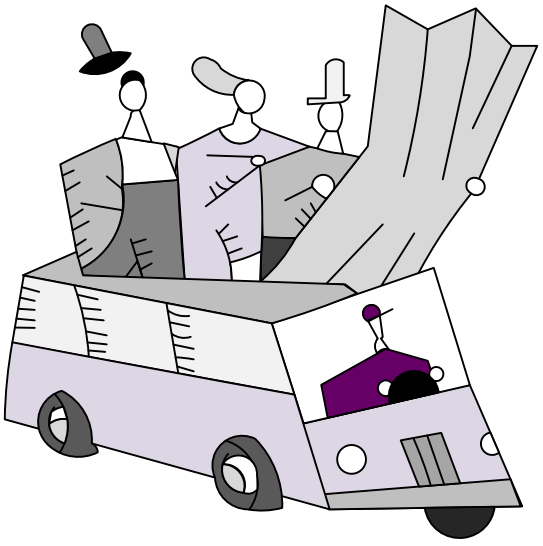
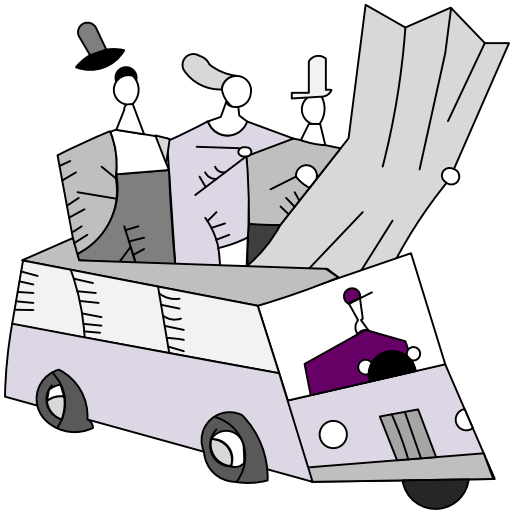
eVSM Value Stream Mapping Workshop for Processing Industries



eVSM Contact:

Jay Shah – jayesh.shah@evsm.com

Part I: eVSM Overview



What is Lean?

Lean is a set of concepts, principles, and tools used to create and deliver the ***most value*** from the ***customer's perspective*** while consuming the ***fewest resources.***

...Lean Enterprise Institute

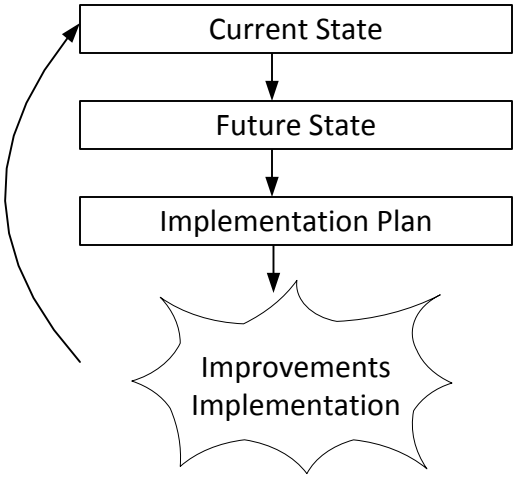
Lean Principles

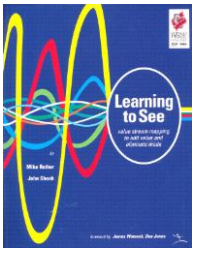
- Value is defined from the Customer's perspective
- Map the Value Stream
- Create flow & eliminate waste
- Create pull where flow is difficult
- Seek perfection

Lean Means...

- Lower cost
- Less inventory
- Less space
- Shorter lead-time
- Fewer people

The Lean Process





...Learning to See, LEI

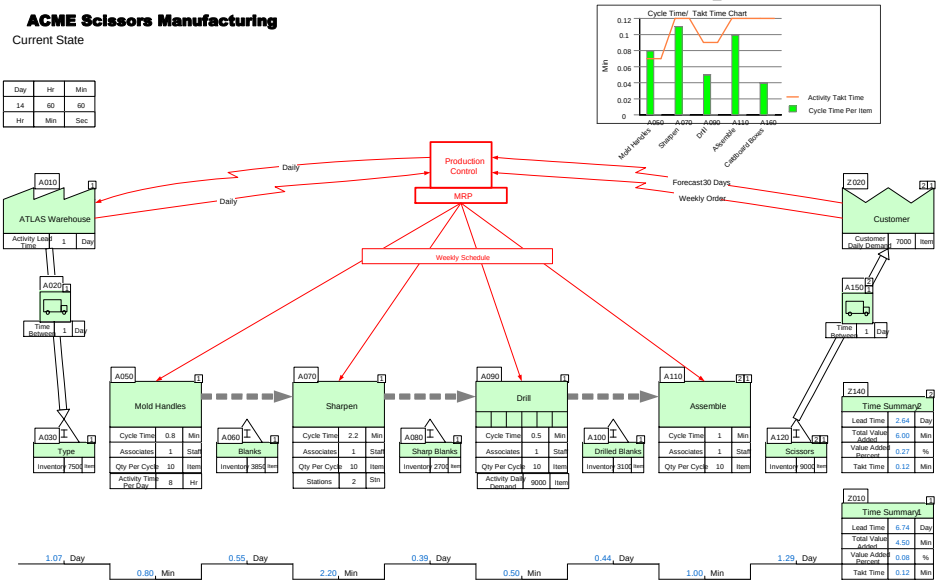
What is a Value Stream?

All steps, both Value Added and Non Value Added, required to complete a product or service from beginning to end

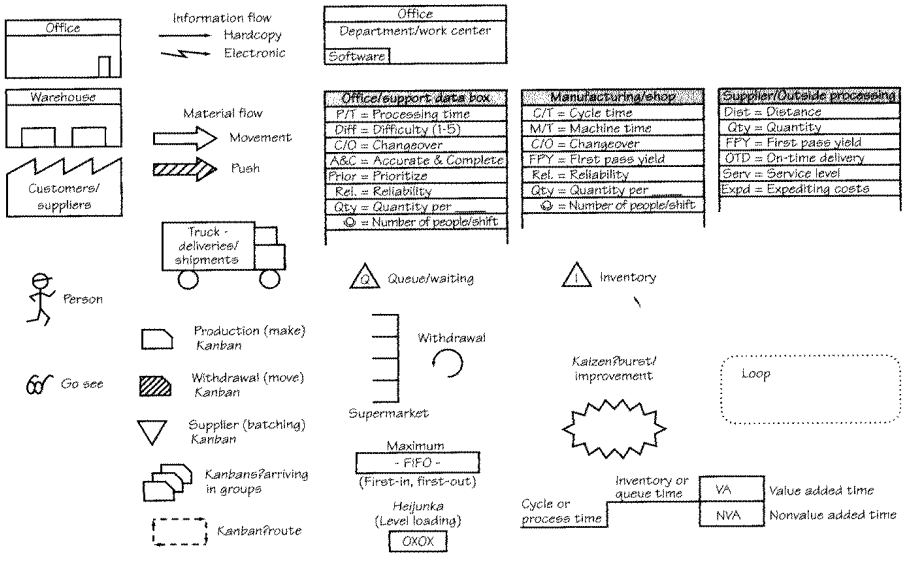
What is a Value Stream Map?

A simple tool that visually represents what's going on in a value stream

What is a Value Stream Map?



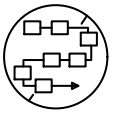
VSM – Learning to See



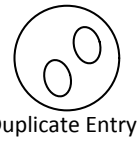
Types of Waste

Transportation

Excess Inventory



Over Processing

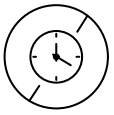


Duplicate Entry

Over Production

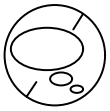
Excess Motion

Confusion



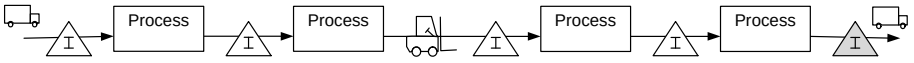
Waiting

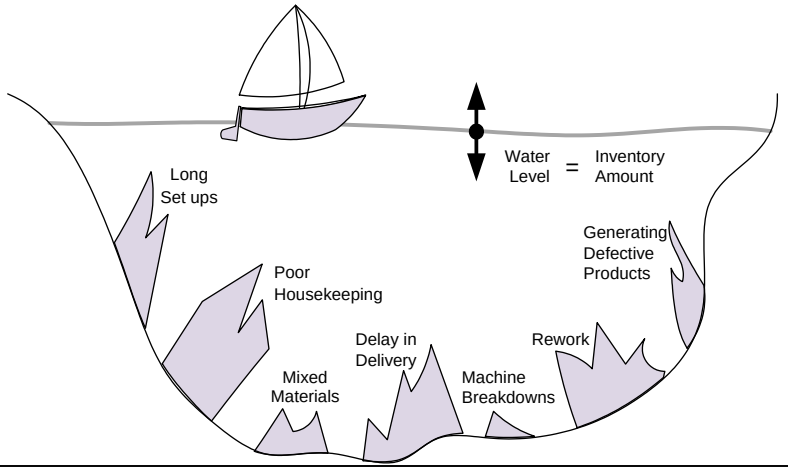
Defects



Knowledge

Hiding the Waste



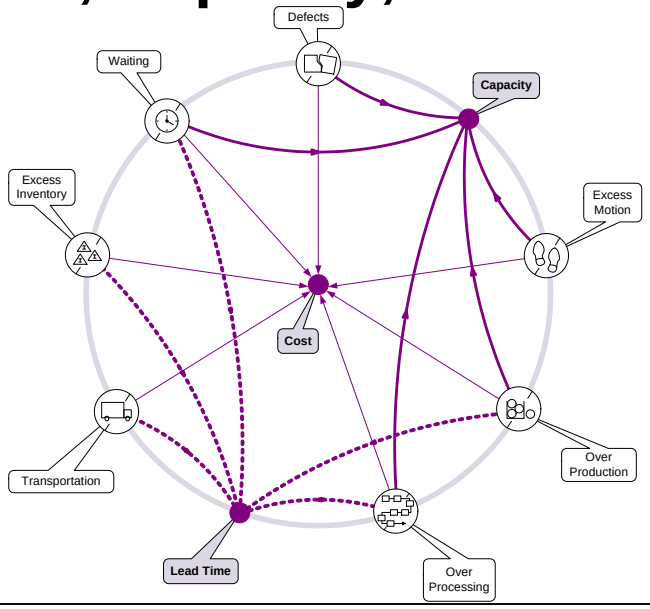


What is a LEAN Value Stream?

- Define value from the customer's perspective
- **Map the value stream**
- Create flow and eliminate waste
- Create pull where flow is difficult
- Seek perfection

- Minimize the LEAD TIME
- Adequate & Efficient CAPACITY
- Minimum COST for QUALITY

Lead Time, Capacity, Cost



What is eVSM?

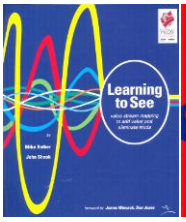
- Software Tool:

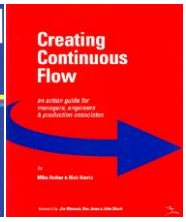
  -VSM, A3 Reports, Spaghetti Reports, Communication Circles

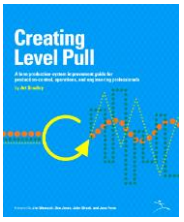
  -Analyze VSM Data

  -Manage Lean Transformation
- Built on Visio and Excel
- Based on Publications from Lean Enterprise Institute

Lean Workbooks

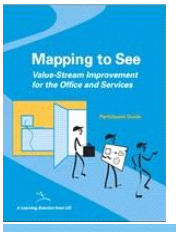




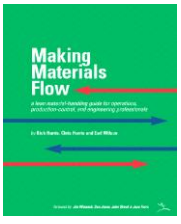


Process Level

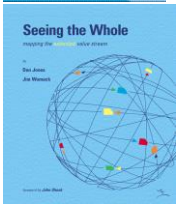
Plant Level

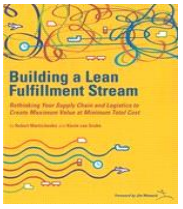


Office Services



Materials





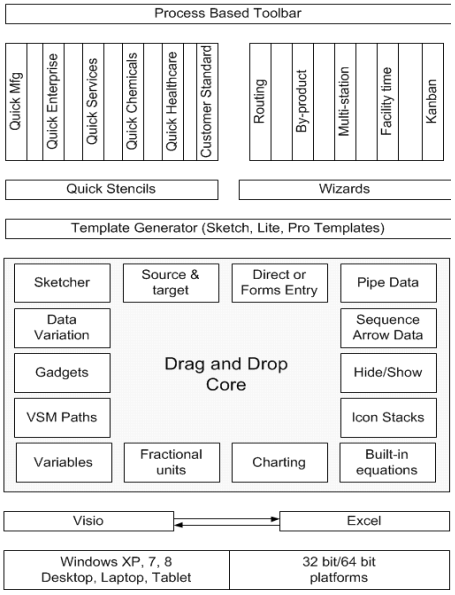
Multiple Plants Across Companies

eVSM v7 Platform

Tablet

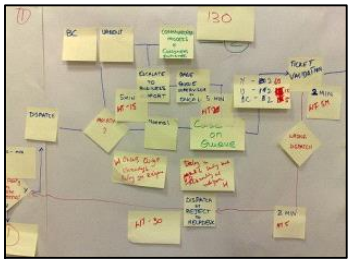
Laptop

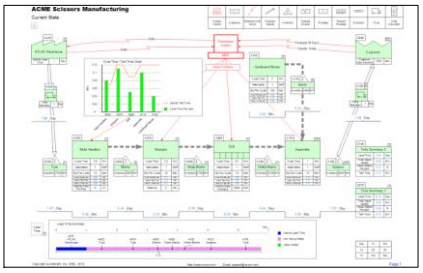
Large Wall-Mounted Touchscreen



Wall Maps/Digital Pictures/eVSM

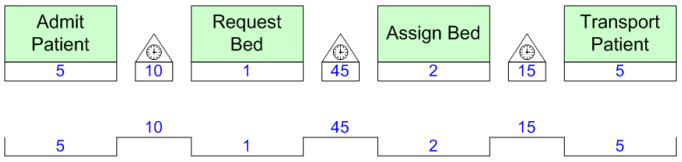
Value Stream Mapping is a Paper & Pencil tool

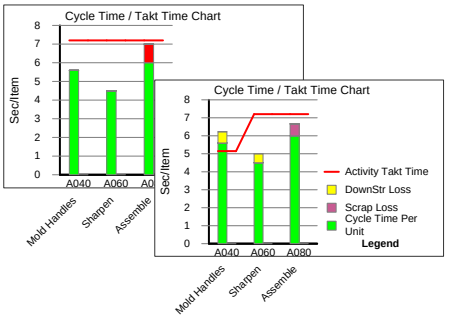




What is a Quick Stencil?

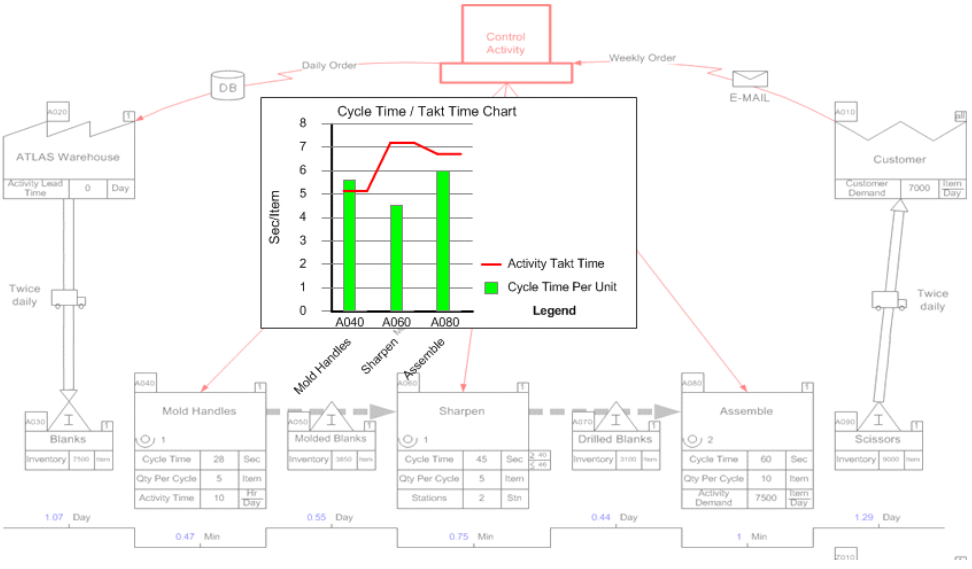
- Very fast way to map
- Drag, Drop & Enter Values
- Automated Calculation & Charts



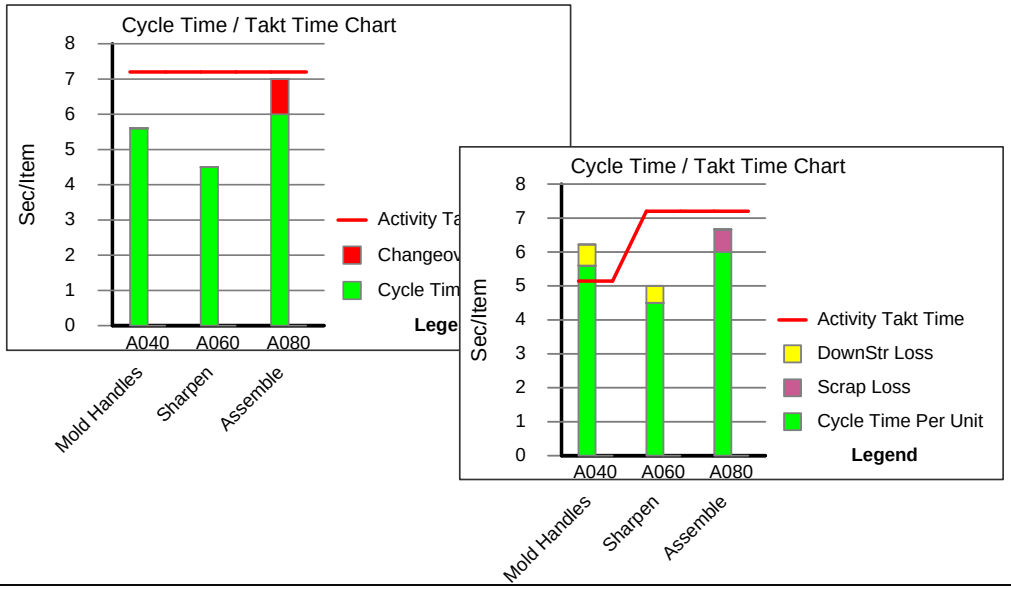


Total Time=VA + NVA
=(5+1+2+5) + (10+45+15)
=13+70
=83 Min's

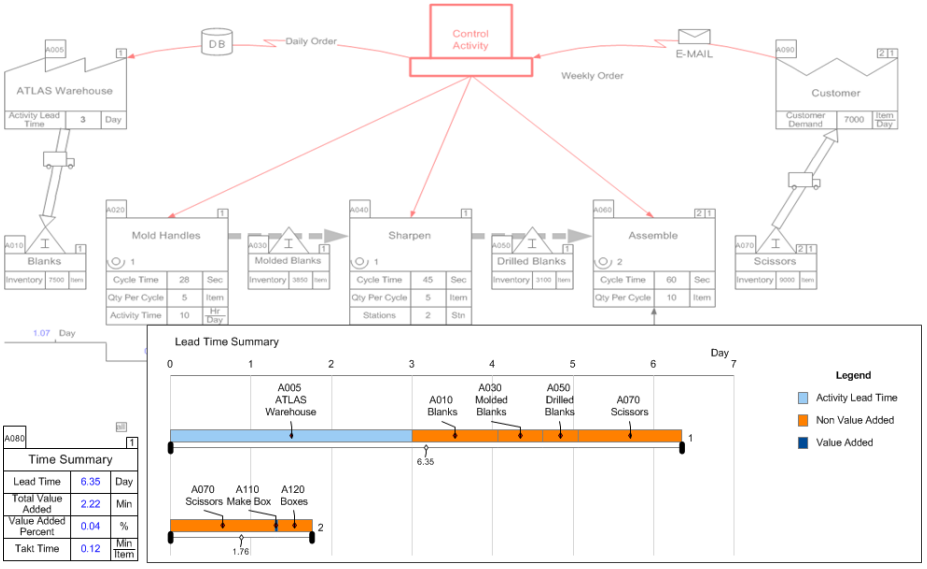
Visualizing Capacity



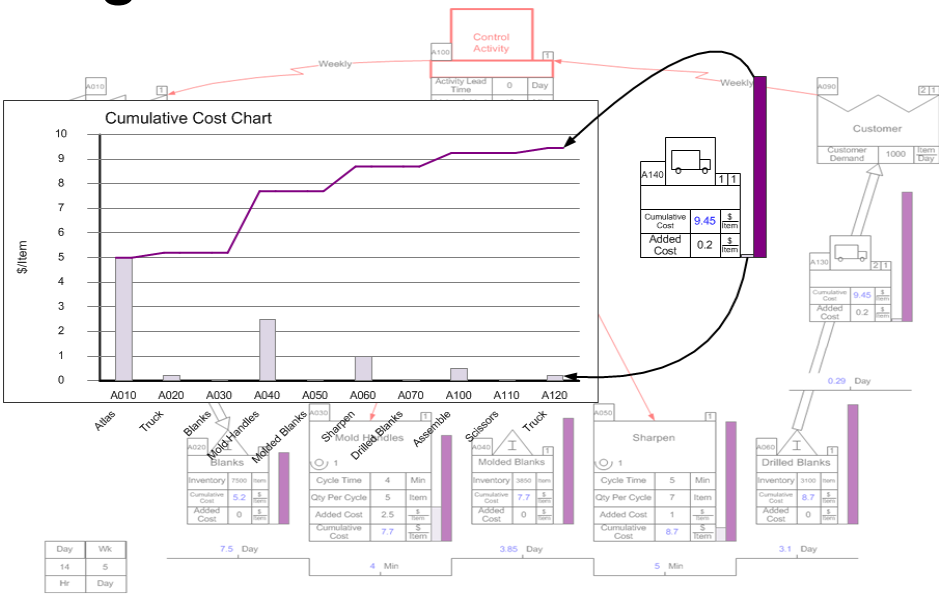
Capacity Losses



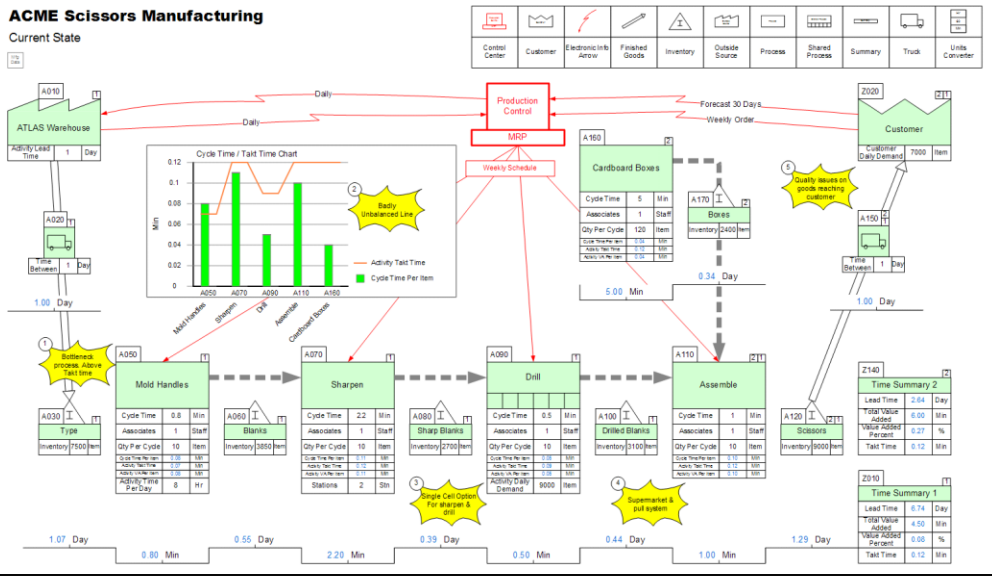
Visualizing Lead Time



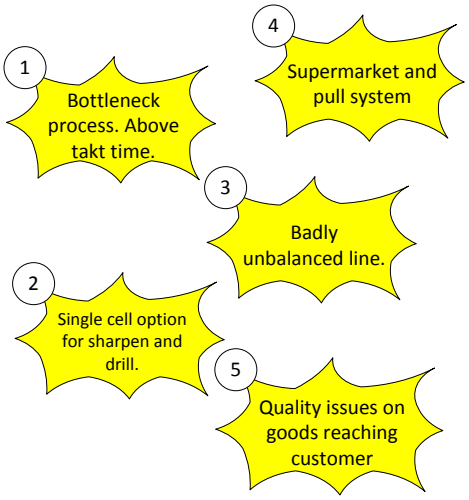
Visualizing Cost

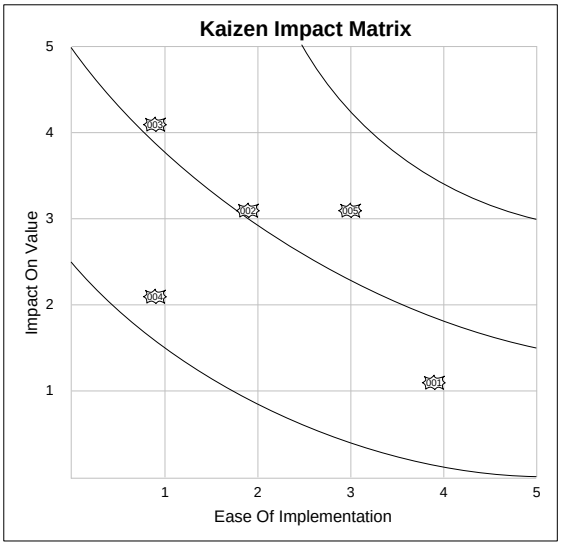


Kaizen – Ideas in Context

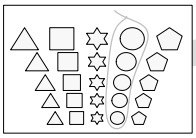


Kaizen Impact Matrix



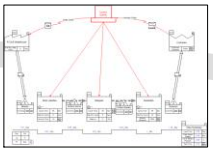


Improvement Cycle

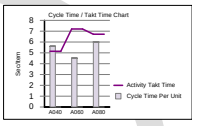


Select Product Family

Wall Sketch

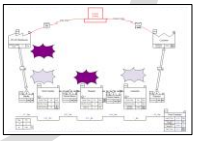


Capture Map

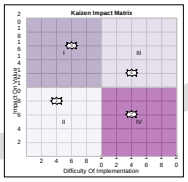


Analyze and Visualize

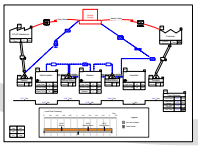
Sustain improvements
Future State becomes Current State
Improvement cycle continues



