# **Mix Supply Network Mapping**

Learn mix model supply network concepts and how to use eVSM Mix to build mix model maps for analyzing lead-times, cost, demand mix changes, comparing alternative suppliers, etc.



# 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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# **Mix Supply Network Concepts**

The Mix Supply Network application provides logistics value stream mapping with calculation of demand, landed cost and lead times. It handles mapping of multiple products variants or those targeted for different regions.

The purpose of this lesson is to introduce you to supply network concepts and calculations.



NOTE: You must have eVSM v11.63 or later to run this course. If you have an older version, please contact support@evsm.com for information on how to upgrade or access manuals for older versions

# **Mix Supply Network Concepts**

# 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.

# eVSM Mix for Supply Network Design

Quick Mix Supply Network is a specialized supply network stencil designed to visualize and play "what-if" games to help improve the capacity, lead time, flexibility, and cost aspects of the network.

Benefits:

- Easily visualize, communicate, and discuss the supply network for a product family and geographic region.
- Input time/cost data for each leg of the network, and automatically generate lead time and cost charts.
- Do "what-if" studies with alternate routes for cost and time improvements or to reduce risk.
- Overlay maps onto geographic detail from any source and perhaps including mapping of adverse events like earthquakes or tornadoes.



# **Supply Network Example Map & Useful Features**



# **Upstream Demand Calculation**

In a supply network, the total customer demand rolls upstream through to the suppliers.

- The demand is equal to the demand at the downstream node unless there is a demand % (other than 100) for the path.
  In this case the demand is factored by that percentage
- In the example supplier A has the same demand as Plant XYZ
- Supplier B's demand is specified as 30% of the demand at plant XYZ



# **Upstream Demand Calculation**



# **Scrap and Demand**

Scrap at any point increases demand on the upstream nodes. So a 20% scrap changes a demand of 8 at the customer to a demand of 10 at the supplier:



Total Parts = Good Parts / (1-Scrap %)

# **Scrap and Demand**



# Q. How many parts must the supplier ship to meet the customer demand of 100 good parts per day?

0 100

**()** 200

**0** 90

**()** 400

0 50

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# **Lead Time**

Lead time is the sum of the Activity Times through a segment of the network. This includes conversion times, wait times in inventory, and transport times:



# Lead Time



# Capacity

The capacity of a facility is the maximum number of "good" products it can deliver in a given time period.

Capacity Utilization is the percentage of the maximum capacity that is currently in demand.



# **Activity Time and Inventory Qty**

If an item takes, say 2 weeks to pass through a location, and the demand is 150 items/week, the minimum inventory at the location must be 2\*150=300 items. So, the calculation for minimum inventory at a location is:

Minimum Inventory = Activity Time x Demand

Some nodes allow direct specification of inventory quantity. If the specified value is less then the calculated Minimum Inventory from the equation above, then the calculated value is used.

Look at the calculated "Inventory Count Used" at the bottom of the following examples via this logic.



# **Activity Time and Inventory**



# **Transport Inventory**

The calculation of the average inventory in transit is simply

Average Inventory = Transport Time \* Demand

This formula takes into account that when the transport vehicle is en route then its carrying enough inventory to sustain demand until the next time it is en route. Note that this average inventory calculation is INDEPENDENT of transport frequency

Transport Time = 2 Days Demand = 100 Items/Day

Average Inventory in Transit = Transport Time \* Demand

= 2 \* 100 = 200 Items

# **Transport Inventory**



 $\bigcirc$ 

## **Cost concepts in Mix Supply Network**



# **Unit Cost**

In general, when two items arrive from different locations in the supply network to a node, their unit costs (part cost per unit of finished goods) are added together to calculate the unit cost at the node. This is the right behavior when the items are components that are both needed to make the product. There are exceptions

1. Sometimes the incoming items are the same but from alternate supply points. In this case demand percent values are specified for the path from each supply point. This is illustrated in the "cumulative unit cost" values for the example below. Note, the cumulative unit cost at the plant is: [[1 \* 60] + [2 \* 40]]/100. Add 2K\$ to this for the plant activity and the total comes out to \$3.4K\$/Item.



2. When one finished good item needs multiple parts (e.g., 6 screws), use a Units Converter to show how many parts go into the final product. In the example below a finished goods "Item" requires 4 of "Part A". Note how the price of 1 \$/Part A equates to a unit cost of 4 \$/Item at the customer.



