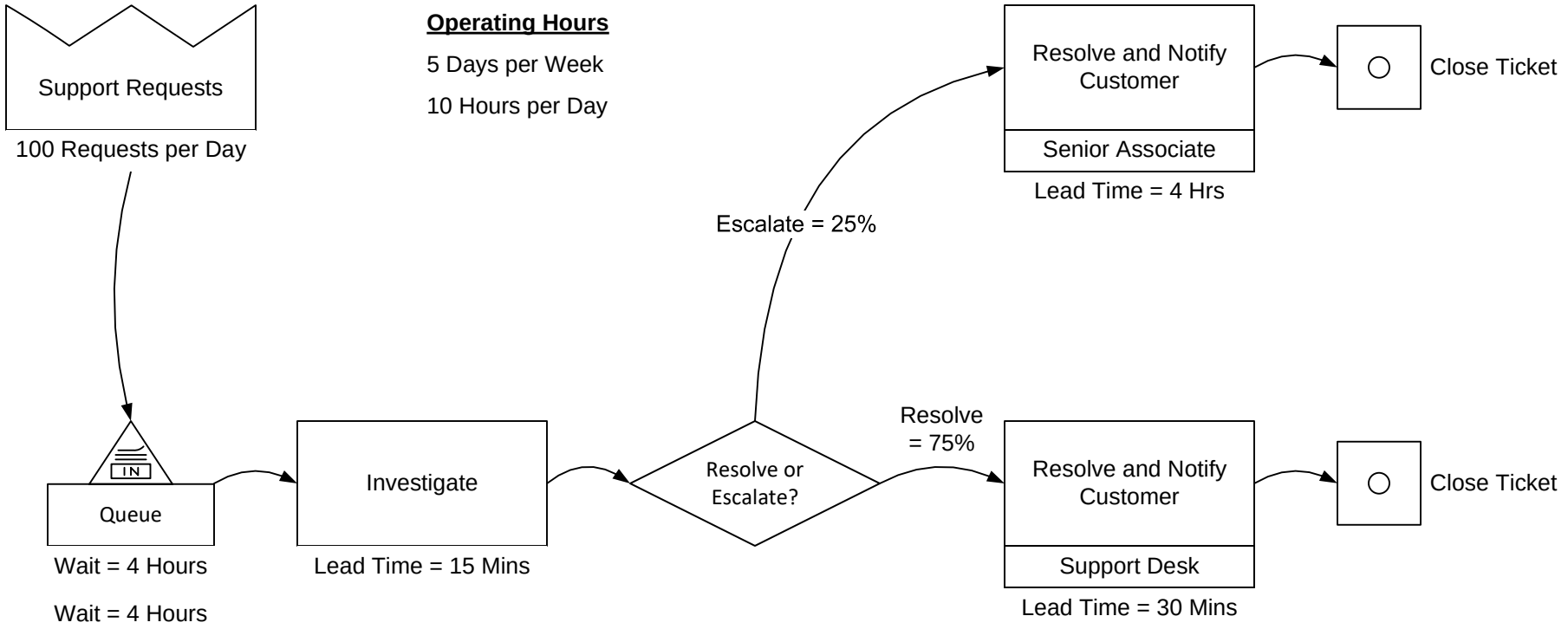


Units	Day	Wk	Year
	8	5	52
	Hr	Day	Wk



Example Map

This example represents a simplified support team process. In the exercise on the next page, you will need to draw this map from scratch.



Draw the map shown on the previous page

Image of the map can be viewed here above the page

You must use the Quick Mix Transaction VSM stencil.

All data values need to be in the appropriate data shapes.

Use sequence arrows to show the flow.

Solve the map and plot the Route Table.

Lesson Summary: Mix Transactional Supplementary Functions

You learned:

- How to make the VSM more engaging through simplification and with the use of visuals such as charts and gadgets
- How to work with the default built-in and the optional extra calculations
- How to summarize performance for any segment of the value stream
- How to input map data through Excel
- How to do estimate resource utilization

Recommended Next Steps:

1. Sketch your first value stream with the Sketch Mix Transactional stencil
2. Create your value stream model
3. Email any questions to support@evsm.com
4. Go through the eVSM Improvement Framework course - accessed from: https://www.evsm.com/my-skills

Useful Links

eVSM Toolbar Guide	evsm.com/toolbarguide
eVSM Productivity Guide	evsm.com/productivity
eVSM Blogs	evsm.com/blog
eVSM Support FAQ	evsm.com/support
Download the Latest Version	evsm.com/install