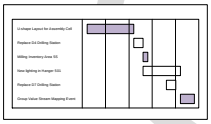
Brainstorm Improvements



Prioritize Improvements



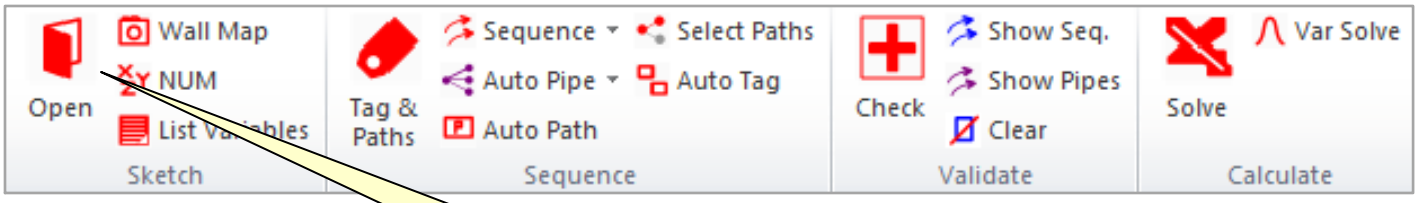
Create Future State



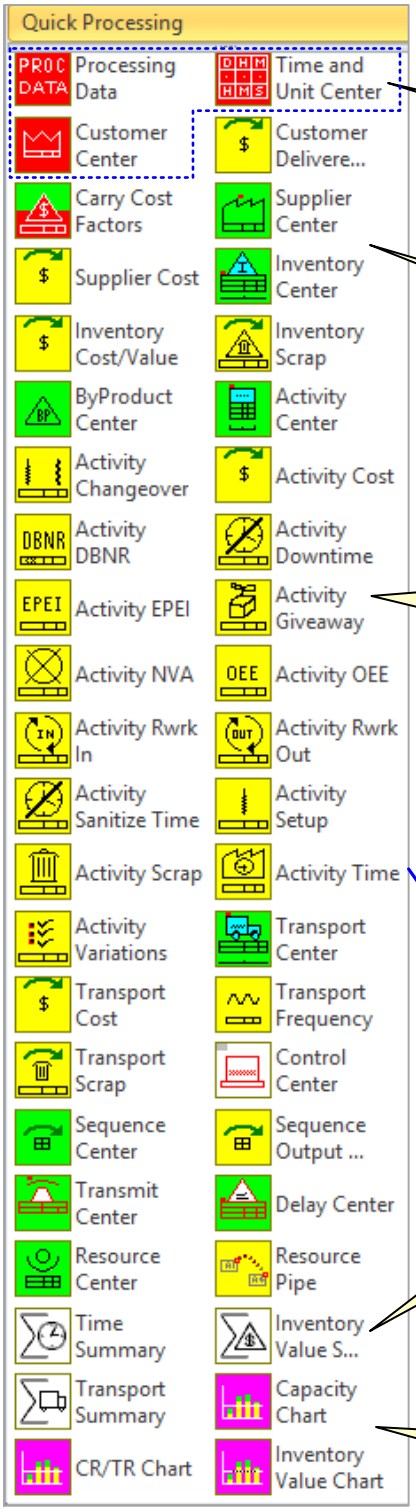
Plan & Implement Improvements

Working with Quick Stencils in eVSM v7

eVSM Toolbar



Quick Stencil

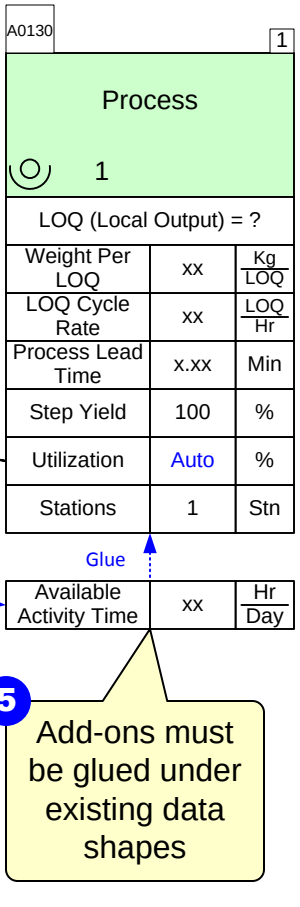


1. Access each Quick Stencil using the Open button and a corresponding Sketch Stencil for initial map capture and layout will open as well

2. Drag out the red icons FIRST

3. Use the Green icons to draw the Flow

4. Yellow icons represent optional “Add-on” calculations

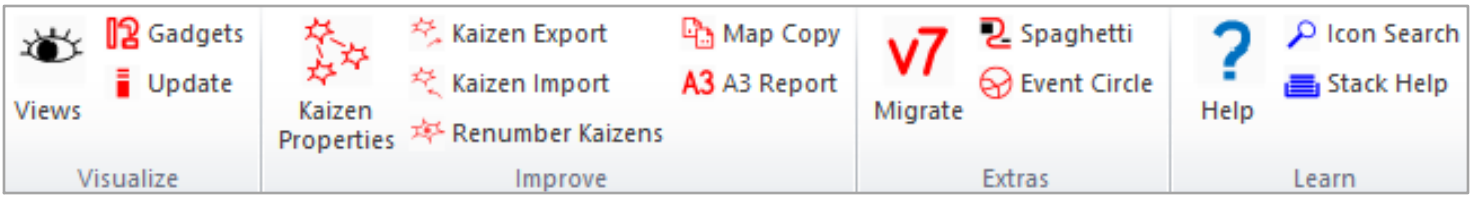


6. Blue values get calculated automatically

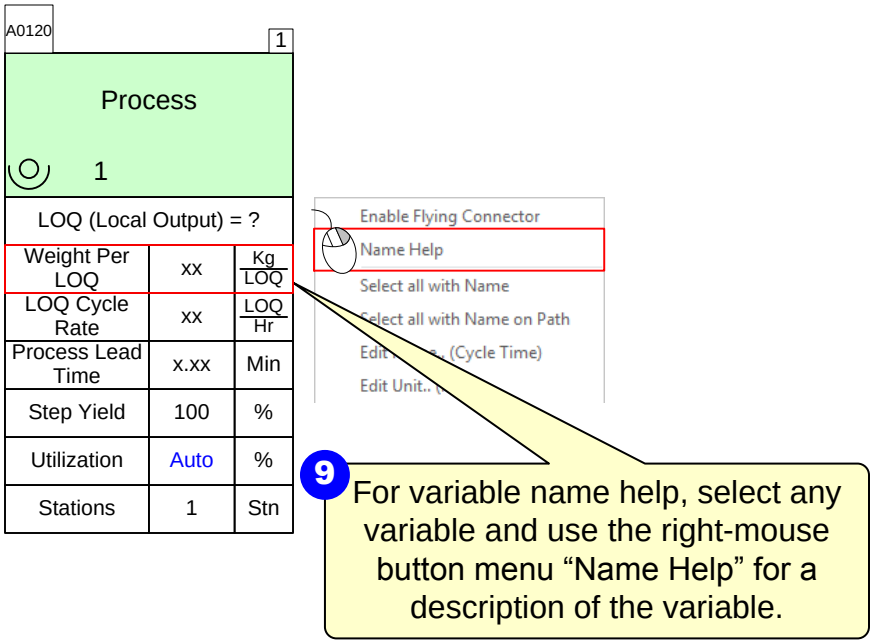
5. Add-ons must be glued under existing data shapes

7. Summary calculations

8. Automatic Charts



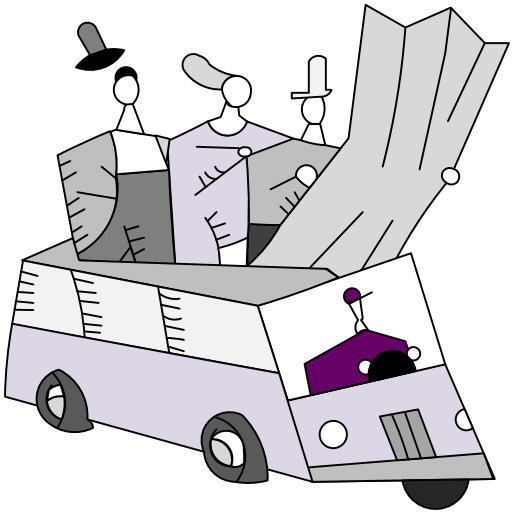
Main Stencil



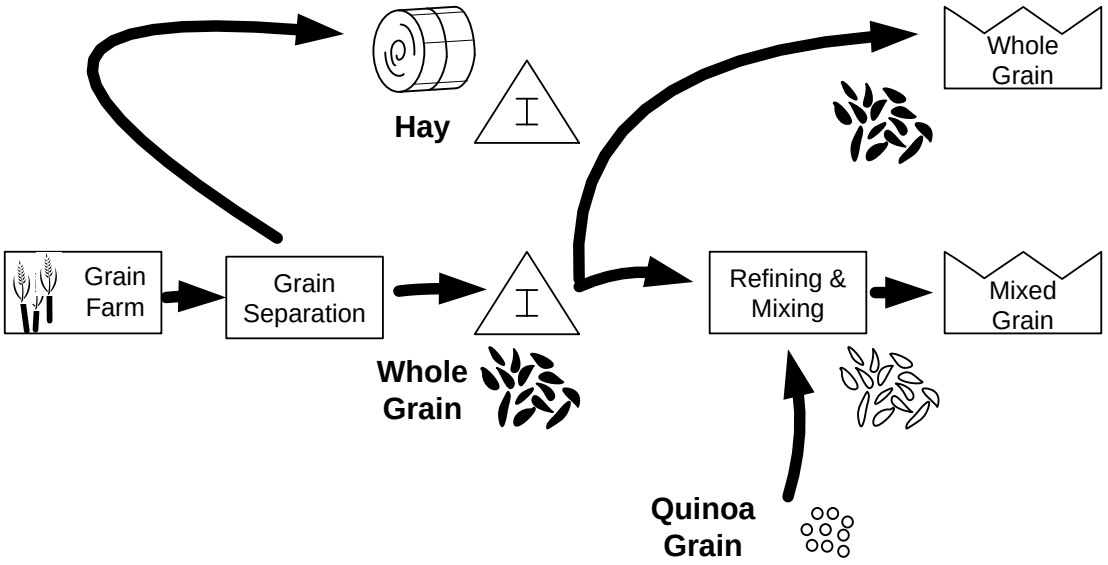
Quick Stencil – Try This:

1. Go to a new page and use the "Open" command to access the Quick Processing stencil.
2. Which icons from the stencil must be put on the map first?
3. Drag out an Activity Center from the stencil. How do you get a quick description of a variable in the center?
4. What is the meaning of the blue "Auto" value in the Activity Center?

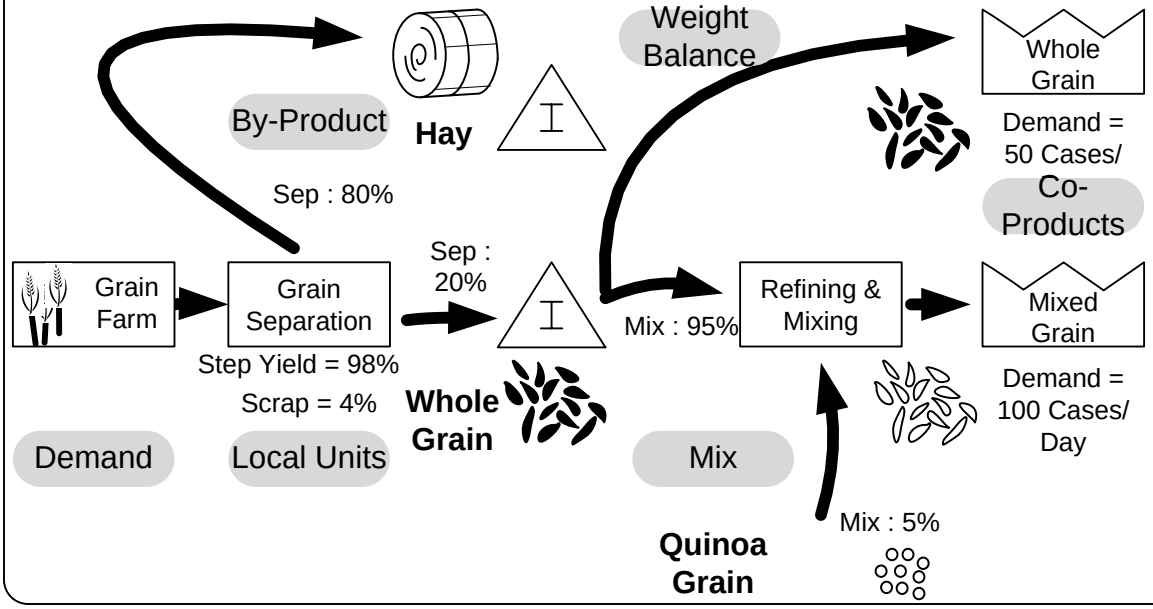
Part II: Plant Level Mapping



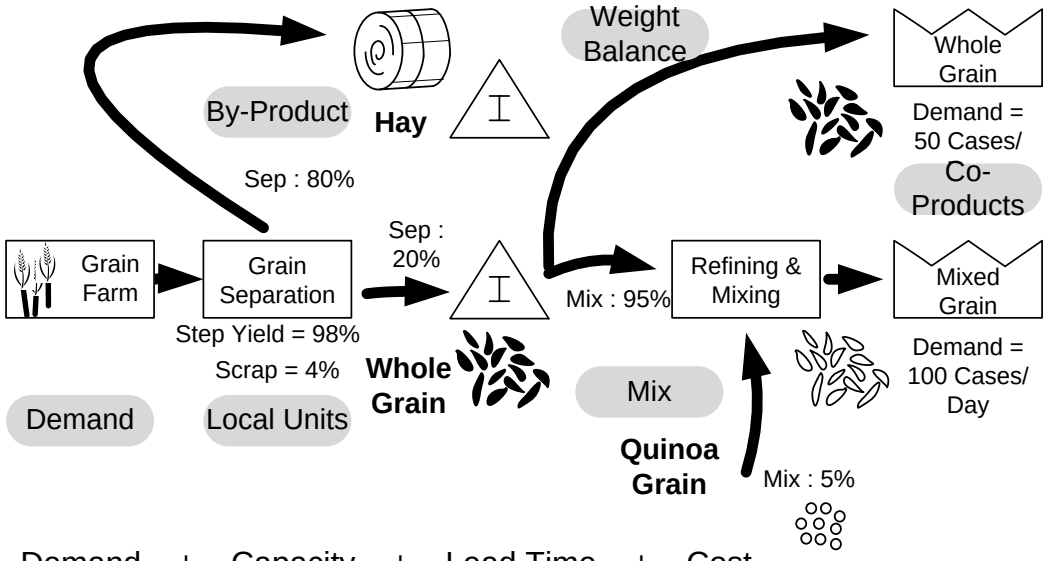
VSMs for the Processing Industries: Sample Process



Process Variables

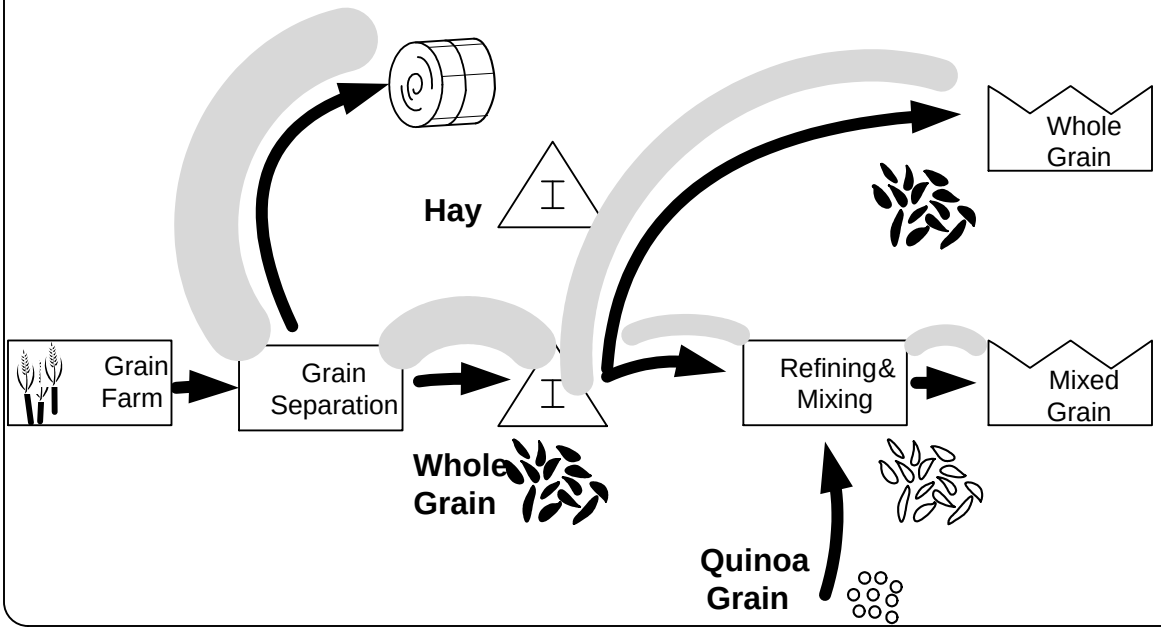


VSM Concepts and Analysis



Demand + Capacity + Lead Time + Cost

Weight Balance Solution



VSM Concepts

- Weight Balance ties Demand for all the raw materials, WIP and process steps to the finished product(s) through a central measure of weight.
- Local Units: Each step along the process can use local units of weight for convenience in comprehension.
- By-Product: Created through the manufacture of the primary products, usually of no or low value.
- Co-Product: Created simultaneously through similar processes and inventories.
- Demand: The amount of product requested by customers.
- Mix: The amount of product used from two different inventories in a process.
- Step Yield Percent: The weight ratio between the primary incoming material(s) (ingredients) and the output of the step.

Process Variables

- Local Output Quantity (LOQ) : The unit of measure most meaningfully used at each step for the Output of that step. It can vary for different steps.
- Weight per LOQ : The actual weight of the LOQ.
- Step Yield: The weight ratio between the output of the step and the primary inputs (ingredients).

$$Step\ Yield\ = \frac{Output\ \ Weight}{Input\ \ Weight} \times 100$$

- Downstream Input Weight % (DIW%): The material contribution of the process step or inventory to the next (downstream) step. The sum of all DIW % must equal 100.
- Upstream Output Weight % (UOW%): The percent of output material, by weight, that flows to the next step. The sum of all U OW% must = 100.

Process Industries VSM Terms

Acronyms

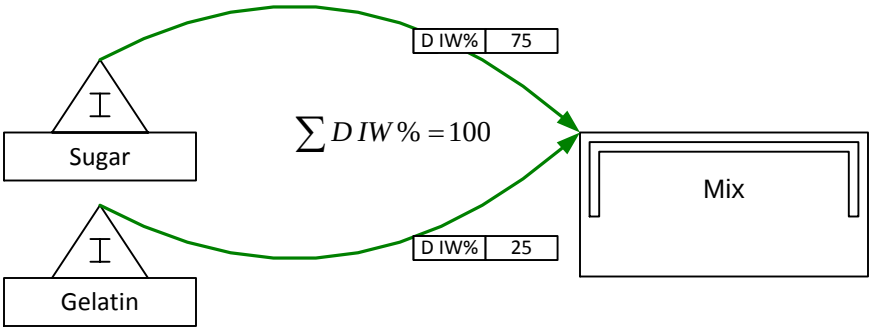
- DIW – Downstream Input Weight
- EPEI – Every Part Every Interval
- LOQ – Local Output Quantity
- NVA – Non Value Added
- OEE – Overall Equipment Effectiveness
- UOW – Upstream Output Weight
- VA – Value Added
- VSM – Value Stream Map
- WIP – Work In Process

Weight Balance Related Terms

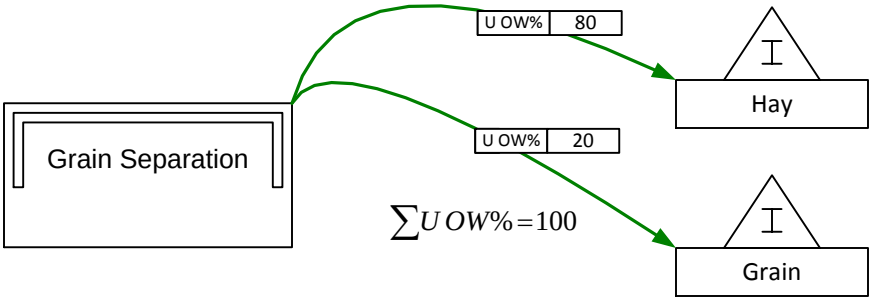
- Local Output Quantity (LOQ) : The unit of measure most meaningfully used at each step for the Output of that step. It can vary for different steps.
- Weight per LOQ : The actual weight of the LOQ.
- Step Yield: The weight ratio between the output of the step and the primary inputs (ingredients).