# **Unit Cost Exercise**



# **Total Cost per Day**



Q. Each Assy needs Qty 4 of Part A and Qty 3 of Part B. Ignoring any shipping costs, what is the daily cost of parts delivered to the customer?

() \$700 per Day

() \$1700 per Day

\$1400 per Day

() \$600 per Day



# **Holding Cost**

If inventory of value is stored at a location, it has an associated "holding cost rate" per annum associated with financing its value and also related costs due to space, damage, theft etc.

Annual Holding Cost = Value of Inventory X Annual Holding Cost Rate

#### Example

Assume holding cost rate is 10%/year. In the below example, calculate the annual holding cost of inventory, excluding any inventory at the customer. Remember from exercise 5 that Activity Time is used to calculate minimum inventory.



# **Externally Managed Inventory (EOI)**

EOI means inventory financially owned by suppliers. This means that the supplier bears any related holding costs (finance, damage, theft..) for the inventory at that point

#### Example

The Customer is considering sourcing a part from two alternate suppliers, and requires 1 year worth of inventory to be maintained onsite.

Supplier 1 is willing to own all the inventory at the customer site until it is used, and has a delivered cost of \$12/item.

Supplier 2 requires the inventory to be purchased and owned by the customer at a cost of \$10/item.

The inventory annual holding cost rate is 10%/year. This means that if a location is storing \$1000 of inventory value, it has an associated annual holding cost of \$1000 \* 0.1 = \$100/year



# Q. From a cost perspective, and with a annual holding cost rate of 10%, which would be the better solution, financially for the customer?

O Supplier 1



O Supplier 2

O Both the same

# **Risk in Supply Network and the Value at Risk calculation(VaR)**

There can be risk associated with nodes on the network and a simple way to quantify each risk is with "Value at Risk". Lets illustrate with a simple example

Suppose

- 1. There is risk associated with a natural disaster
- 2. If the disaster occurs there is a one time loss of \$2 million
- 3. The probability of the disaster occurring is 10%

Then the "Value at Risk" is calculated As \$2 million \* 10 percent = \$200,000

# Value at Risk (VaR)



Risk: Strike-based plant shutdown for a month

#### Q. What is the VaR (Value at Risk)?

() \$2 million

() \$20 million

() \$0.2 million

() \$0.8 million

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# **Risk Impact Number (RIN)**

Its useful to have a single number so risks can be ranked in an approximate way.

```
RIN (Risk Impact Number) = [Risk Probability] x [Risk Severity] x [Risk Detectability]
```

Each factor is on a scale of 1 to 10, where 10 represents highest probability, highest severity, or lowest detectability

#### Example

Suppose:

- 1. The risk probability is 2
- 2. The risk severity is 7
- 3. The risk detectability is 6

Then the Risk Impact Number =  $2 \times 7 \times 6 = 84$ 

# **Risk Impact Number (RIN)**



# **Risk Mitigation**

A mitigating action if implemented can limit the risk and lower its probability of occurring but at a mitigating cost

Suppose:

- The original risk event has a cost of \$2 million (if it happens) and a probability of occurrence of 10%
- There is a mitigating action that would reduce the probability of occurrence to 5% but would cost \$50K to implement. The event if it still occurred despite mitigation would still cost \$2 million

•

Then the original "Value of Risk" = \$2million \* 10% = \$200,000

The mitigated "Value of Risk" = \$2million \* 5% = \$100,000

Then the 'mitigated' reduction in "Value of Risk" would be calculated as \$200K-\$100K = \$100K

This number would be considered in addition to the mitigation cost of \$50K to help decide if mitigation action should be taken

# **Risk Mitigation**



**Risk:** 10% probability of water shortage based plant shutdown in dry season (Impact of shortage is \$2 million if it happens)

**Mitigation Strategy:** Reduce risk of water shortage through on-site holding tank

Cost of implementing holding tank: \$30K

Mitigation Result: Risk Probability reduced to 5% (risk was originally 10%)

Q. What is the remaining "Value of Risk" after mitigation action is implemented ?

() \$30K

() \$100K

() \$130K

() \$70K

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# **POE – Perfect Order Execution**

A perfect order from a supplier is one that contains the right quantity being delivered of the right quality at the right time

POE = [Right Quantity] x [Right Quality] x [Right Time]



# **Dual Suppliers**



Q. What is the average unit cost of Part A delivered to the customer when demand is sourced from dual suppliers in the percentages shown?



# **Alternate Transport**



9 Day

Time

# **Time and Inventory Quantity Variations**

Many of the problems in value streams come down to variation in key parameters. Understanding the variation can help identify what improvements might be possible.

Mix Supply Network has input variables like Activity Time, Transport Time and Inventory Qty. These are used for lead time calculations and charting

The application also allows input of variations in the above values so that they are visible on the map. Variants that can be input and displayed are

**Standard Deviation** 

**Target Time** 

**Expedited Time** 

Target time and Expedited Time have associated summation calculation across the map such that the sums can be compared to the sum of the current map times. This is illustrated in the example below


## Lesson 1 Summary

#### You learned:

- Supply network terminology such as activity time, inventory, scrap, activity cost, holding cost, and risk
- How demand flows upstream from the customer
- Cost calculations such as unit cost, value of inventory, and holding cost



#### What's next:

Next, you will learn how to declare the products for your value stream, and how to organize them into route sets.

## **Declare Products and Route Sets**

In the previous lesson of this course, you reviewed the key concepts of mix model supply network design.

In this lesson, you will learn how to specify the products for the value stream in Excel and how to organize them into Set groups of similar routes.



# **Declare Products and Route Sets**

## Start eVSM and Open the eVSM Mix Stencils

#### **Opening the Mix Supply Network Stencils**



#### **Quick Mix Toolbar Functions**



Note: eVSM Mix and eVSM Standard are two different editions of eVSM. eVSM Standard is a sub-set of eVSM Mix. The Mix functionality is only in the eVSM Mix edition.

The free 30-Day eVSM trial includes eVSM Mix.

# First some Essential Terminology...



#### Q. What does a "Routing Set" in eVSM Mix contain?

- O All products which have same cycle times
- O All products which go through exactly the same nodes
- O All products which are pulled by the customer through similar steps downstream but could vary in steps upstream
- For online () All products which get packaged together for customer shipment

## **Define Products and Routing Sets**

The Mix Manager dialog shows the current products and which routing set each belongs to. Products can belong to the same routing set only if they go through exactly the same nodes. New products and sets can be added, and existing ones edited.

Products and sets can be declared interactively in this dialog or, on a **first time only** basis, you can import them from Excel via the buttons at the bottom of the dialog. After import, any editing should be done manually in the dialog box. The Excel file is for one time use only.



## What are the multiple functions of the Mix Manager dialog?

## Multi-Select ALL that are true.

- □ It shows all the products for the current page
- □ It allows adding/removing Products from Sets
- □ It allows input of demand by product
- □ It allows importing of Products and Sets from Excel

ALL that are true.	Mix Manager - Define Products and Sets	×
	Products: Can Must Is ID Name Set Merge? Merged? Description	
	1 Product 1 S1 Y N N   6 Product 6 S1 Y N N	Add
he products for the current page	3 Product 3 S2 Y N N 4 Product 4 S2 Y N N 5 Product 5 S2 Y N N	Edit
	2 Product 2 S3 Y N N	Remove
ling/removing Products from Sets		Auto Merge
ut of demand by product	Move to top Move Up Move Down Move to bot.	
	Sets: ID Name Description Tag	
orting of Products and Sets from Excel	S1 Set 1   S2 Set 2   C2 Set 2	Add
	53 SEL 3	Edit
		Remove
	Create Template Import Cancel	ок

## **Product Matrix**

From the Mix Manager dialog you can generate a product matrix template (in Excel format) which provides a quick initial way to enter a large number of products and group them into sets with common routing. Instructions for using the template are below and also included in the first worksheet of the Excel file. Note that the template is for first time use only. After that editing should be done directly in the Mix manager dialog

When the matrix is imported into Visio via the button in the Mix Manager dialog, the software will define the products and sets and additionally draw the process steps (or nodes) below the drawing page and the routing sets to the right of the page



### What are the multiple uses of the eVSM Product Matrix?

## Multi-Select ALL of the following that are true.

- □ Provides an easy way to input products for the value stream
- □ Allows input of product cycle times in Excel
- For online course only Groups products together which follow exactly the same route
- □ Automatically draws processes on the map on Import

## **Steps to create the Product Matrix**



#### **Reference Notes – Steps Demonstrated in the Video**

- 1 Select the map type with Open Select the "Supply Network" category and then the "Mix Supply Network" application
- 2 Initiate the map by dropping the "Mix SN Data" shape from the Quick Mix Supply Network stencil on the page.
- 3 Open the Mix Manager form. Then click "Create Template" to open the product matrix template for Mix Supply Network in Excel.
- 4 Fill out the Excel template (for help, see the "Instructions" worksheet in Excel).
- 5 Sort products into Route Sets and name the Sets.