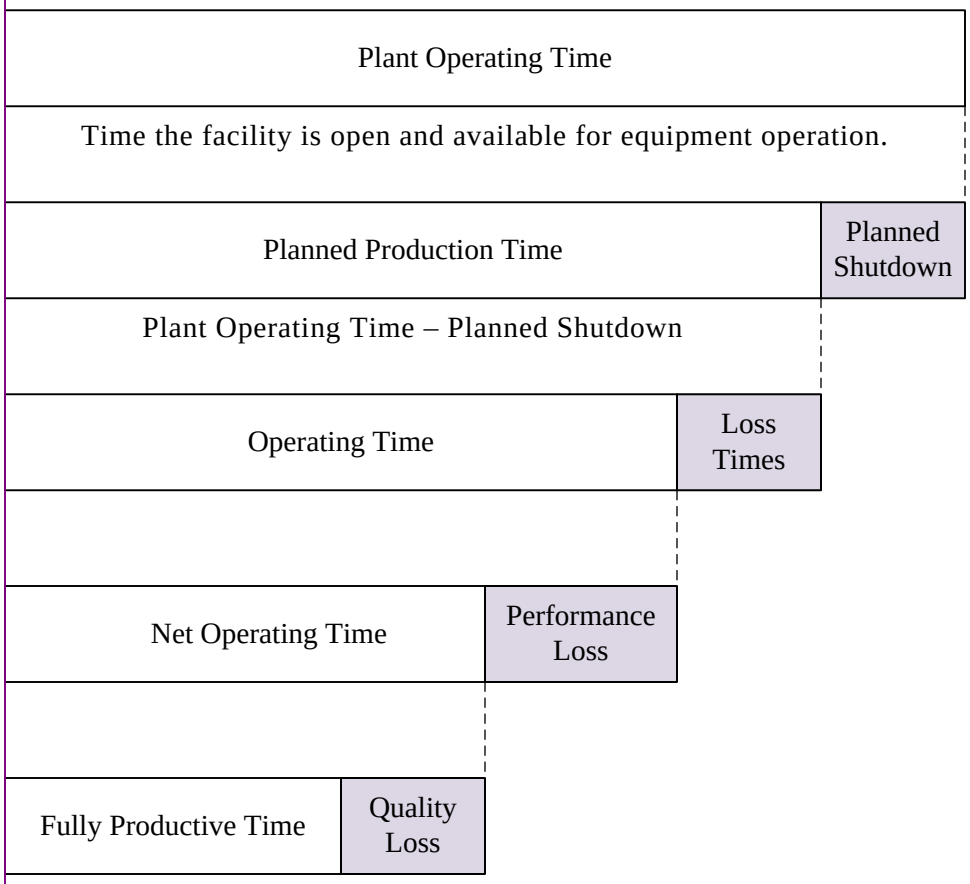
$$\text{Step Yield} = \frac{\text{Output Weight}}{\text{Input Weight}} \times 100\%$$

- Required Input Weight: The quantity of input required by a process step in order to produce enough output to meet demand.
- Required Output Weight: The quantity of output a process step needs to produce to meet the Input Weight requirements of all downstream steps.
- Downstream Input Weight % (DIW%): The material contribution of the process step or inventory to the next (downstream) step. The sum of all DIW % must equal 100.



- Upstream Output Weight % (UOW%): The percent of output material, by weight, that flows to the next step. The sum of all U OW% must = 100.





- Takt Rate : The rate at which a facility needs to produce finished goods in order to meet demand. It is the inverse of Takt Time.

$$\text{Availability Rate} \times \text{Quality Rate} \times \text{Performance Rate}$$

$$\frac{\text{Operating time}}{\text{Planned production Time}}$$

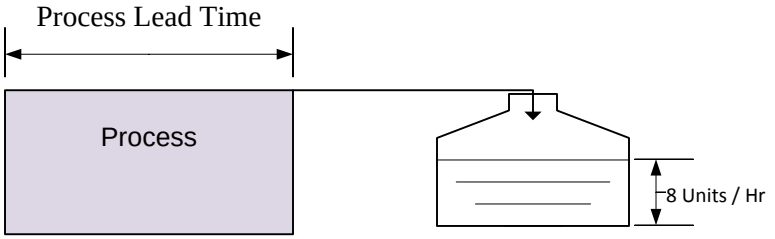
$$\frac{\text{Fully productive time}}{\text{Net Operating Time}}$$

$$\frac{\text{Net Operating Time}}{\text{Operating Time}}$$

Activity Time Related Terms

- LOQ Cycle Rate : The maximum rate at which a station is designed to run, measured in the Local Output Quantity (LOQ) unit. This rate will usually be different from the actual run rate.

- Process Lead Time : The time it takes one unit to move all the way through a process, from start to finish. Unless explicitly stated, this will be the process's value-added time.



LOQ Cycle Rate

- Utilization : A measure of how fully utilized an activity is. $\text{Utilization} = \frac{\text{Takt Rate}}{\text{Effective Cycle Rate}}$

- Activity Time: Total production time available to an activity to complete all work elements.

- Setup Time: Time required to get a station ready to start production.

Quality Related Terms

- Scrap: The percent of the output of a step that is defective and has to be scrapped.

Enriched Grain - Plant

Chicago Rice Inc.

Exercise

With your group, read the information below and then:

1. Draw a wall value stream map for the product showing the customer, inventories, and processes.
2. Show the data associated with the inventory, activities, and any costs.
3. Calculate how many days of inventory you have at each point.
4. Identify useful summary metrics for the map.
5. Identify what charts would be useful to visualize the value stream and mark these up.

Background and Overview

Chicago Rice Inc. sells an enriched grain product which is made from a combination of rice and quinoa. The plant line first husks the whole rice then mixes the rice with the quinoa as an enriched grain product.

Value Stream Walk

To capture the current state value stream, you meet the plant supervisor on Monday afternoon and he walks you through the plant. You learn that the plant line works 2 shifts per day, 5 days a week. After breaks are taken out, the actual production time is 15 hours per day.

The plant supervisor explains how the whole rice and quinoa from the suppliers is stored in separate inventories. The whole rice must first be husked and then the husked rice is mixed with the quinoa and packaged into an enriched grain product. The raw materials are measured by the metric ton (MTon), which is equal to 1000 kilograms (kg). The delivered product is bags of enriched grain product, each with a net weight of 25 kgs.

You see that the whole rice is stored in an inventory that currently holds 750 MTons. The materials enter the husker which can husk 3 MTons of whole rice per hour in each of two stations. The lead time for this process is 55 minutes and it requires 1 setup per day per station, which lasts 25 minutes. The OEE for the Husker is 80%. After the rice is husked the yield is 80% of the original weight. The husker adds a cost of $25 per MTon. Once husked, the rice is stored in an inventory that currently has 100 MTons.

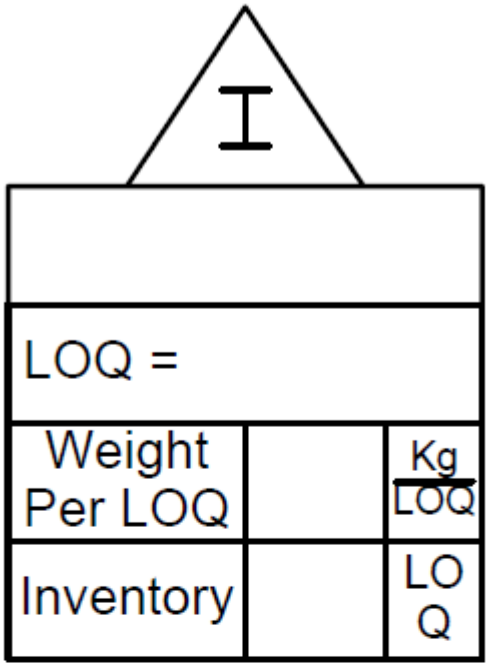
Next, the quinoa is mixed and packed with the husked rice. The quinoa from the supplier is stored in an inventory that currently holds 25 MTons. The rice and quinoa enter the mixing and packing process which produces 500 bags of rice per hour. Each bag weighs 25 kgs and consists of 95% husked rice and 5% quinoa. The lead time for this activity is 25 minutes and the yield is 100% of the original weight. The OEE of the mixing/packing process is 85%. The average customer demand is 350 MTons/Week. There is scrap at this operation of 4% and the mixing process costs an additional $10 per bag.

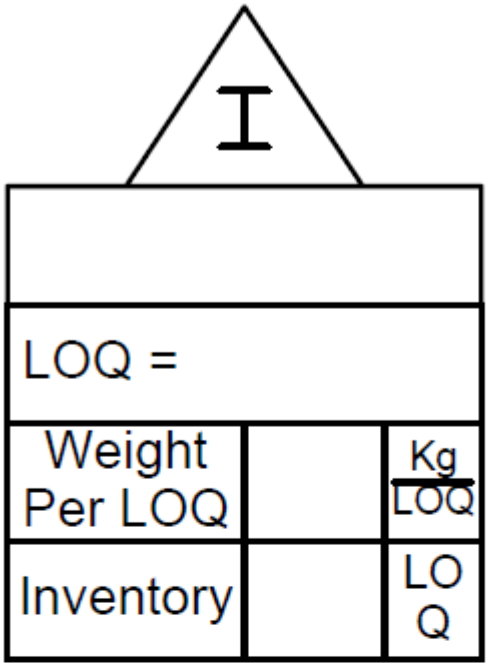
Once the enriched grain product is packed, it is stored in a finished goods inventory that currently holds 5,000 bags.

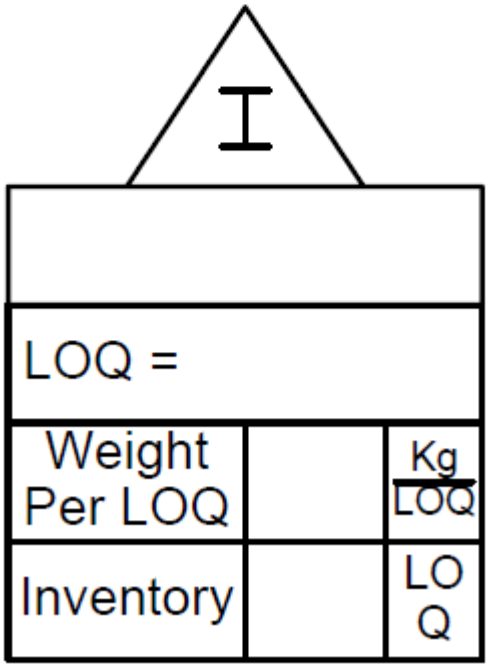
Plant Templates

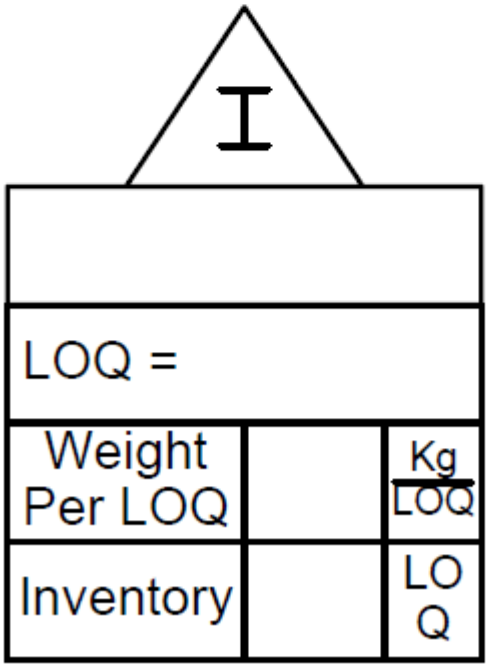
Plant Activity		
 1		
LOQ (Local Output) =		
Weight Per LOQ		Kg / LOQ
LOQ Cycle Rate		LOQ / Hr
Process Lead Time		Min
Step Yield		%
Activity Added Cost		$ / LOQ
Setups		StUp / Day
Time Per Setup		Min / StUp
OEE		%
Stations		Stn
Scrap		%

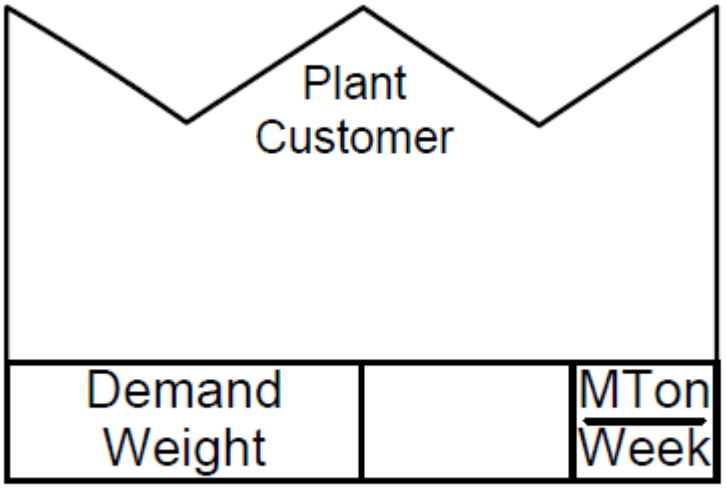
Plant Activity		
 1		
LOQ (Local Output) =		
Weight Per LOQ		Kg / LOQ
LOQ Cycle Rate		LOQ / Hr
Process Lead Time		Min
Step Yield		%
Activity Added Cost		$ / LOQ
Setups		StUp / Day
Time Per Setup		Min / StUp
OEE		%
Stations		Stn
Scrap		%

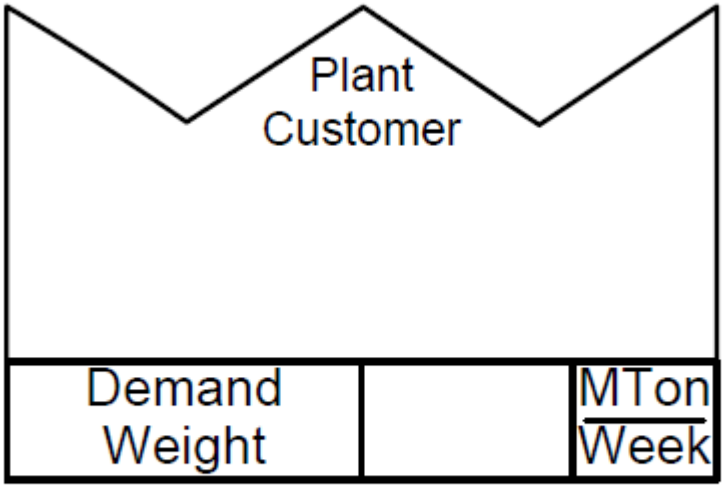








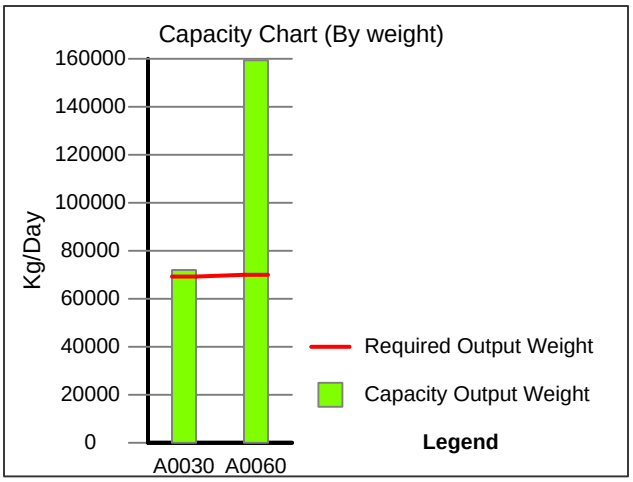




eVSM Plant Workshop

1. Insert the picture of the wall map into eVSM using the Wall Map button in the toolbar. Refer to the Sketcher section in the eVSM User Guide for help.
2. Use the Open command in the eVSM toolbar to open the Quick Processing stencil.
3. Draw the map in eVSM using the Quick Processing Stencil.
4. Create sequence arrows and note that the sum of the DIW values coming into an activity needs to add up to 100%. Refer to the Sequence section of the eVSM User Guide for help.
5. Use the Auto Path button in the toolbar to assign path numbers. Refer to the AutoPath section of the eVSM User Guide for help.
6. Use the Auto Tag button to sequentially number the tags. (this affects charting) Refer to the AutoTag section of the eVSM User Guide for help.
7. Check the map and then Solve for the calculated fields.
8. Draw the Cycle Rate / Takt Rate chart to visualize capacity. Refer to the Charts section in the eVSM User Guide for help.
9. Draw the Lead Time Chart.
10. Draw the Cumulative Cost Chart.

Units	Day	Week
	15	5
	Hr	Day



Husking

Mixing & Packing

DIW% 100 %

A0020 1

Whole Rice

LOQ = MTon

Weight Per LOQ	1000	Kg/LOQ
Inventory	750	LOQ
Inventory Requirement	432.94	MTon/Week
Days of Inventory	8.66	Day
Inventory Added Cost	60	$/MTon
Inventory Value	45.00	K$

DIW% 100 %

A0030

Husking 1

LOQ (Local Output) = MTon

Weight Per LOQ	1000	Kg/LOQ
LOQ Cycle Rate	3	LOQ/Hr
Process Lead Time	55	Min
Step Yield	80	%
Utilization	96.21	%
Activity Added Cost	25	$/LOQ
OEE	80	%
Setups	1	StUp/Day
Time Per Setup	25	Min/StUp
Stations	2	Stn

DIW% 95 %

A0040 1

Husked Rice

LOQ = MTon

Weight Per LOQ	1000	Kg/LOQ
Inventory	100	LOQ
Inventory Requirement	346.35	MTon/Week
Days of Inventory	1.44	Day
Inventory Added Cost	0	$/Kg
Inventory Value	10.00	K$

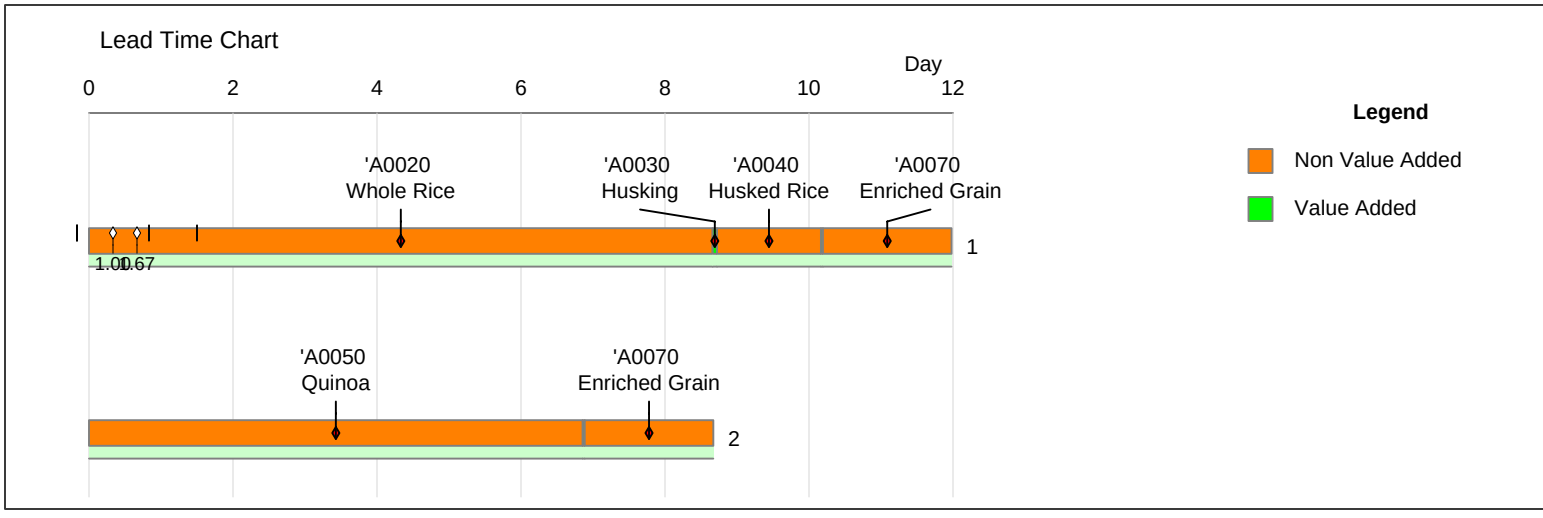
DIW% 5 %

A0050 2

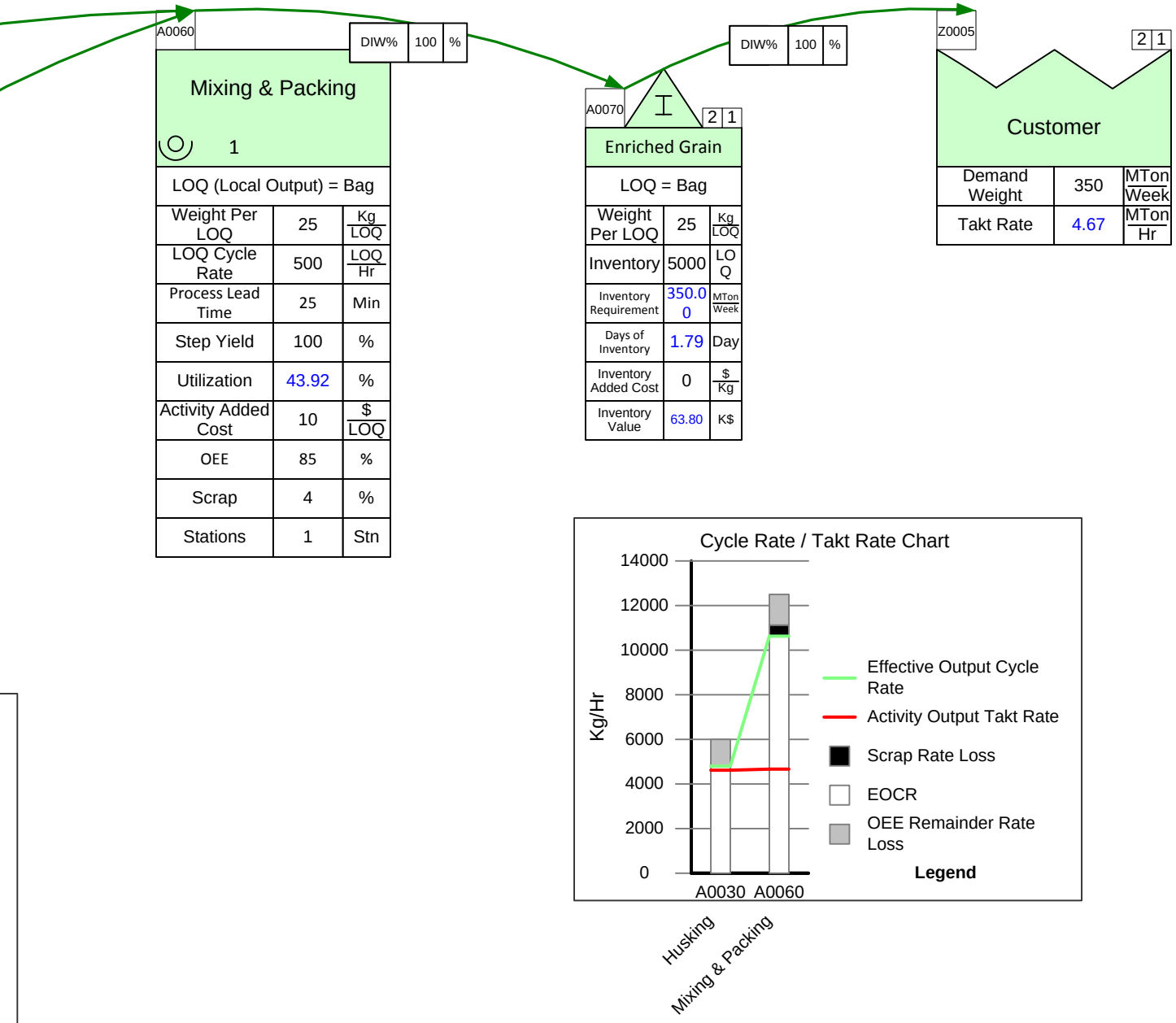
Quinoa

LOQ = MTon

Weight Per LOQ	1000	Kg/LOQ
Inventory	25	LOQ
Inventory Requirement	18.23	MTon/Week
Days of Inventory	6.86	Day
Inventory Added Cost	220	$/MTon
Inventory Value	5.50	K$



Chicago Plant – Enriched Rice

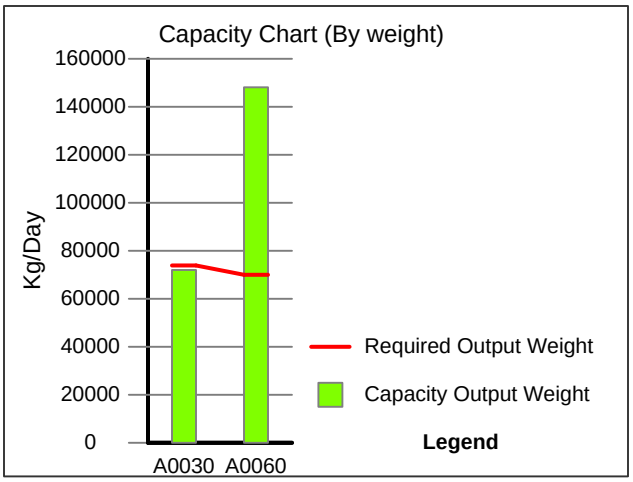


eVSM Rework

There is also some rework present in the value stream. At the mixing/packing process, 6% of the rice hasn't been husked correctly and so is sent back to the husking activity. Between storage and handling costs, there is a rework added cost of $0.05 per kg. Model the rework at the two activities, solve the map, and observe how the cost and graphs change.