#### Complete all 5 steps on this page and then click Grade It!

**6** 

Return to Visio, exit the Mix Manager form, and submit the exercise with Grade It!

## Lesson 2 Summary

- You learned: How to declare products for the value stream
  - How to represent process centers in the product matrix
  - How to sort the products into route Sets and name the Sets

#### Summary:



#### What's next:

You will learn how to import the product matrix on to your drawing page, arrange the flow, and establish the routes.

## **Draw the Flow and Establish Routes**

In the previous lesson of this course, you learnt how to specify the products for the value stream in Excel and how to organize them into Set groups of similar routes.

In this lesson, you will learn to import the product matrix into Visio, draw the flow, and establish the routes.



# **Draw the Flow and Establish Routes**

# Icon Color Codes in Quick Mix Supply Network

You will draw primarily with icons from the Quick Mix Supply Network stencil on the left of the page. Icon color codes explained below



## **Steps to Draw the Flow and Establish Routes**



#### **Reference notes – Steps demonstrated in the video**

- 1. Create the products, routing sets and centers (nodes) on the map
- 2. Arrange centers on the page. Note that the product matrix is only to be used once. After that you can edit products and sets via the Mix Manager dialog and edit centers with drag & drop from the Quick Mix Supply Network stencil
- 3. Indicate all material flow with Sequence arrows.
- 4. Click Display Gates to make the routing gates visible. By default all gates will be open (square).
- 5. Change the gate status with the "Set Gate Open" command in the right-mouse menu of the color shape indicators (square = open gate, circle = closed gate).
- 6. Click Display Gates to refresh the Set gates view.

# Drop and arrange the centers as shown in the blue image

	Find the icons shown in the blue image in the <b>Quick Mix Supply</b> <b>Network</b> stencil and drop them on this drawing page	Supplier 1 Train   Activity Time 0 Day Transit Time 0 Day		
			Warehouse P	lant
		Supplier 2 Supplier 2 Tanker	Input General Inv 0 Item Activity Time 0 D	ay
course		Activity Time 0 Day Transit Time 0 Day		
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## Specifying material flow sequence on the map

The need to specify material flow sequence using eVSM's Sequence arrows is mandatory. Sequence arrows are used to:

- 1. Calculate demand at any point working back from customer demand
- 2. Establish unique product routings
- 3. Label activities from upstream to downstream (useful for charting)

## How do you specify material flow sequence ?

Let's say material is moving from supplier, to plant, to warehouse, to customer as seen in diagram below. Some raw materials from the supplier may be transported via truck and the rest via train. Also, some finished goods are stored in the warehouse while the rest shipped directly to the customer. The green sequence arrows are used to indicate all the material flow paths. Note that arrows are directional



#### How do you create the sequence arrows ?

Shift-select two or more centers in the correct sequence (holding down the shift key). Then click the "Sequence" button in the eVSM toolb<del>ar</del>





#### Add Sequence arrows to show all three routes



# Using Set gates to establish Set routes

Sequence arrows each have associated gates for each set that determines if the set route moves down that arrow. The gates can either be open or closed for a set and provide a simple visual way to establish set routes

- 1. Make sure sequence arrows are created to support each of the routes.
- 2. Use the "Display Gates" button in the eVSM toolbar. It will show the sets as square colored boxes on the arrows and activities.
- 3. Right-click the square indicators and deselect the "Set Gate Open' on any arrows that the set does not travel through. The square will turn to a circle. Right-click the circle and reverse the setting to correct any mistakes.
- 4. Use the "Show Set Colors' button to verify and present set routes to your audience. Use "Display Gates" to check where the gates are closed and to make any adjustments.