1. Start by dragging out a Customer Delivered Cost add-on from the Quick Processing stencil and add it to the Customer Center.
2. Click on Views and select "Cumulative Output Cost" to see the cost for each unit after each process. Solve the map and take note of the output cost for the mixing/packing process and the final customer delivered cost.
2. Drag out an Activity Rwrk Out add-on from the Quick Processing stencil and add it to the Mixing & Packing Activity. The Rework Out % is 6.
3. Change the units for the Rework Output to MTon per week.
4. Drag out an Activity Rwrk In add-on from the Quick Processing stencil and add it to the Husking Activity. The Rework Input will be a calculated value from the Rework Output.
5. Input "0.56" for the Rework Added Cost. This value is equal to the cumulative output cost of each kg at the mixing/packing process ($0.51/kg), plus an additional $0.05 per kg to get the materials back to the husking process.
6. Add a Data Source shape from the eVSM main stencil and glue it to the Rework Output variable on the Mixing & Packing Activity. Then add a Data Target shape to the Rework Input variable on the Husking Activity.
7. Predict how the added work will change the customer delivered cost.
8. Solve the map and observe any changes.

Units	Day	Week
	15	5
	Hr	Day



Capacity Chart

Husking

Mixing & Packing

DIW% 100 %

A0020 1

Whole Rice

LOQ = MTon

Weight Per LOQ	1000.00	Kg/LOQ
Inventory	750	LOQ
Inventory Requirement	438.47	MTon/Week
Days of Inventory	8.55	Day
Cumulative Output Cost	0.06	$/Kg
Inventory Added Cost	60	$/MTon
Inventory Value	45.00	K$

A0030

Husking 1

DIW% 100 %

LOQ (Local Output) = MTon

Weight Per LOQ	1000.00	Kg/LOQ
LOQ Cycle Rate	3	LOQ/Hr
Process Lead Time	55	Min
Step Yield	80	%
Utilization	102.62	%
Cumulative Output Cost	0.13	$/Kg
Activity Added Cost	25	$/LOQ
OEE	80	%
Rework Input	23.33	MTon/Week
Rework Added Cost	0.56	$/Kg
Setups	1	StUp/Day
Time Per Setup	25	Min/StUp
Stations	2	Stn

A0040 1

Husked Rice

LOQ = MTon

Weight Per LOQ	1000.00	Kg/LOQ
Inventory	100	LOQ
Inventory Requirement	369.44	MTon/Week
Days of Inventory	1.35	Day
Cumulative Output Cost	0.13	$/Kg
Inventory Added Cost	0	$/Kg
Inventory Value	13.16	K$

DIW% 95 %

DIW% 5 %

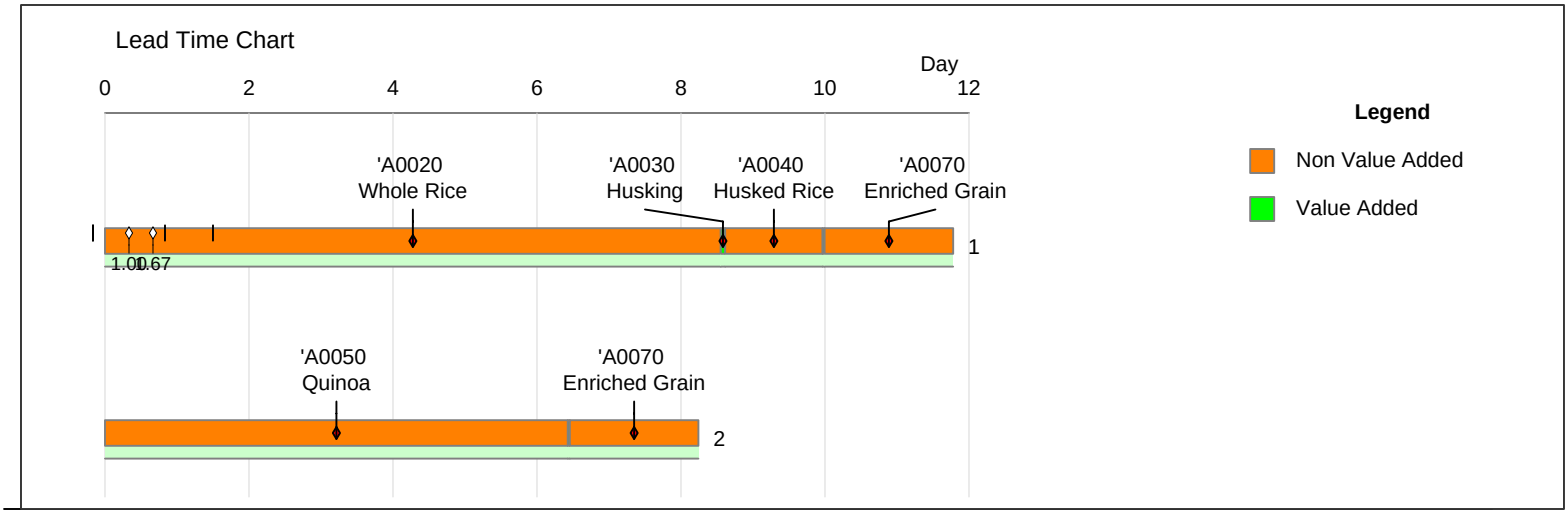
A0050 2

Quinoa

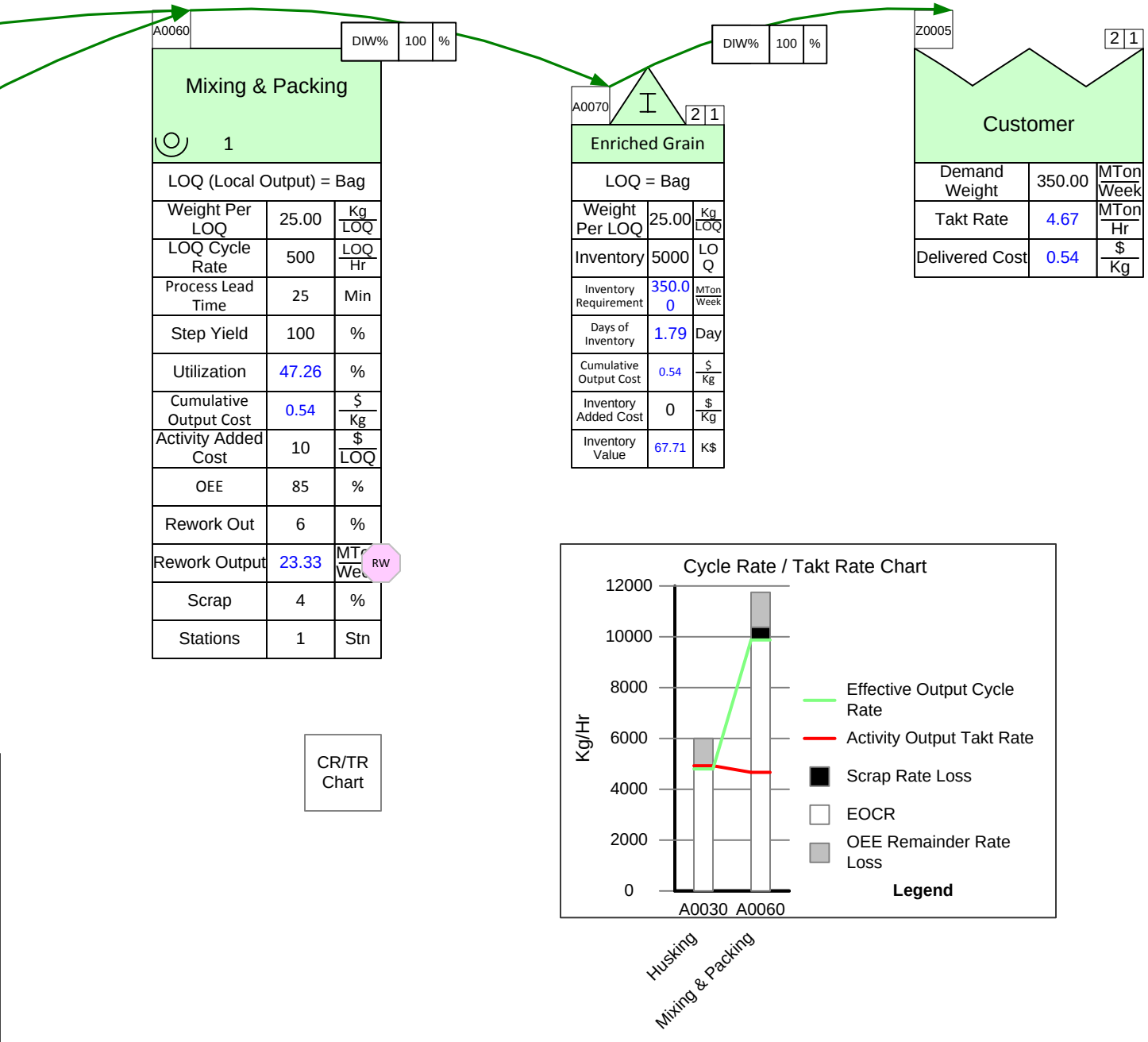
LOQ = MTon

Weight Per LOQ	1000.00	Kg/LOQ
Inventory	25	LOQ
Inventory Requirement	19.44	MTon/Week
Days of Inventory	6.43	Day
Cumulative Output Cost	0.22	$/Kg
Inventory Added Cost	220	$/MTon
Inventory Value	5.50	K$

Lead Time Chart all



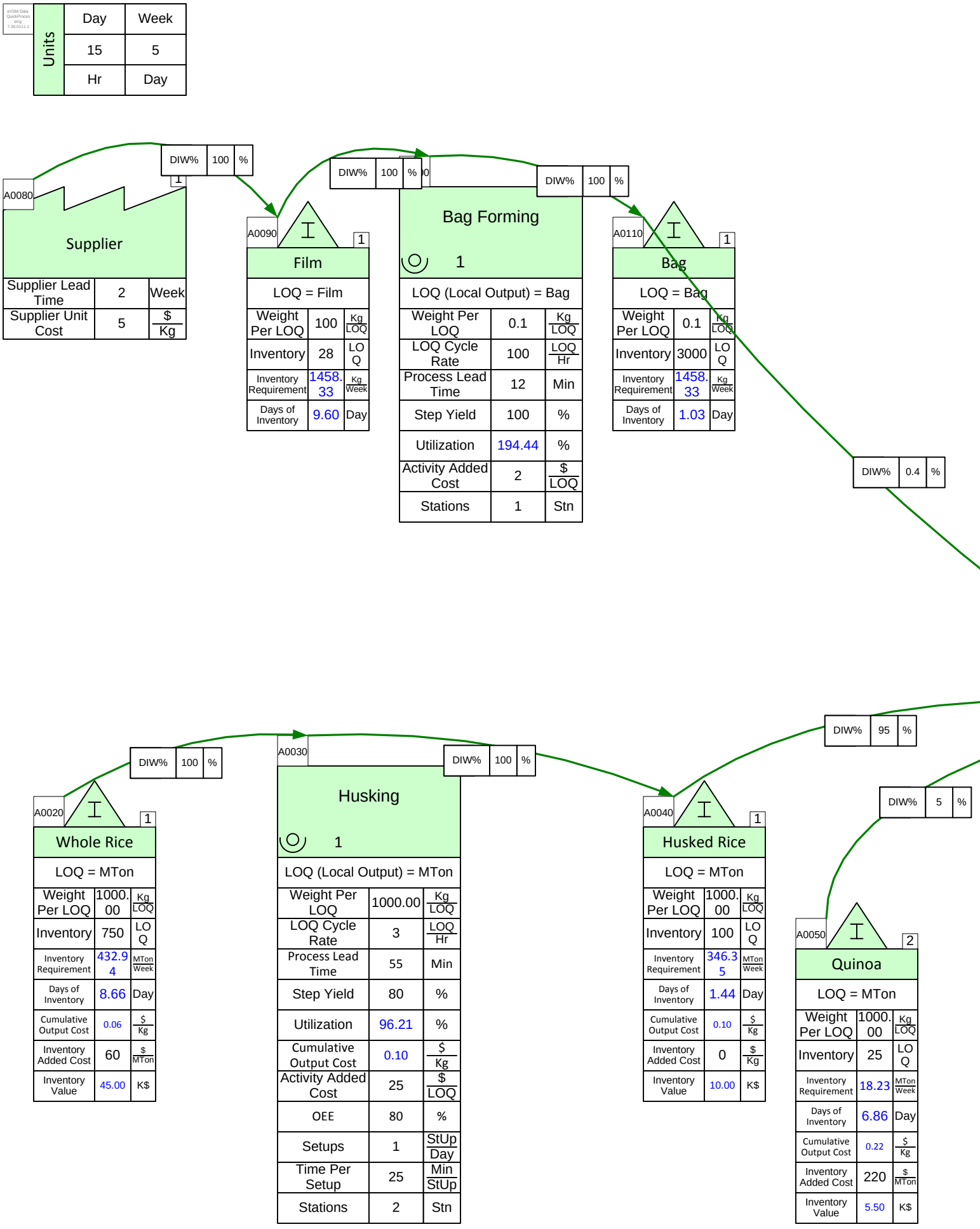
Chicago Plant – Enriched Rice



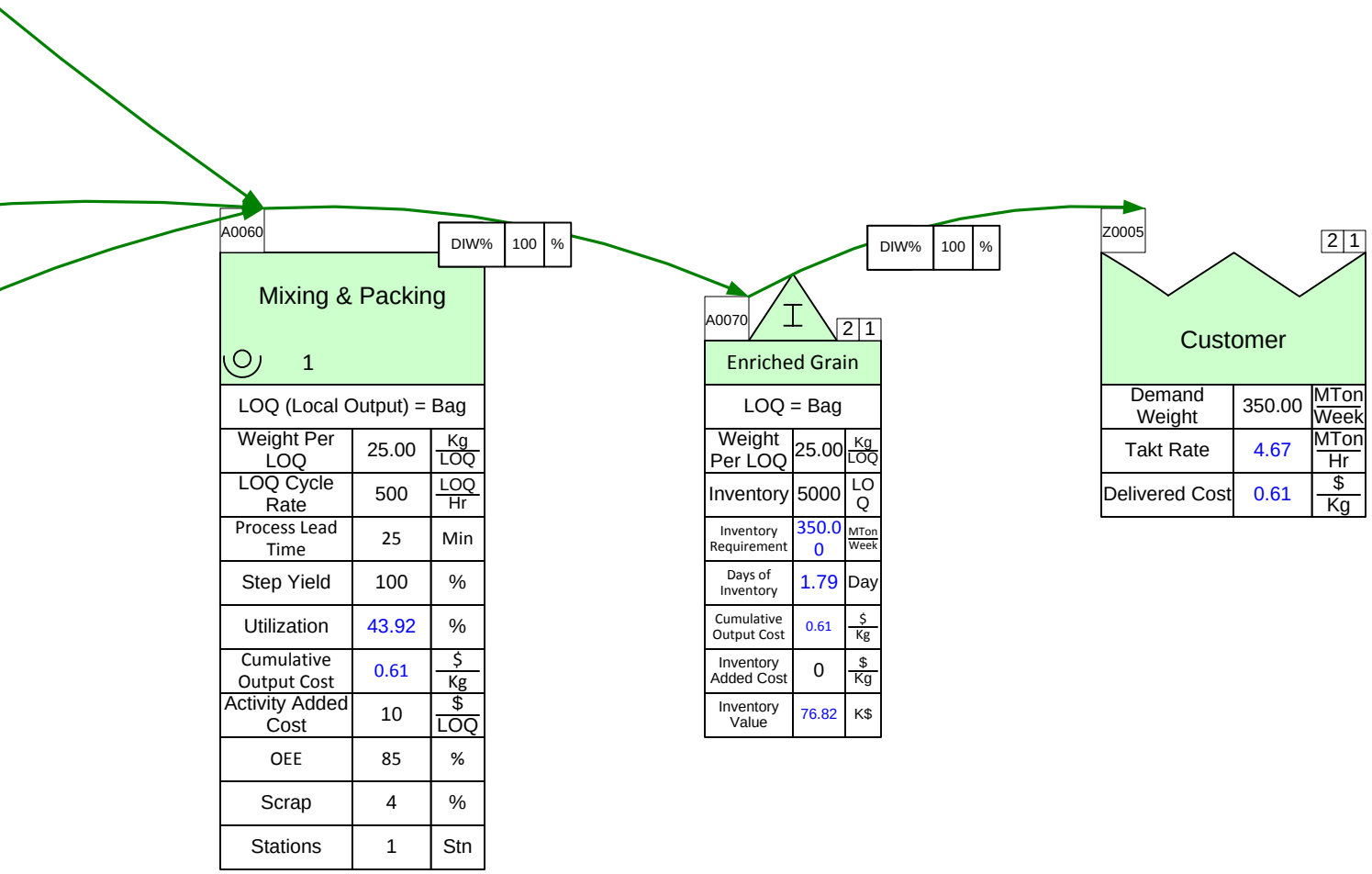
eVSM Packaging

Lets model the packaging activities explicitly on the map. The process starts from the supplier to when the product is placed in the packaging. Raw material from the supplier costs $5/kg and Added Activity Cost for forming the bag costs $2/bag. Each bag weighs 100 gm. Model the packaging activities, solve the map, and observe how the delivered cost changes.

1. Start by drawing out the packaging value stream above the product value stream, this will include the supplier, inventories and activities.
2. Sequence the new centers, with the final sequence connecting the Bag inventory to the Mixing & Packing activity of the product VSM.
3. Each empty bag weighs 100 gm and holds 25 kg of product. So each bag is (100/25000 * 100) 0.4 % of the weight of the product. This is the value we will input for the DIW % on the sequence arrow connecting the Bag inventory to the Mixing & Packing activity.
4. Add Supplier Cost and Activity Cost add-ons to the appropriate centers. Enter $5 for the Supplier Unit Cost and $2 for the Activity Added Cost.
5. Predict how the packaging will change the customer delivered cost.
6. Solve the map and observe any changes.



Chicago Plant – Enriched Rice



eVSM ByProduct

The process of producing the enriched rice also produces a byproduct, husks, which can be used in the process to make animal feed (a separate value stream). For every metric ton of rice produced, 240 kg of husks is also produced. You decide to allocate 90% of the costs for production (up through the Husking activity) to the rice and 10% to the husks. The allocation is based on the relative value of the rice versus the husk. Find out how much husk is produced per day, and what its value is.

1. Start by dragging out a ByProduct Center from the Quick Processing stencil, and placing it below the Husking activity.

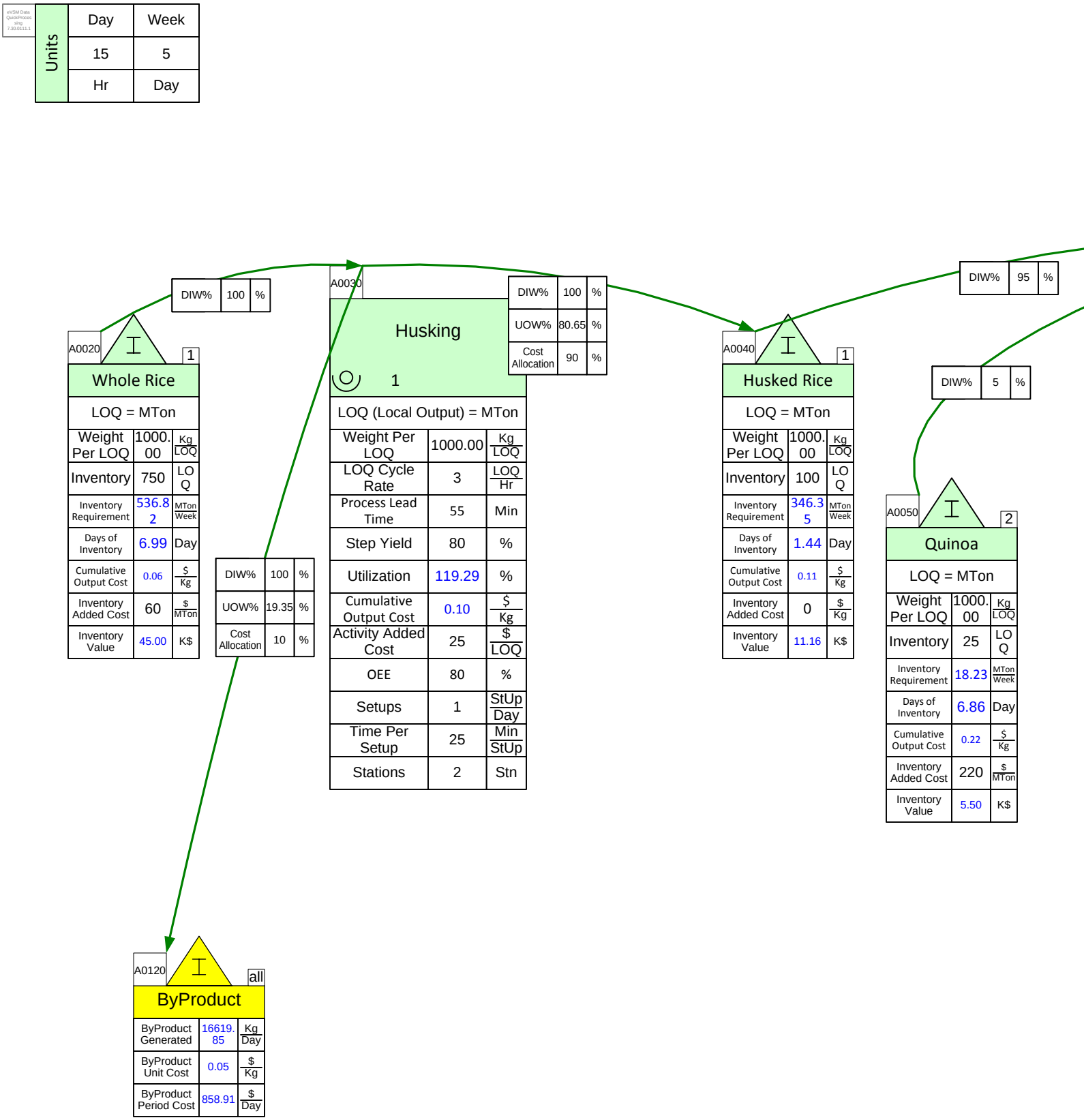
2. Add a sequence arrow from Husking to the ByProduct Center.

3. Now add a Sequence Output Weight add-on to the Sequence Center arrow, by gluing it to the bottom of the DIW% data block. Also add the add-on to the Sequence Center arrow connecting Husking to the Husked Rice inventory.

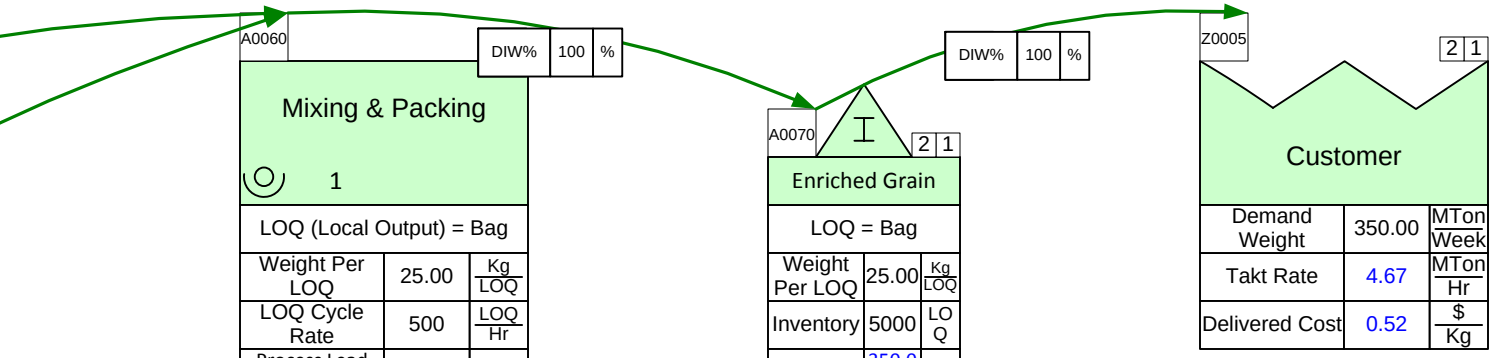
4. Since 120 kg of husk is produced for every 1000 kg of rice produced, it represents 19.35% (240/(240+1000) * 100) and 80.65% (1000/(240+1000) * 100) of the total output of the husking activity. Use these values for the respective UOW% (Upstream Output Weight %) data blocks on the sequence arrows.

5. For the Cost Allocation from Husking to the ByProduct, use 10%, and 90% for Husking to Husked Rice.

6. Solve the map and see how much husk is produced in a day and its value.



Chicago Plant – Enriched Rice

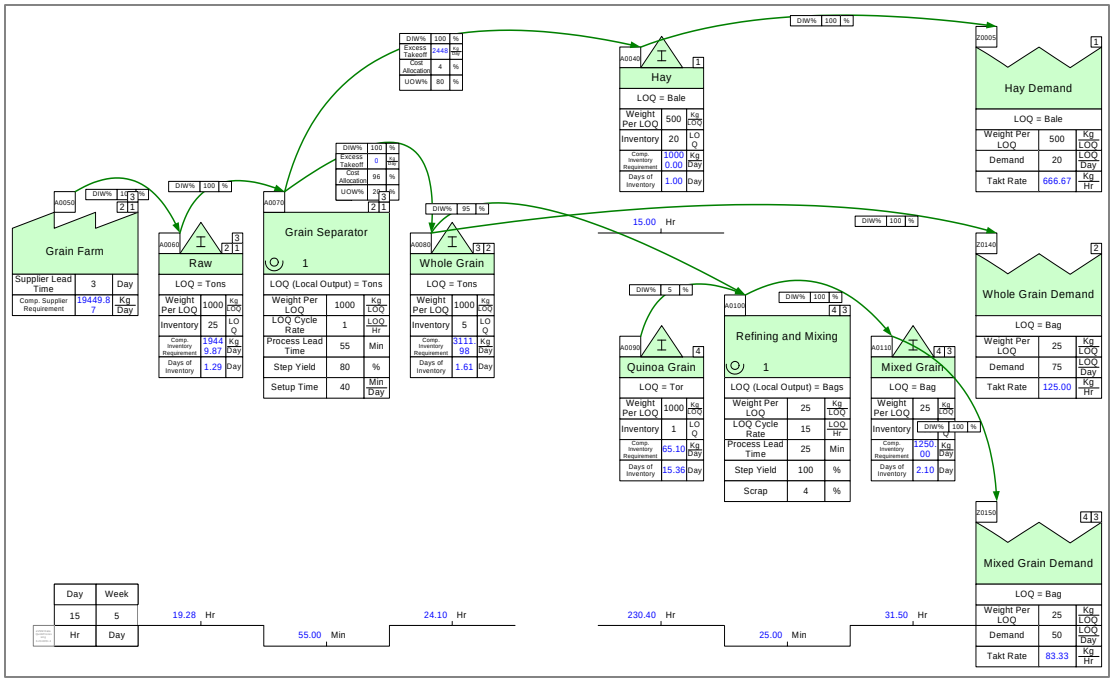


LOQ (Local Output) = Bag		
Weight Per LOQ	25.00	Kg / LOQ
LOQ Cycle Rate	500	LOQ / Hr
Process Lead Time	25	Min
Step Yield	100	%
Utilization	43.92	%
Cumulative Output Cost	0.52	$ / Kg
Activity Added Cost	10	$ / LOQ
OEE	85	%
Scrap	4	%
Stations	1	Stn

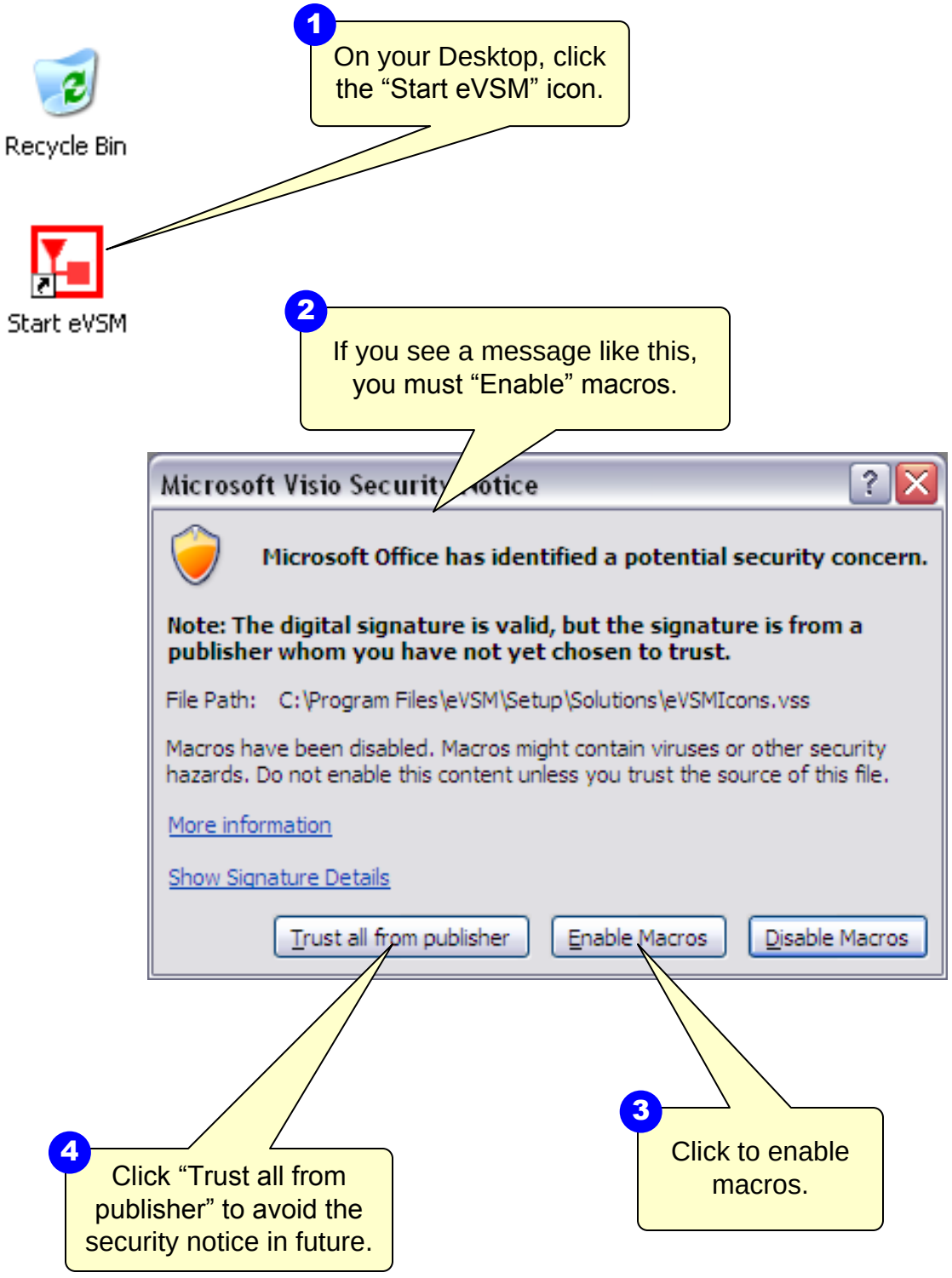
LOQ = Bag		
Weight Per LOQ	25.00	Kg / LOQ
Inventory	5000	LOQ
Inventory Requirement	350.00	MTon / Week
Days of Inventory	1.79	Day
Cumulative Output Cost	0.52	$ / Kg
Inventory Added Cost	0	$ / Kg
Inventory Value	65.24	K$

Customer		
Demand Weight	350.00	MTon / Week
Takt Rate	4.67	MTon / Hr
Delivered Cost	0.52	$ / Kg

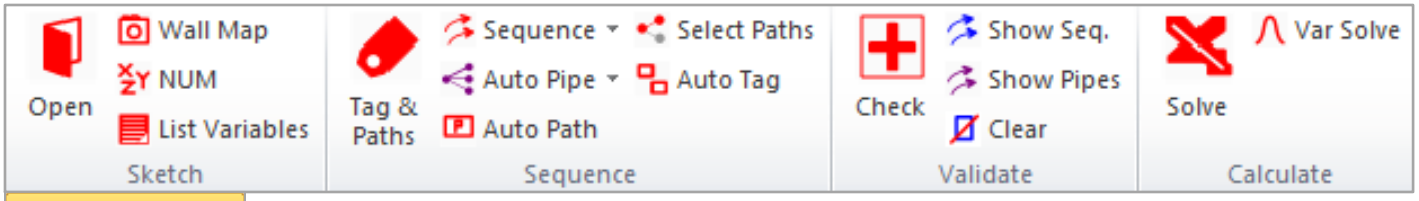
This tutorial will guide you through the steps to draw the following map using the Quick Processing stencil.



Step 1: Start eVSM



Step 2: Learn eVSM Basics



Quick Processing

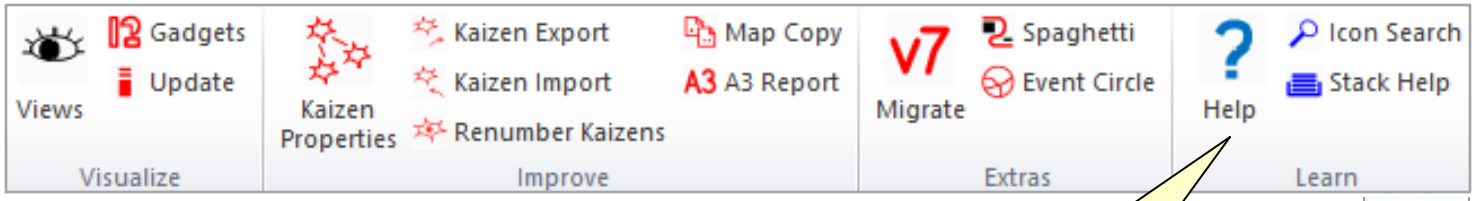
Sketch Processing

6 Avoid re-sizing eVSM shapes. Instead grow the drawing page when needed. To resize the page, hold down the "Ctrl" key, and then drag any page edge to the required size. This method works on all four edges of the page.

7 If you would like to copy and paste a map between files, there is a shortcut to using the regular copy/paste.
1. Drag and select the whole map, or any part that needs to be copied.
2. Right-click and use the "Group" function in the right mouse menu.
3. Right-click the grouped image and use the "Copy" function in the right mouse menu.
4. Go to the destination page in the other file.
5. Right-click on the page and use the "Paste" function.
6. With the grouped shapes selected, right-click and use the "Group>Ungroup" function in the right-mouse menu.

8 Save your Visio file and then insert a new page via the right-mouse menus on the page-tabs.

VSM Quick_eVSM



1 eVSM Help resources are available here. Hover over each help button and learn what it does.

3 To edit any text, just double-click it. To move text relative to the shape location, use the Visio Text Block Tool located by the Text Tool in the Visio Standard toolbar.

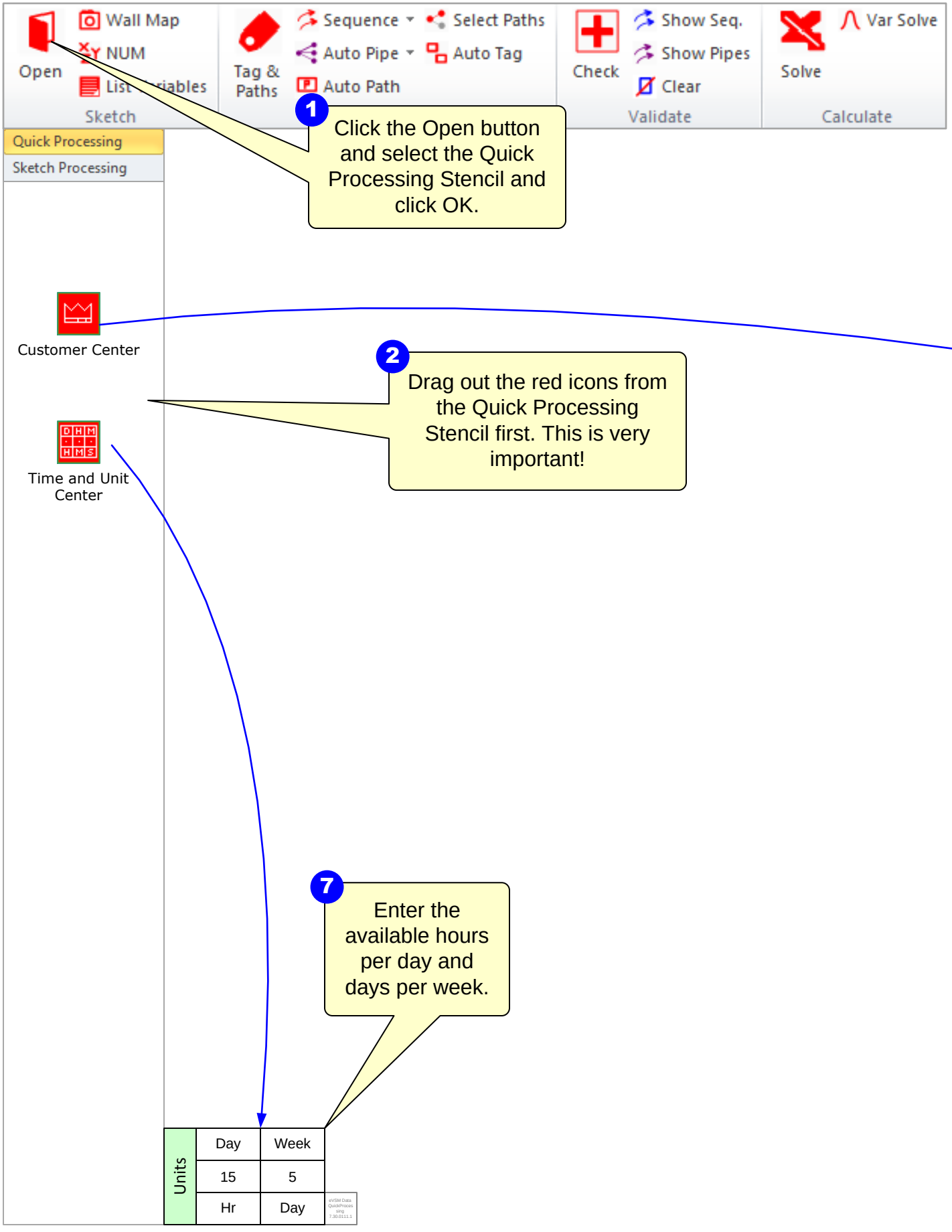
2 Blue icons in the main stencil represent families of shapes. Drag out the Transport icon.

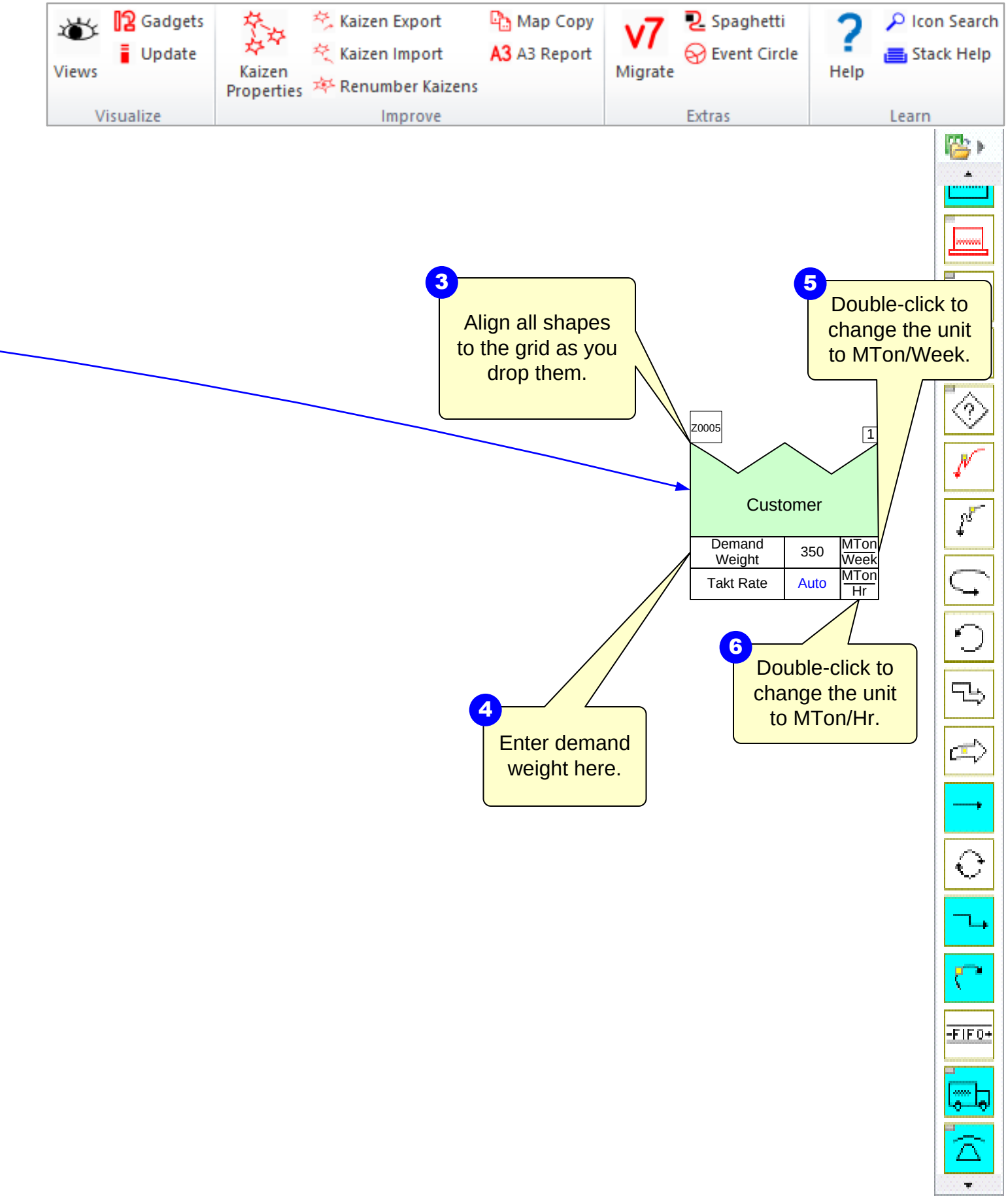
Daily

4 Use the shape's right-mouse menus to turn it into a car

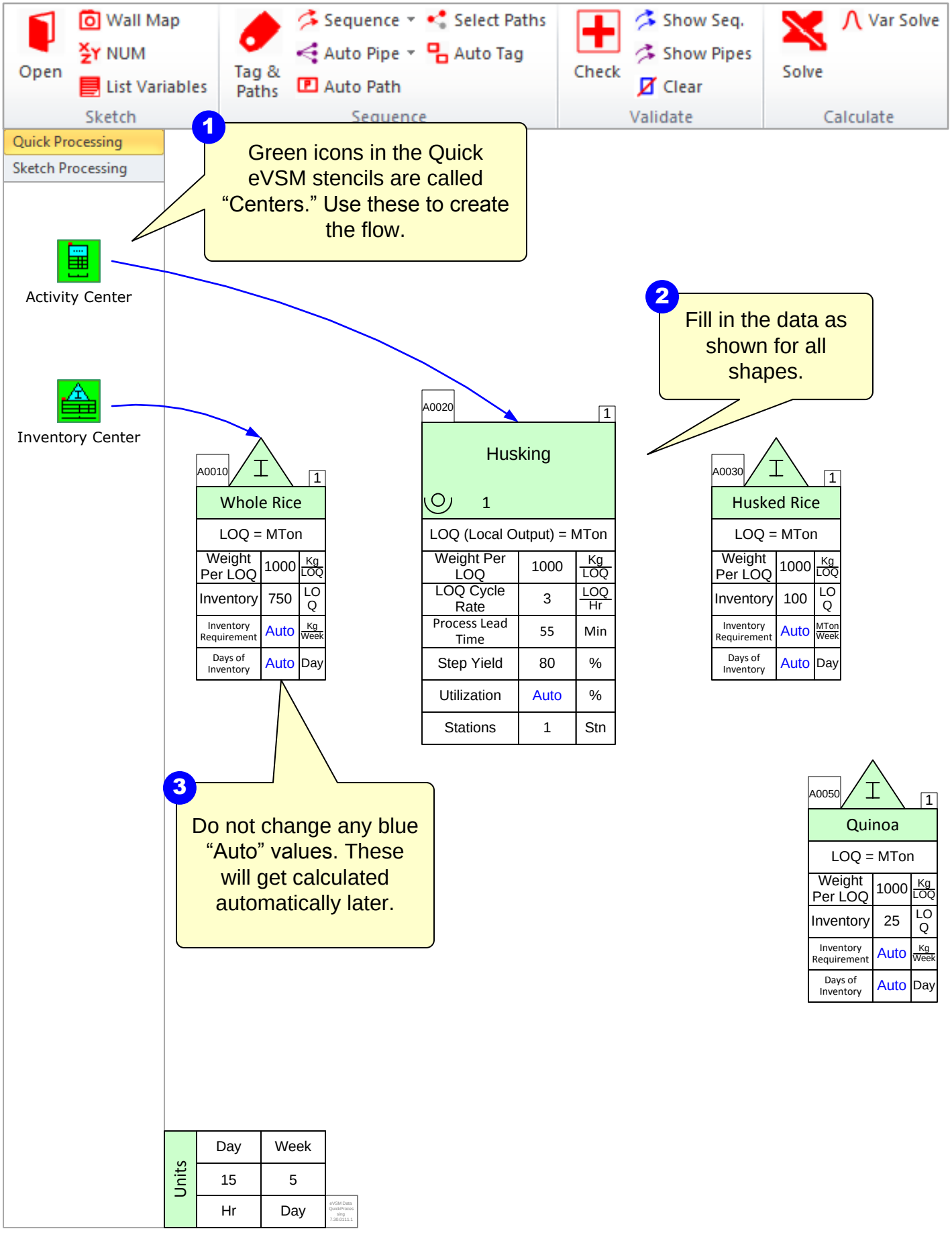
5 Zooming:
-Ctrl + Shift = Drag Zoom Options
-Whole page view in Visio 2003/2007: Ctrl + W
-Whole page view in Visio 2010/2013: Ctrl + Shift + W