Mix section of eVSM Toolbar



#### Adjust the Set gates in the map below to match the blue thumbnail image.

The gate is open when it is a square shape at the center of the green arrow. Close it with a right click on the square shape and deselecting "Set Gate Open". It will become circular when closed

In the exercise note that the set colors may be in a different order when compared to the sketch

START by working on the DOWNSTREAM arrow gates first and use the "Display Gates" to update after a few changes



#### Adjust the Set Gates to meet the following requirement

S1 requires surface treatment, S2 does not.



## Lesson 3 Summary

#### You learned:

- How to import products, route sets, and centers from an Excel template
- · How to represent material flow with Sequence arrows
- How to establish routes on the map with Set Gates

#### Summary:



#### What's next:

You will see how to enter demand and operational data on the map, and how to set up the map for automatic calculations.

## Enter Data, Check, and Solve

In the previous lessons you learnt how to create products and sets, draw the flow, and define the routes for each set.

In this lesson, you will learn to enter data, check the map, and then solve to calculate and visualize some useful metrics



# Enter Data, Check, and Solve

# Working with Data on a Map

- Map data is stored in special data shapes. These data shapes 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 click on the value field.
- The Views form (accessed with the views button) provides controls to hide/show data shapes associated with each center.
- All data shapes, including hidden ones, can also be accessed through the 📃 List Variables button. First select the center and then use the button to access its variables
- eVSM comes with a long list of variable names and units with built-in equations. Pre-built names should not be modified or deleted. New names and units can be added through "Name and Unit Manager" form which is accessed with the YNM button.





# Using "Views" to control visibility of data shapes

The Mix Supply Network 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.



#### **Hide/Show Data shapes**

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



## Data shape access in Mix Supply Network

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

## **List Variables Form**



#### Enter the Activity Time and the Activity Unit Cost at the ABC Plant

Use the **List Variables** form to enter the Activity Time and the Activity Unit Cost at the ABC Plant as shown in the callouts.



## **Entering Variable Values for Products**

Where eVSM only allows a **single value** for a product, you will see this variable shape. The center value can be changed by double clicking here in the center value field:



x.xx

Sec

Where the value is allowed to be **product specific**, you will see a rounded "products tab" on the right side of the variable shape. If the value is a constant just type it in the center field. Otherwise double-click the "products tab":



Cycle Time

## **Entering in Customer Demand values and demand propagation**

The Customer Demand variable at the customer center allows input of demand for each product. These demands flow upstream and can be affected by losses such as scrap along the way.

If demand has to split into multiple paths as it flows upstream, a "Path Demand %" variable is available on all the sequence arrows to control the percentage flowing up each path.



## Steps to Add Data, Check, and Solve



#### Watch the Movie

Click the Video button in the eLeanor panel to start the video https://evsm.com/VidMixData

#### **Reference Notes – Steps Demonstrated in the Video**

- 1. Enter data values.
- 4. Run HCheck and resolve any problems reported.
- 5. Run  $\bigotimes$  solve to apply the built-in equations

# Example Map 1

In the next exercise, you will draw the map below from scratch.

Se	t ID	Set Name	Product ID	Pr	oduct Name	Castings	Inventory	Springs	Plant	Customer
	Aut	o Name			Sort Products	Supplier	Inventory Qty	Supplier	Plant	Customer
			1	P1	L	Х	х	Х	Х	Х
			2	P2	2	Х	х		Х	Х
			3	P3	3	Х	Х	Х	Х	Х



#### Draw the map shown on the previous page below including sequence arrows, routes, and data values.

Here are the steps to go through (note the image showing the map is available just above this pages top border)

- 1. Initialize the page by opening the Mix Supply Network application and dropping the "Mix SN data" shape on this page
- 2. Use the Mix manager to create an Excel template, fill in the product matrix and import the data
- 3. Drag the VSM icons (page bottom) and set icons (page right) onto the page and create sequence arrows for the flow and connecting the customer to the sets
- 4. Use "Display Gates" and adjust routes as needed by right-clicking the arrow set colors. Use "Show Set Colors" to confirm
- 5. Enter in the data values

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## **Example Map 2**

In the next exercise, you will draw the same map (below) simply using drag & drop from the stencil and without the product matrix. This is typically how you will edit maps no matter how you create them to begin with



#### Draw the map shown on the previous page below without using the product matrix

Here are the steps to go through (note the image showing the map is available just above this pages top border)

1. Initialize the page by opening the Mix Supply Network application and dropping the "Mix SN data" shape on this page.

2. Use the Mix manager dialog and its buttons to create products P1,P2,P3 and Sets S1 and S2. Put products P1 and P3 into S1 and products P2 into S2.