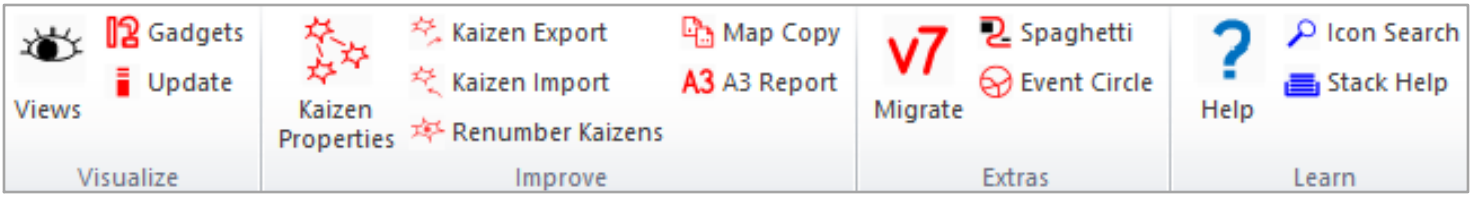
Step 3: Initiate the map for Quick Processing

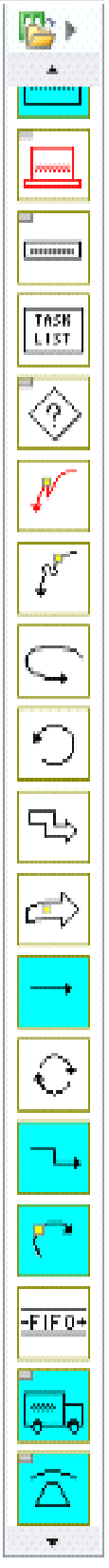


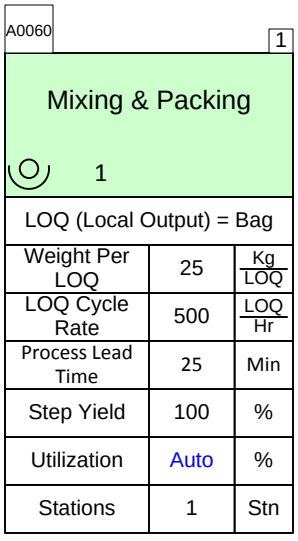


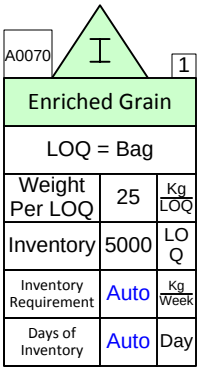
Step 4: Draw the Flow

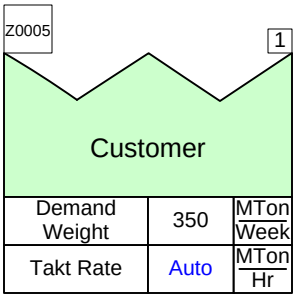




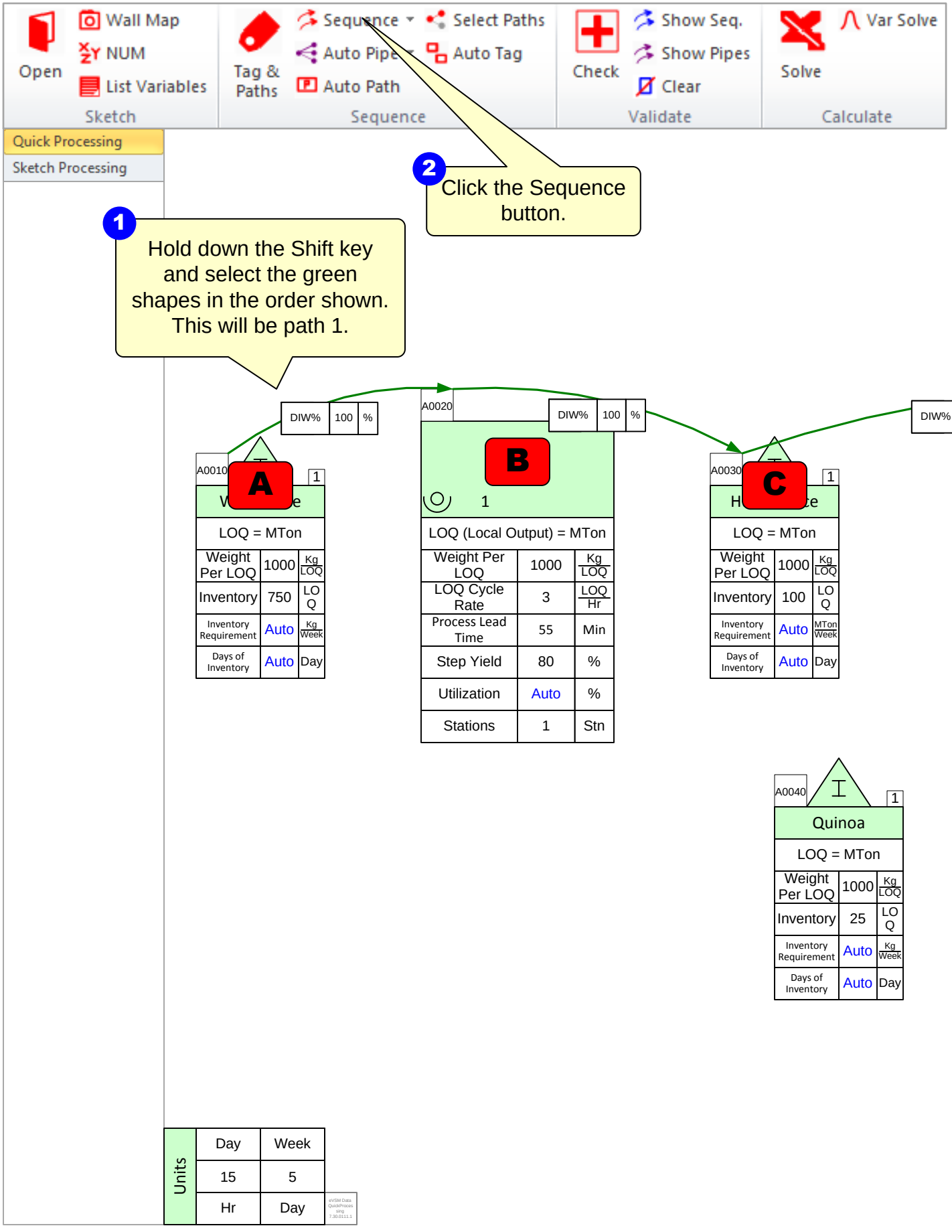


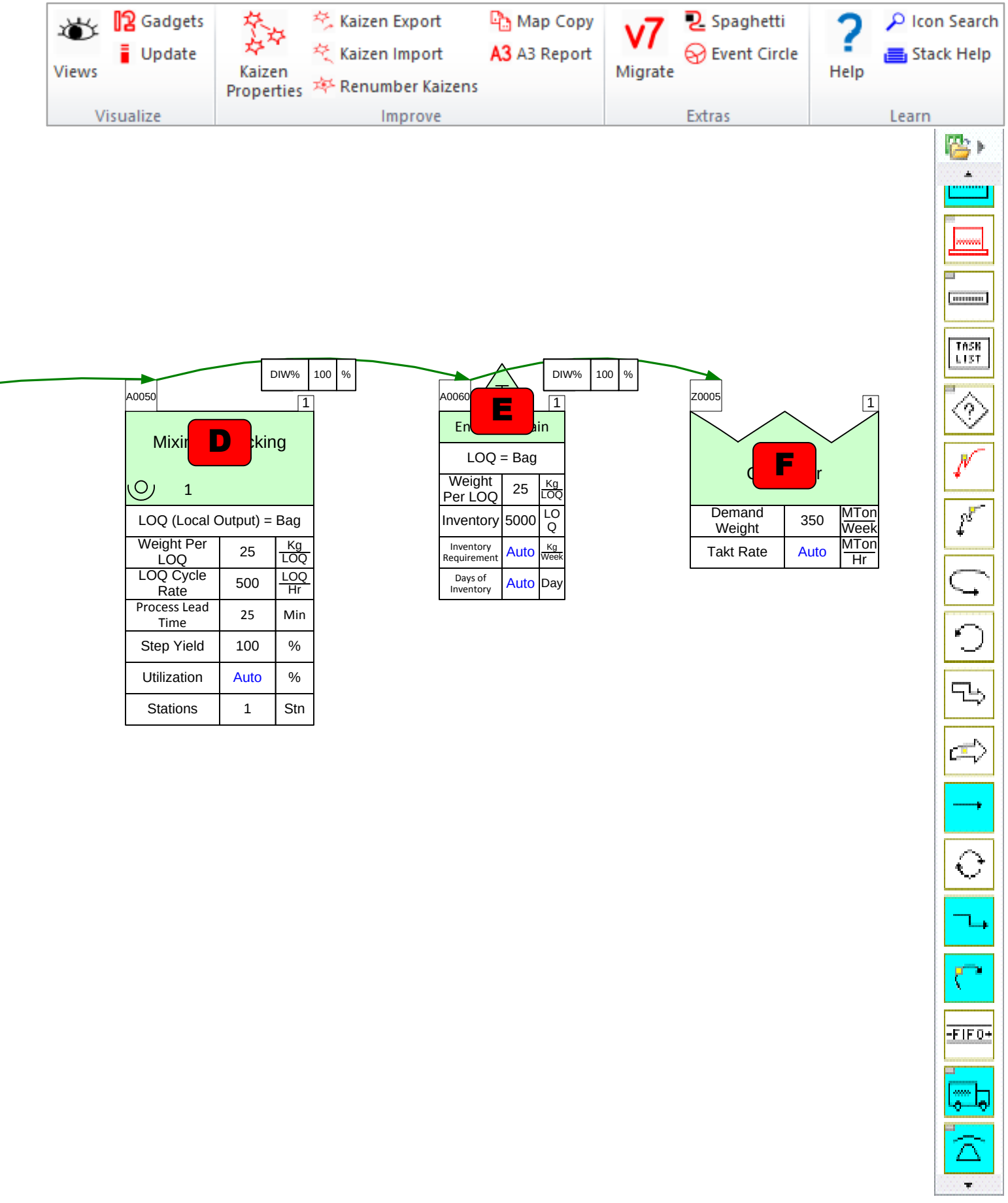




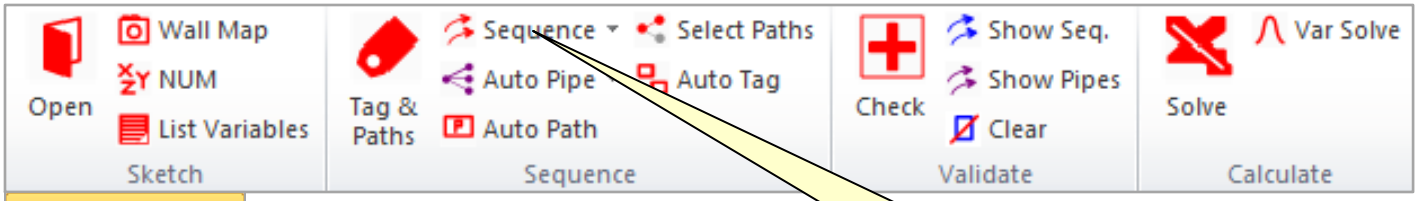


Step 5: Sequence Path 1





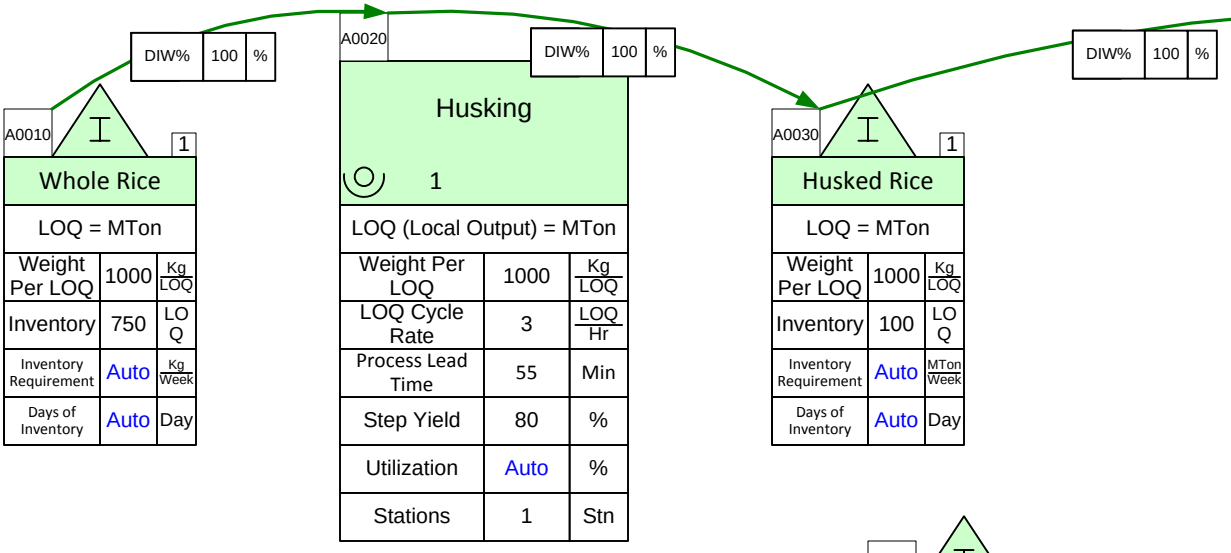
Step 6: Sequence Path 2

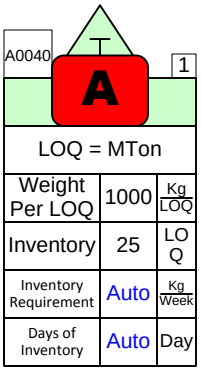


Quick Processing

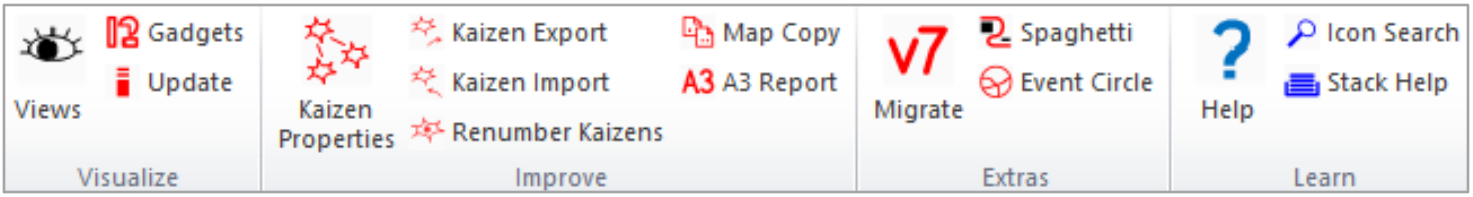
Sketch Processing

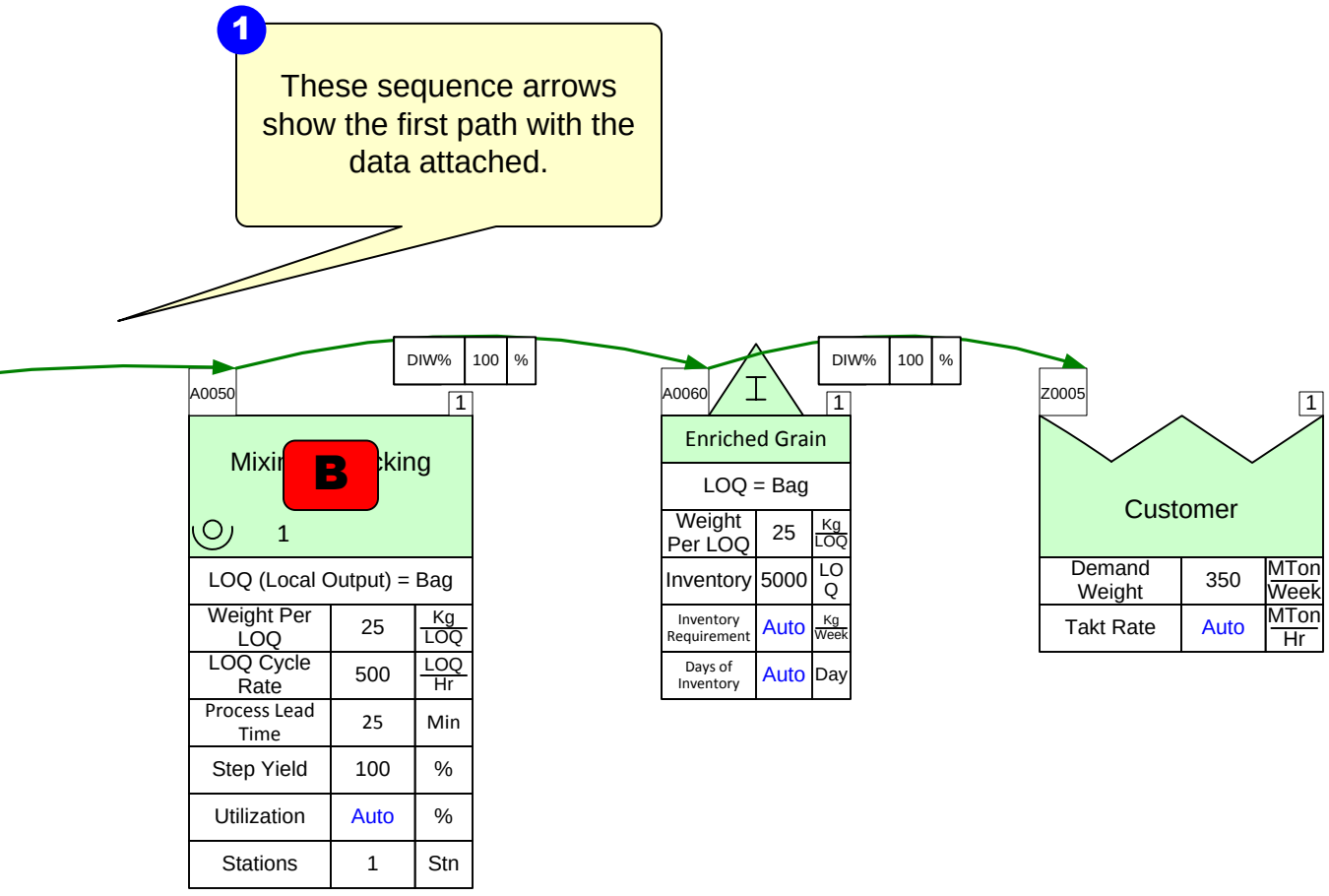
2 Again, hold down the Shift key, select the shapes in order for Path 2, then click the Sequence button.

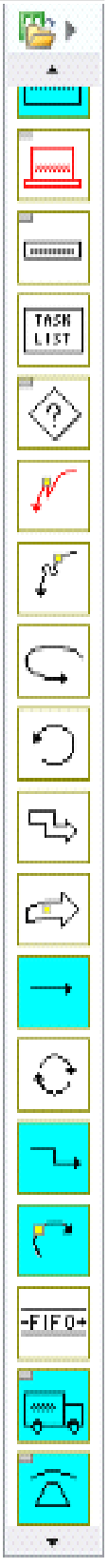




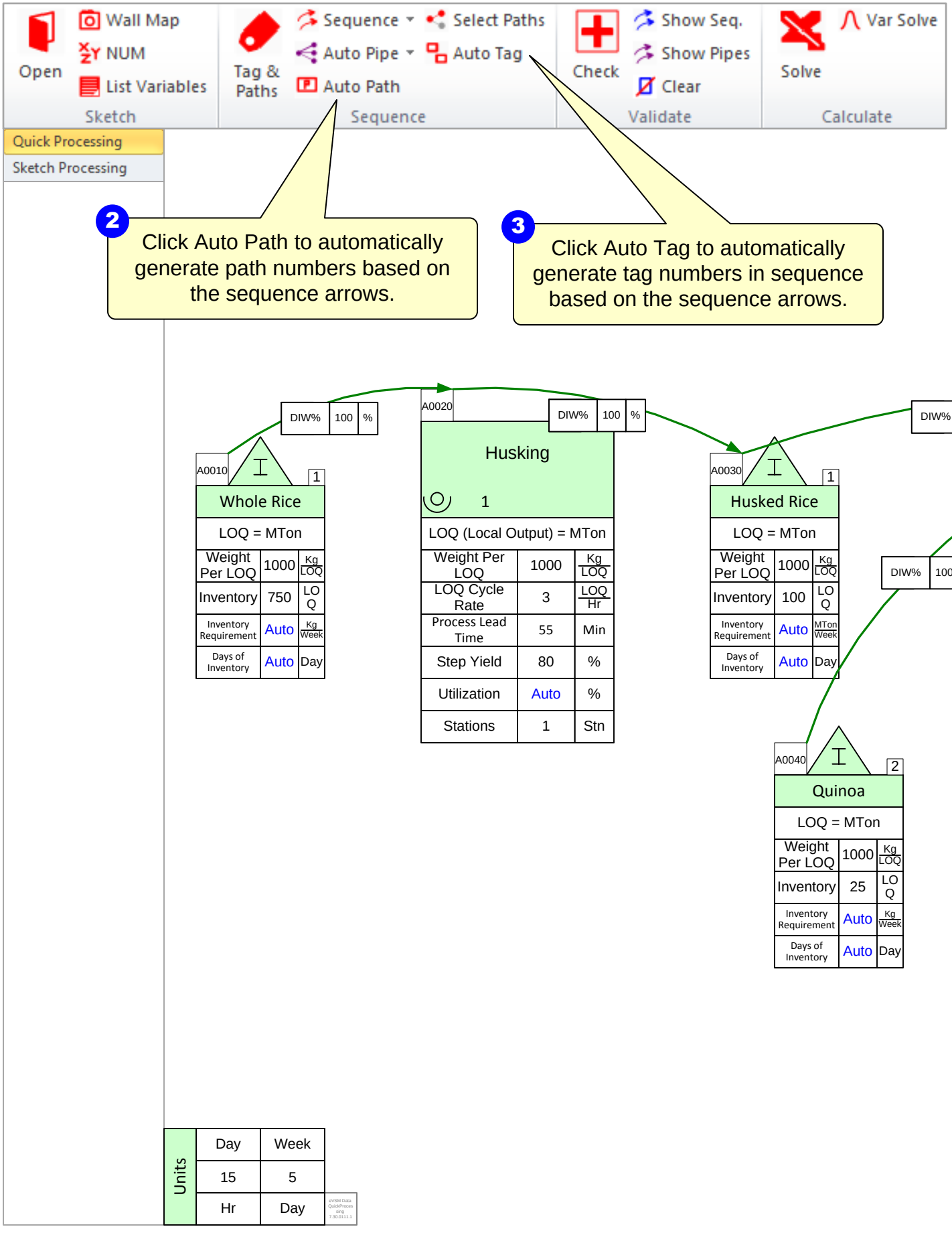
Units	Day	Week
	15	5
	Hr	Day

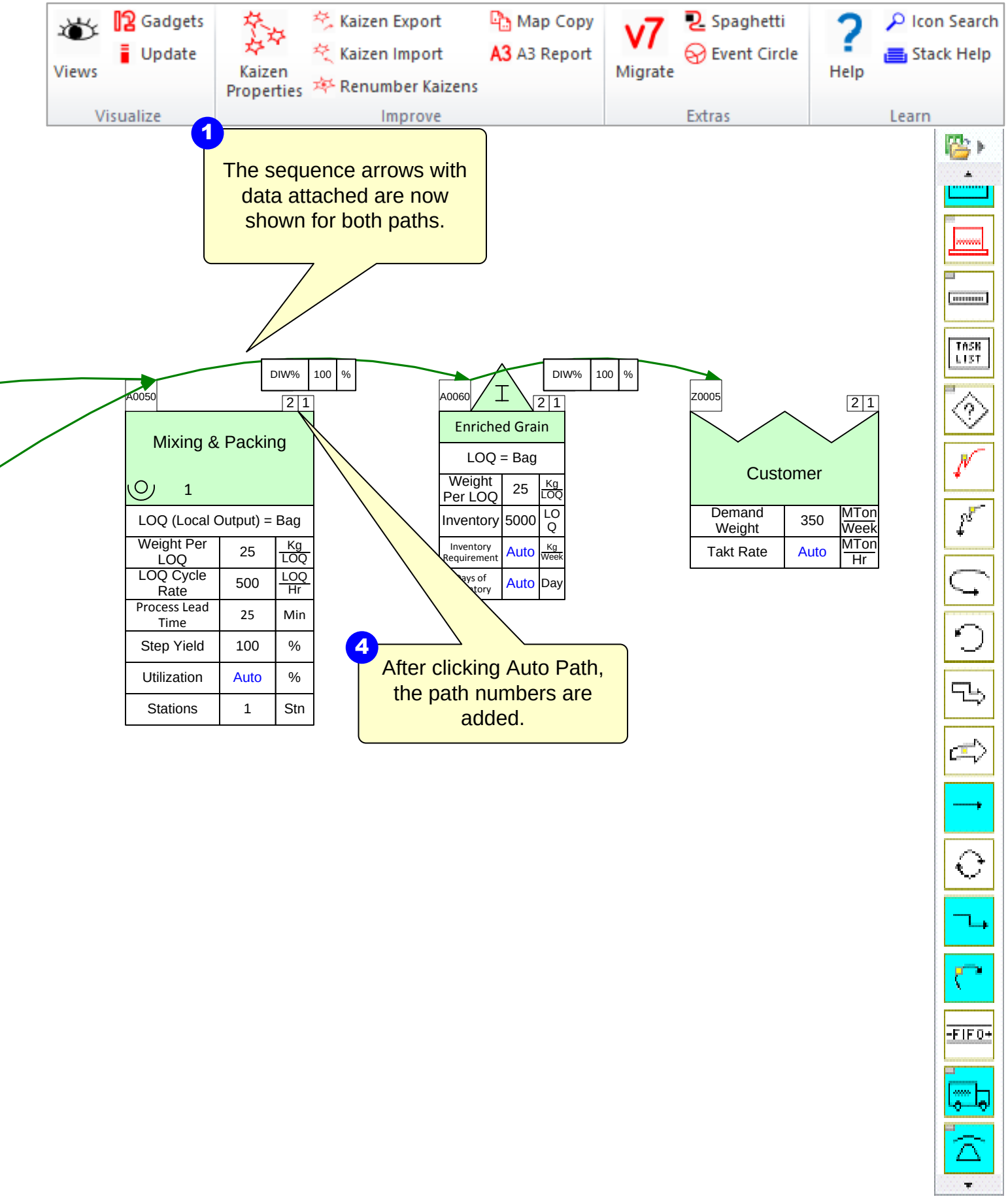




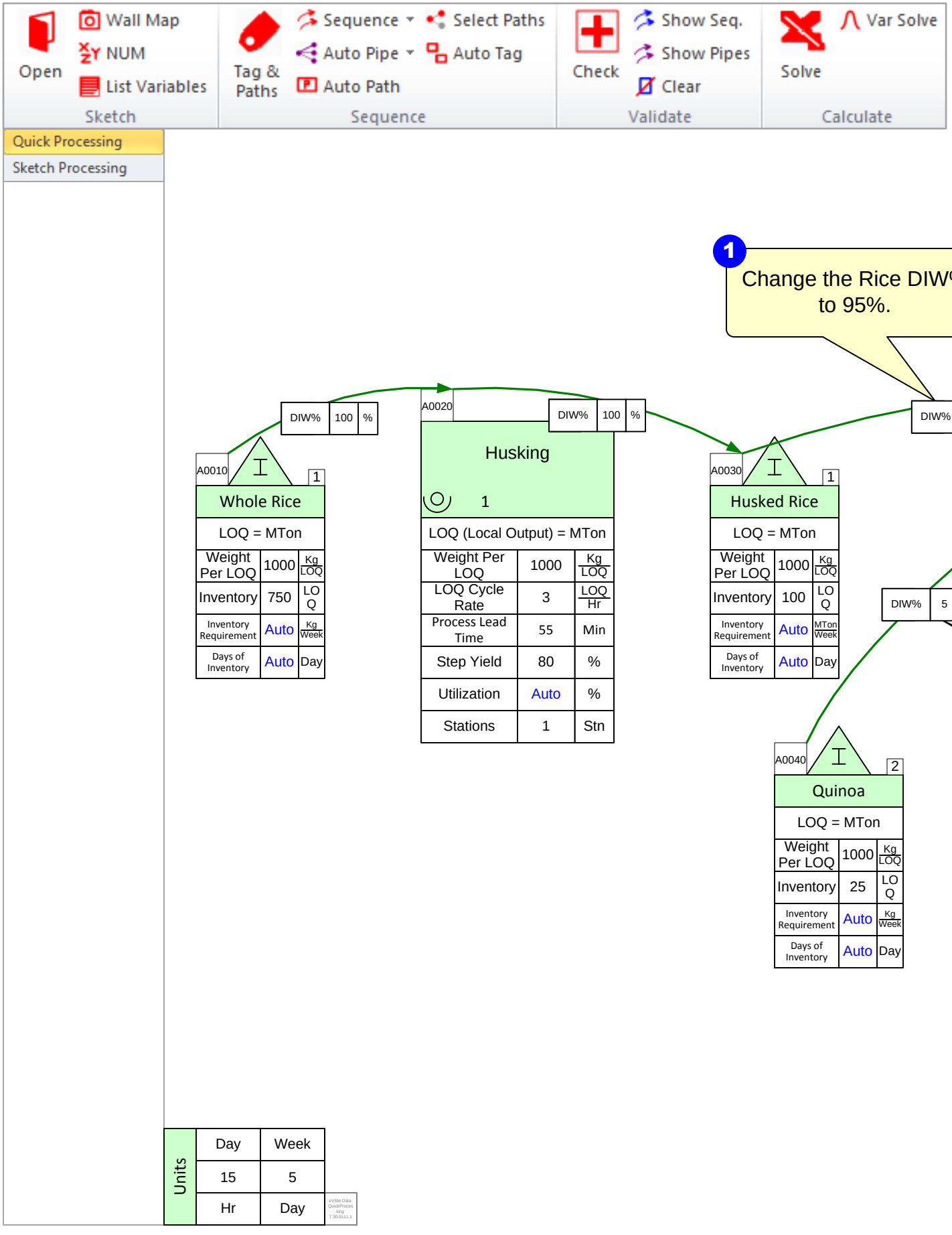


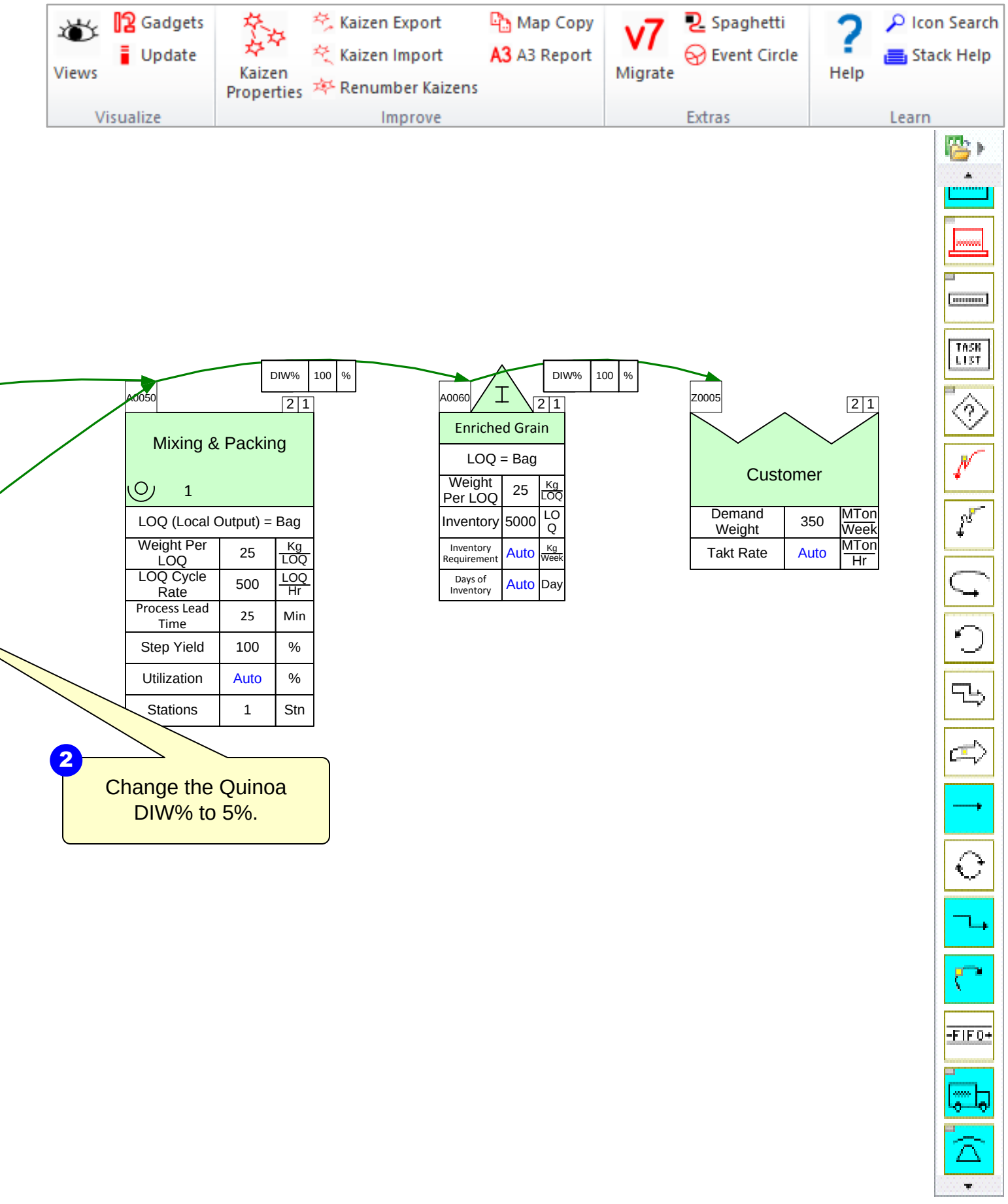
Step 7: Create Path Numbers Based on Sequence Arrows