3. Once you exit the dialog use the "Draw Sets" button in the toolbar. This will draw the sets to the right of the page and you should drag them onto the page.

4. Drag the VSM icons from the Mix supply network stencil and then connect them with sequence arrows by picking the start and end icons and then the "sequence arrow" button in the toolbar. Also connect the customer icon to the sets with the same method.

5. Use "Display Gates" and adjust routes as needed by right-clicking the set color squares on the arrows . Use "Show Set Colors" to st c course continne continne continne confirm.

6. Enter in the data values.
# Checking and solving 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.

## The "Check" button 🕂 Check

Examples of problems the Check function will identify are:

- Unconnected Sequence arrow
- Missing mandatory data
- Missing units convertors
- Unglued data shapes
- Duplicate Operation tags

The problems will be reported in a form like this. You can select the error in the form and use the Highlight buttons in the form to highlight and zoom into the problem area on the map.

The problems will be reported incrementally. So, fix the problems reported and then run the Check function again. Repeat until you see a message like this:

# The "Solve" button K Solve

eVSM Model Check Warnings	×
Double-Click on any item to zoom in to associated area of the	Highlight Selected
Variable data must be numeric Variable data must be numeric	Highlight All
	Clear Warning Shapes
	Export to Excel
Selected Warning (double click for full warning text) Select a warning to show its full text here	
	ОК



eVSM has pre-built equations that do the lean calculations for capacity, lead time, etc.

Once you have checked the map, use the Solve button to apply the equations. Values on the map that are a result of the equations are shown in blue.

### Run the check function, Resolve any problems and then Solve the map

For the missing activity time use 10 days



## Lesson 4 Summary

- You learned: How to enter product specific demand and operational data on the map
  - How to check the map for completeness
  - How to Solve the model and see the calculation results

#### Summary:



#### What's next:

Once you create the map and solve it, you can use standard charts for utilization, capacity, lead time, etc. to see the waste in the value stream and come up with improvement ideas

## **Additional Topics**

You have completed the primary training for eVSM Mix Supply Network. This lesson covered some optional topics which allow you to further improve productivity with your maps.



# eVSM Mix Supply Network Additional Topics

# **Data Input through Excel**

Mix model value streams need require significantly more data. Data input can get tedious, time consuming, and error prone. To address this, eVSM facilitates data input through Excel.



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.



#### Watch the Movie

Click the Video button in the eLeanor panel to start the video

			The colum	ins have							
			pre-set fi	Iters to							
			quickly h	ome in							
		А	E	С	D	E		F	G		
Only input values are	1	Tag 💌	ID 🗸	Туре 👻	Produ 👻	Variable	<b>T</b> ,	Value 🔻	Unit	-	
output to Excel. No	2	A0170	Machine	Activity Center	Default	Cycle Time		x.xx	Min		
calculated values	3	A0170	Machine	Activity Center	P1	Cycle Time			Min		No fields allocated to
	4	A0170	Machine	Activity Center	Default	Qty Per Cycle		1	ltem		products which do not
	5	A0170	Machine	Activity Center	P1	Qty Per Cycle			ltem	~	do through an activity
	17	A0180	Drill	Activity Center	Default	Cycle Time		x.xx	Min		ge mough an acavity
	18	A0180	Drill	Activity Center	P1	Cycle Time			Min		
	19	A0180	Drill	Activity Center	Default	Qty Per Cycle		12	2 Item		
	20	A0180	Drill	Activity Center	P1	Qty Per Cycle			ltem		
	32	A0190	Assemble	Activity Center	Default	Cycle Time		x.xx	Sec		
	33	A0190	Assemble	Activity Center	P1	Cycle Time			Sec		
	34	A0190	Assemble	Activity Center	P3	Cycle Time			Sec		
	35	A0190	Assemble	Activity Center	P2	Cycle Time			Sec		
	36	A0190	Assemble	Activity Center	Default	Qty Per Cycle		1	ltem		
	37	A0190	Assemble	Activity Center	P1	Qty Per Cycle			ltem		
	38	A0190	Assemble	Activity Cer /	P3	Qty Per Cycle			ltem		
	39	A0190	Assemble	Activity (er	P2	Qty Per Cycle			ltem		
			See how	<sup>,</sup> P1, P2, P3 ar	e						
			included	for Assemble							

while only P1 for Drill

#### Enter the product specific data using Create XL and Import XL

Use the Create XL button to export all data items to Excel. Use the column filters and enter the data values in Excel for **Activity Unit Cost** as shown in the image on the bottom right of the page. Then use the Import XL button in eVSM to populate onto the map.



## Merging products to reduce solve times

eVSM does multiple solves in support of analytics for mixed model value streams. The solve can take a lot of time and the solve time can be approximated as proportional to

Number of Activities On Map \* (Number of Routing Sets + Number of Products)

One of our maps with 50 products, 4 sets and 10 activities takes 30 mins to solve on our test laptop. If we are able to reduce the number of products from 50 to 10 we find the solve time is about 5 minutes. Hence the idea for merging products. If we can solve the map faster, it becomes more useful to us.

## What is a merged group of products?

Lets say that the value stream is making 10 products and that the top 2 products comprise 80% of the volume. We could consider merging the other 8 products into a effective single product so the map effectively has the top 2 products and a "merged" product. We would expect a 3X reduction in solve times.

#### How do we merge products?

We enter in demand and operational values for the Individual products. Via the "Mix Manager" button in the toolbar, we now have an "Auto Merge" function that allows us to specify a cumulative demand % below which products are merged. The software takes product operational values and combines them for merged products using weighted average logic based on customer demand values for each product.

The user can return to the Mix manager and change the cumulative demand % value at any time ahead of the next solve

## Will the software merge products with different routings?

No, the software will create a merged product as needed for products with common routings but will NOT merge products across routings. So for each routing set we may have zero or 1 merged product. The merged product name is always the routing set name\_merge. So for example "Set1\_Merge"

# Merging products step by step

- Define products, sets and routes
- 2 Enter demand and operational values for products
- Benter the "Mix Manager" via the eVSM toolbar
- Click on the "Auto Merge" button
- 5 Select a cumulative demand % below which products are merged and click the "try" button to see merge statistics
- 6 Selecting "OK" on the form will merge the products. You can edit the form again later.
  - In the Set keys to the right of the routing sets on the map, merged products will be indicated in Italics

	🗇 Draw Sets
4	Show Set Colors 👻
Mix Manager	😡 Display Gates 🔻
	Mix

N	lix Mana	ager - Define Pr	oducts and	Sets				$\times$
	Products ID	s: Name	Set	Can Merge?	Must Merge?	Is Merged?		
	1	P1	S1	Y	N	Y		Add
	10	P10	S1	Y	N	Y		
	11	P11	S2	Y	N	Y		- 44
	12	P12	S2	Y	N	Y		Edit
	13	P13	S2	Y	N	Y		
	14	P14	S2	Y	N	Y		Remove
	15	P15	S2	Y	N	Y		
	16	P16	S2	Y	N	Y	Δ	Auto Merge
	17	P17	S2	Y	N	Y		Auto Merge
	18	P18	S2	Y	N	Y	•	

 $\times$ 

#### Merge Products

1	All Products	:	Can	Must	Is		Cumulative	
1	ID	Name	Merge?	Merge?	Merged?	Demand %	Demand %	% of demand to merge
	41	P41	Y	N	N	12.5	100.0	
	35	P35	Y	N	N	12.4	87.5	25 Try
	34	P34	Y	N	N	11.3	75.0	5
	42	P42	Y	N	N	11.3	63.7	Total # of products
	20	P20	Y	N	N	11.3	52.4	50
	8	P8	Y	N	N	11.3	41.1	50
	7	P7	Y	N	N	11.3	29.8	
								# of products after merge
	40	P40	Y	N	Y	1.2	18.5	7
	20	D20	v	N	v	1 2	17.3	

#### Merge the low demand products to reduce Solve time

Open the Mix Manager and click on the Auto Merge button. Set the merge percentage to 20% and merge. Solve the map.



## Lesson 5 Summary

- You learned: How to enter data through Excel
  - How to simplify the mix model and improve solve times by merging low demand products

#### Summary:



#### What's next:

Capture your first value stream in eVSM and request a free review with an eVSM expert via support@evsm.com

#### -Useful Links-

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