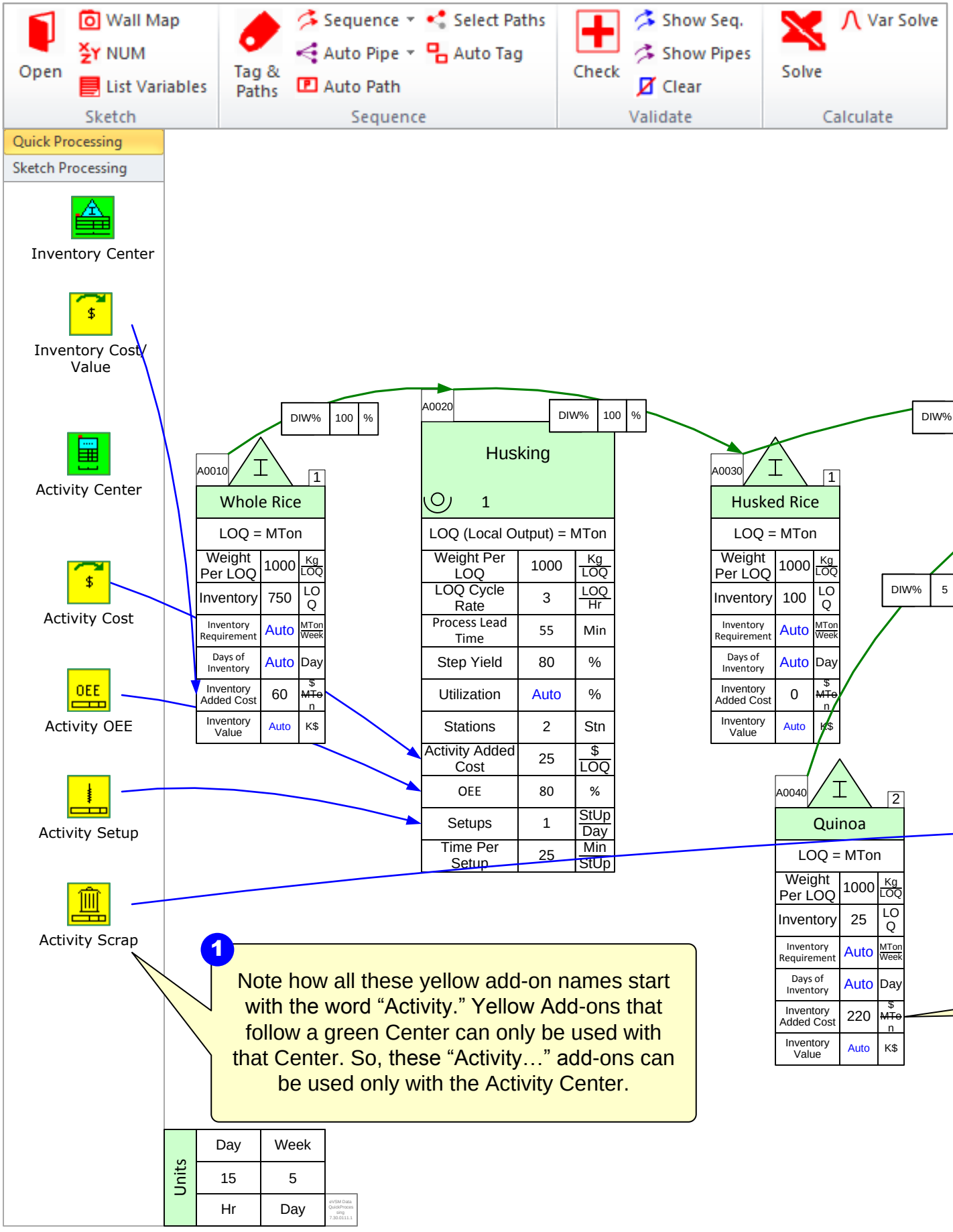


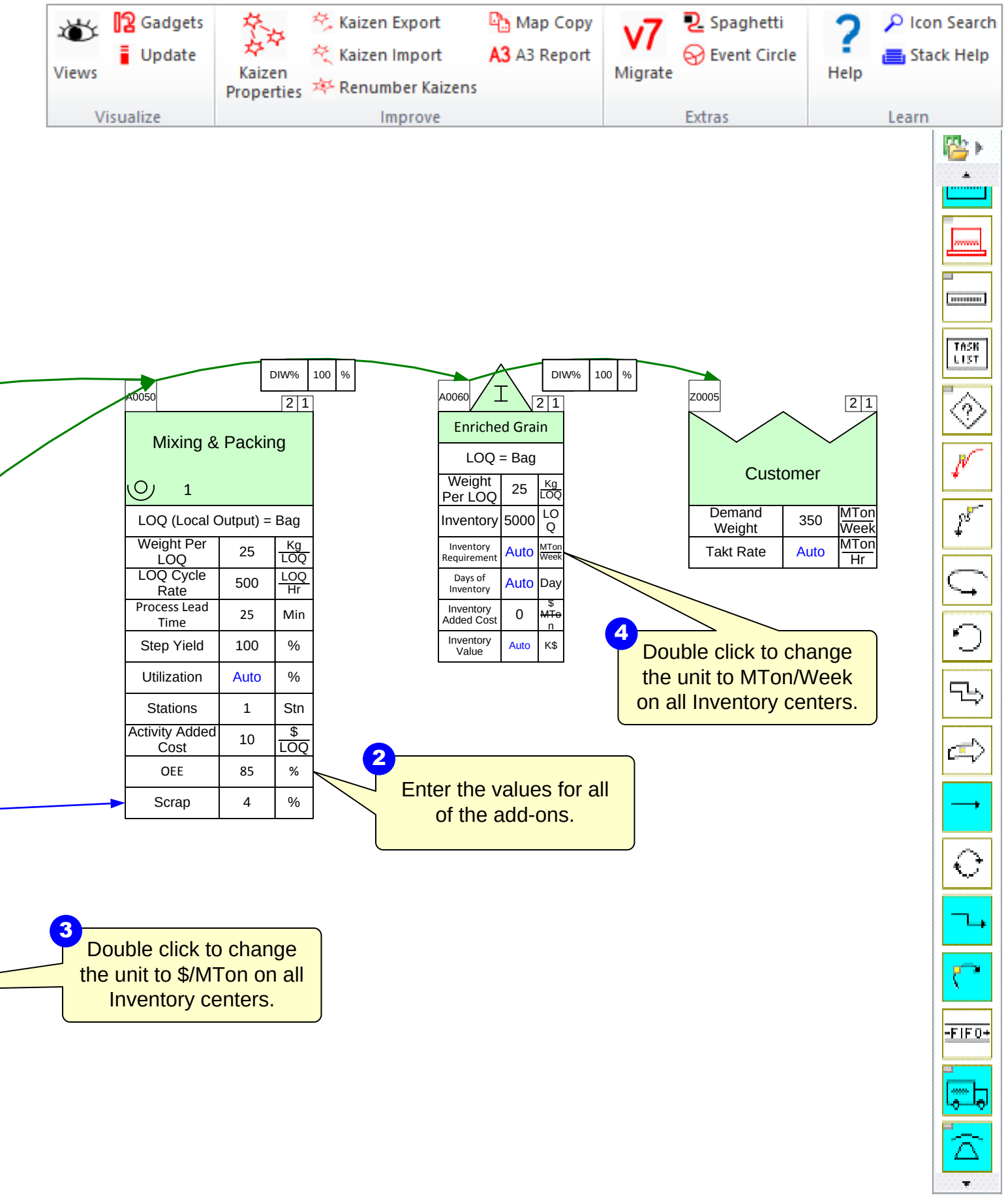
Step 8: Update Sequence Data



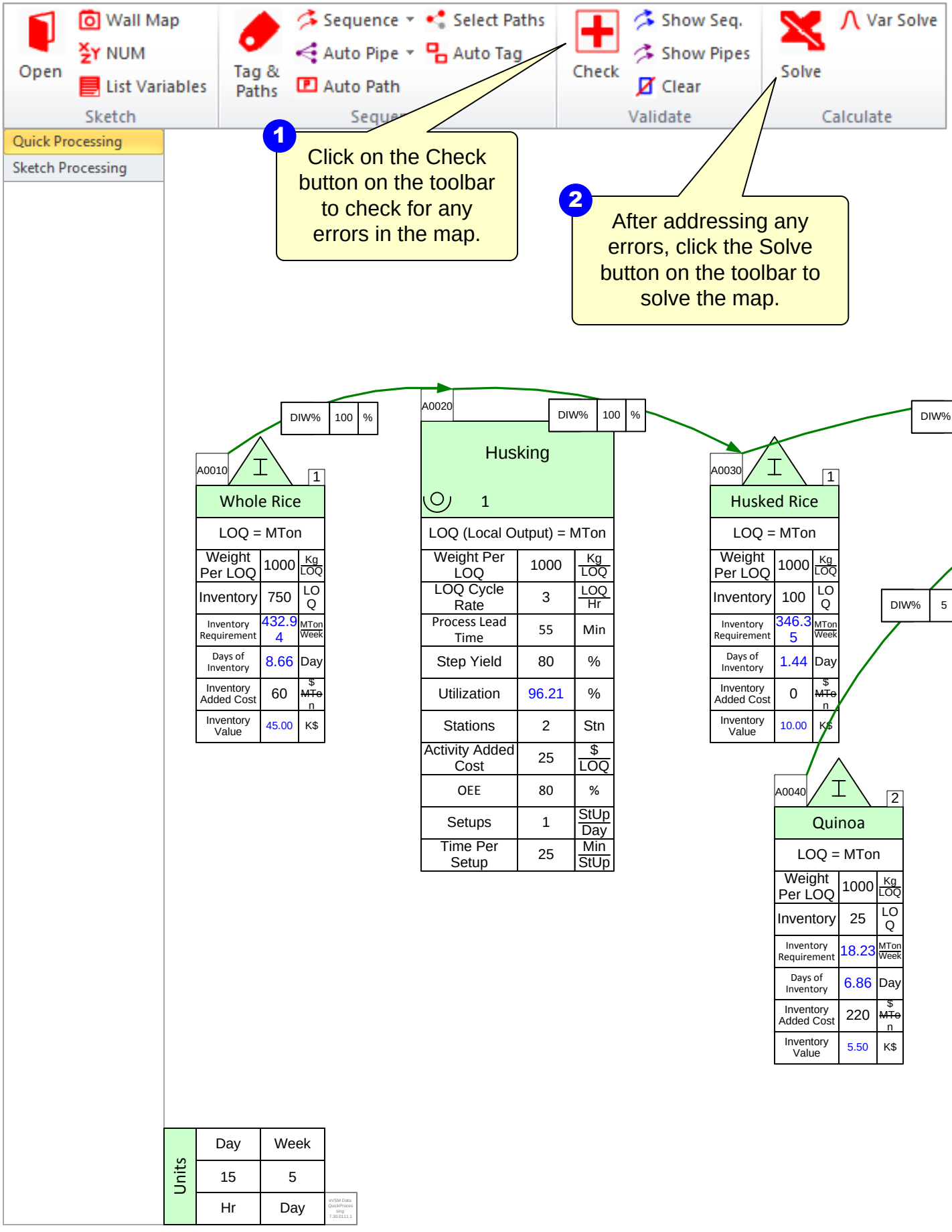


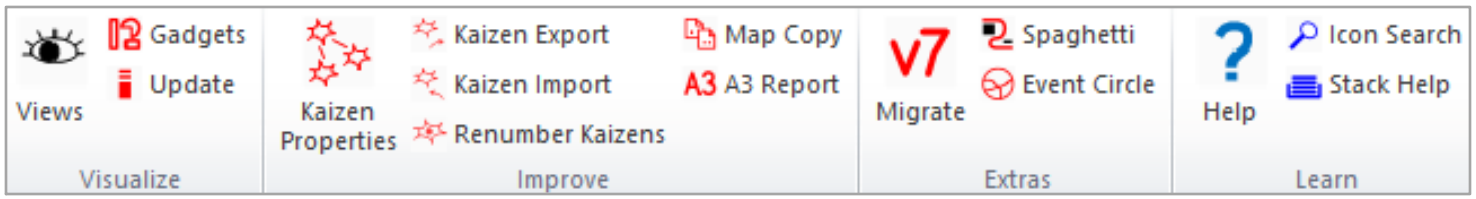
Step 9: Add-Ons

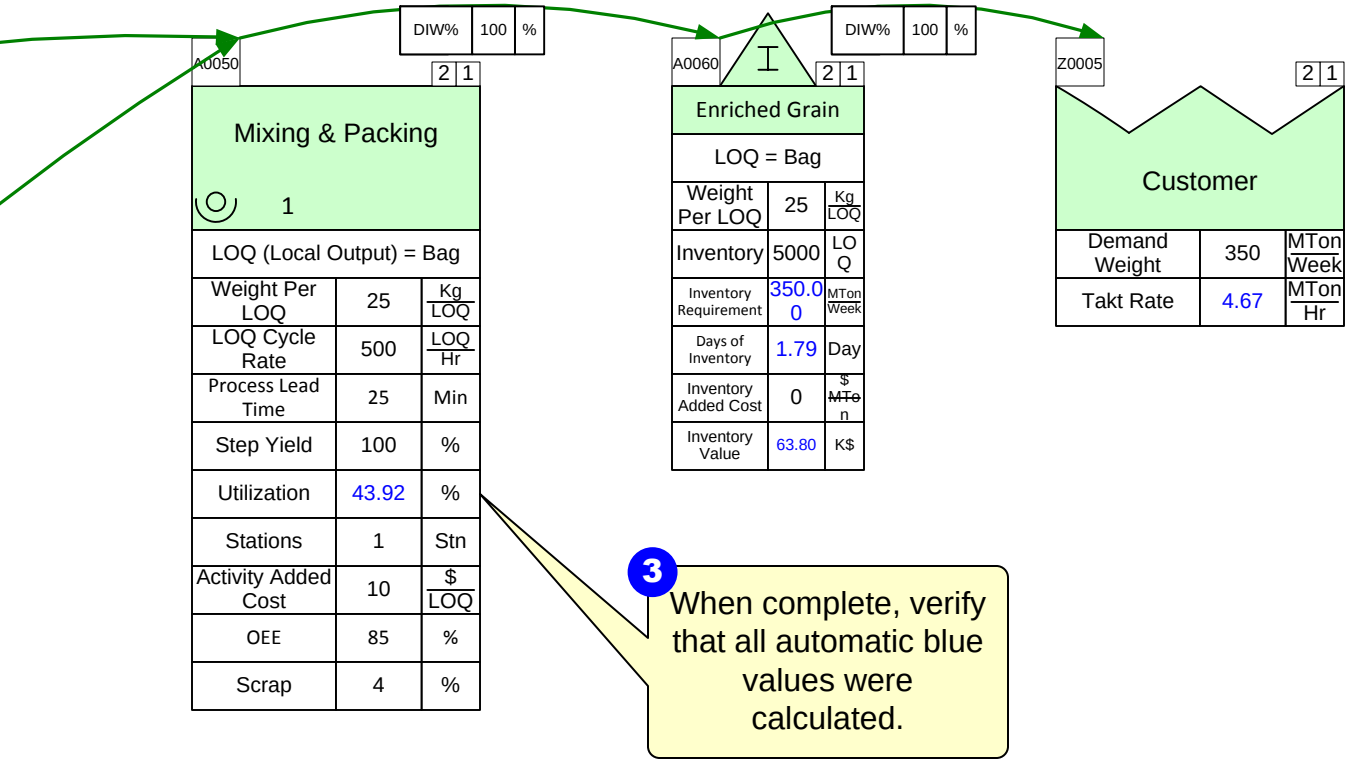


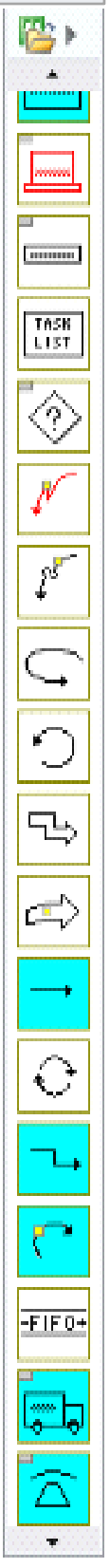


Step 10: Solve the model

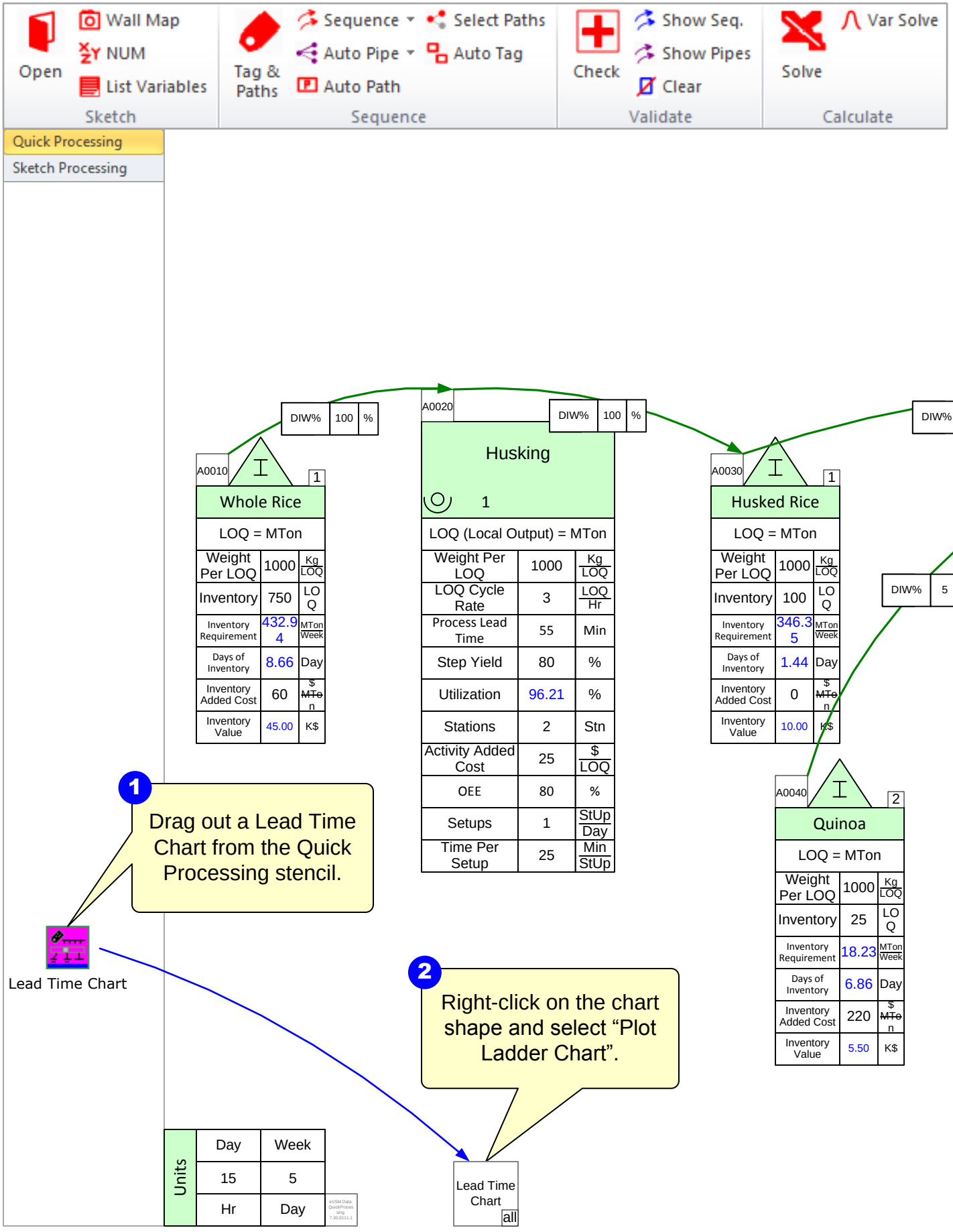


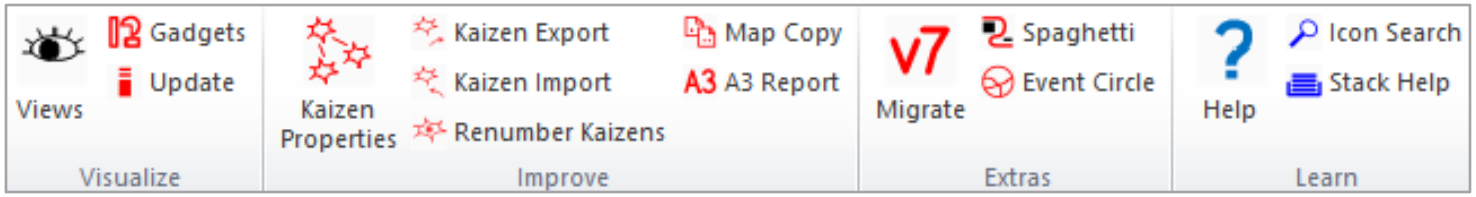


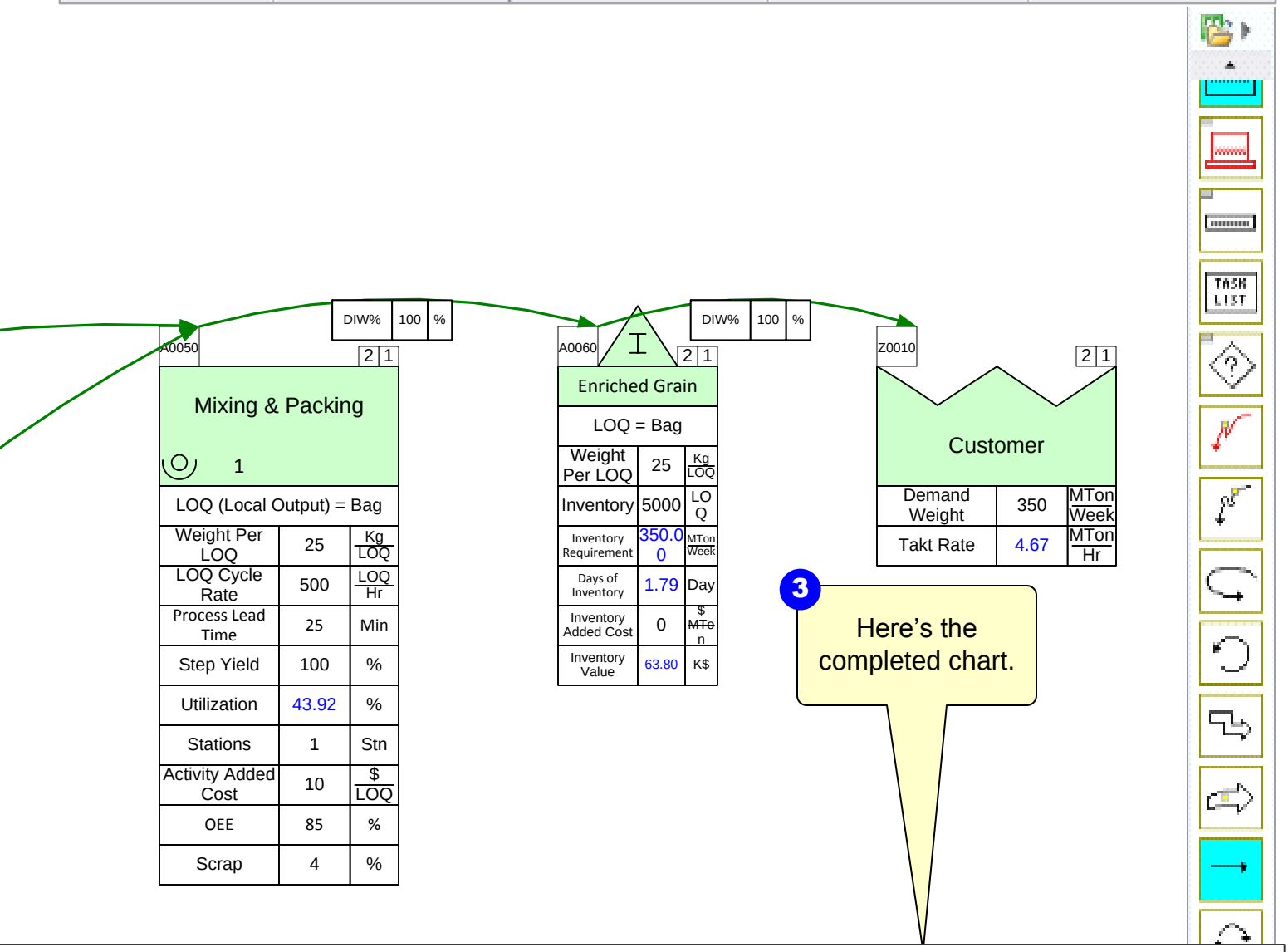


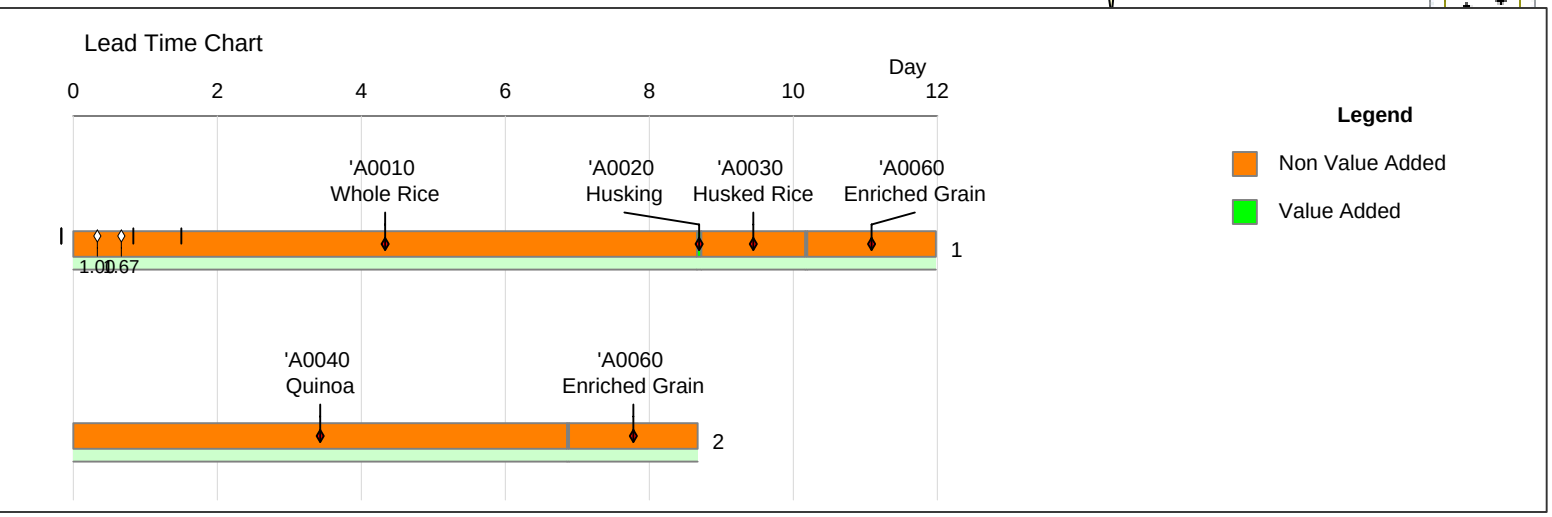


Step 11: Add Lead Time Chart

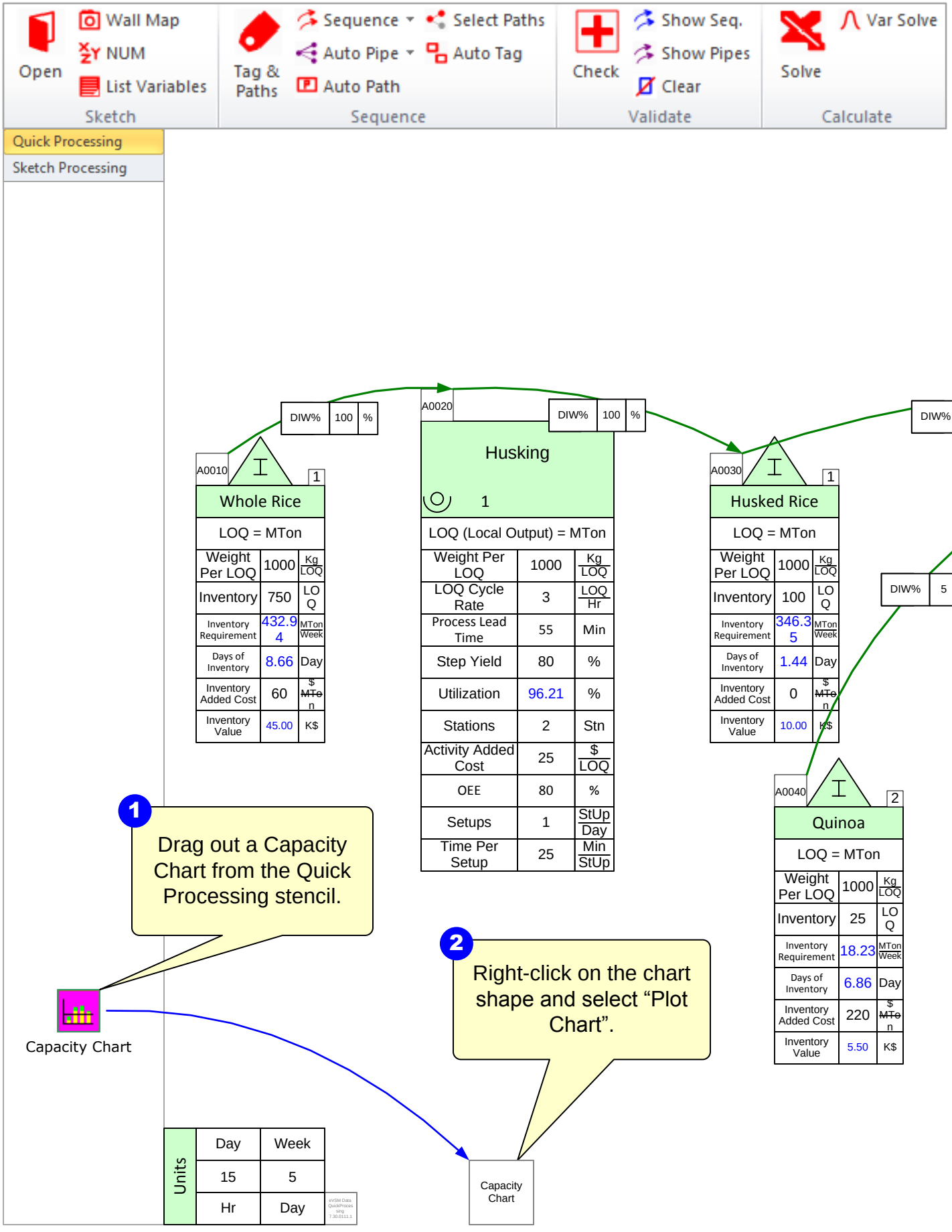


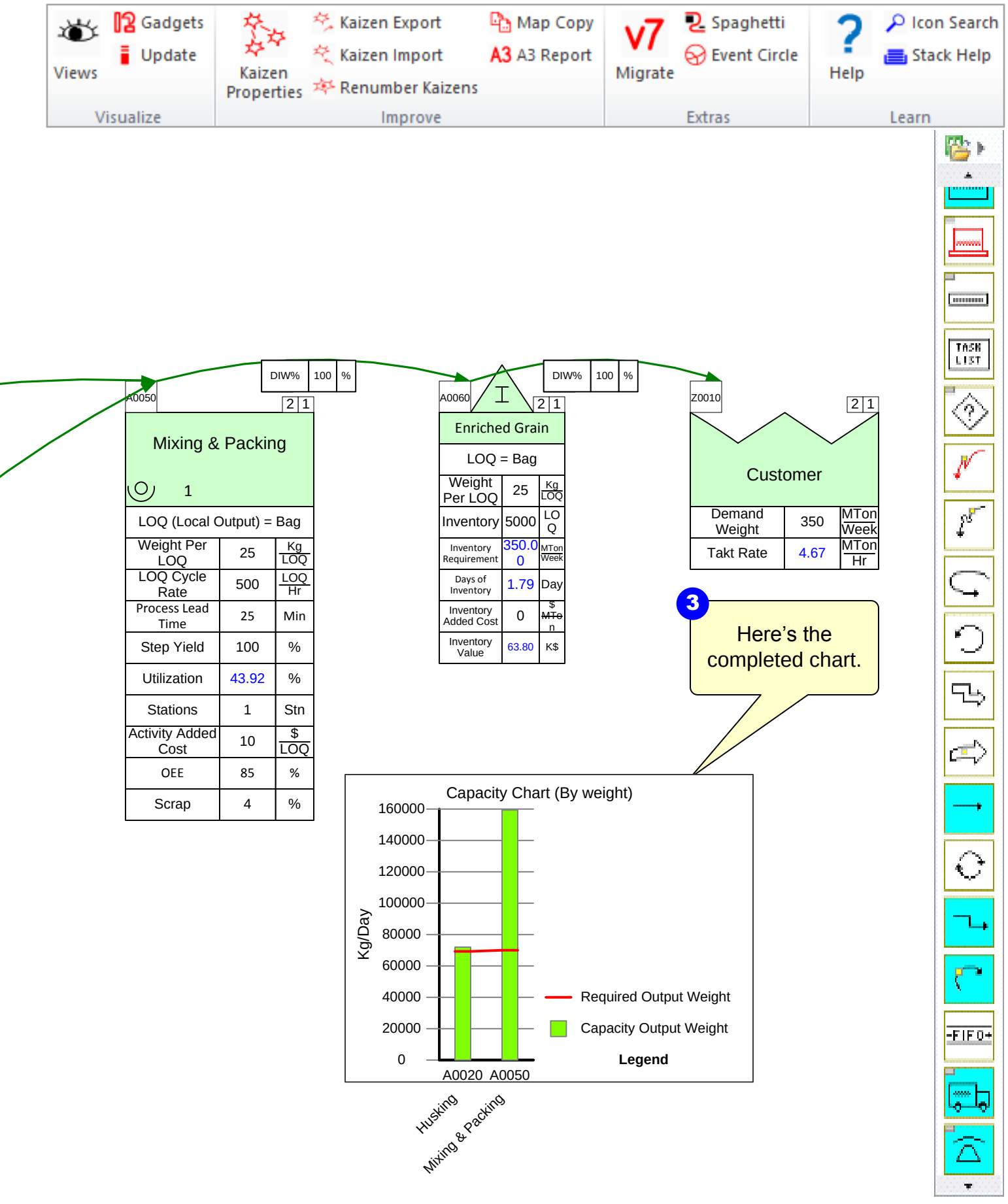




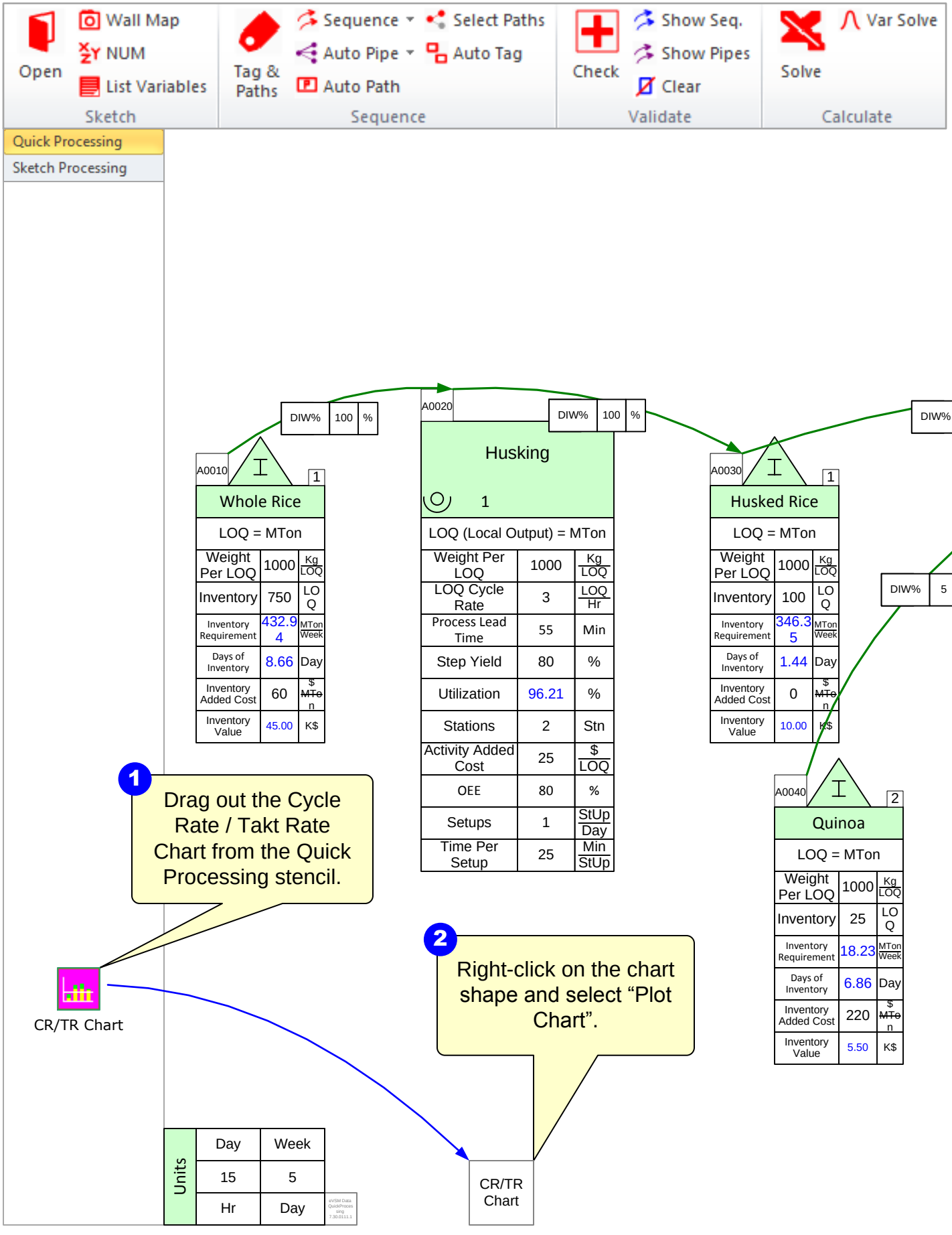


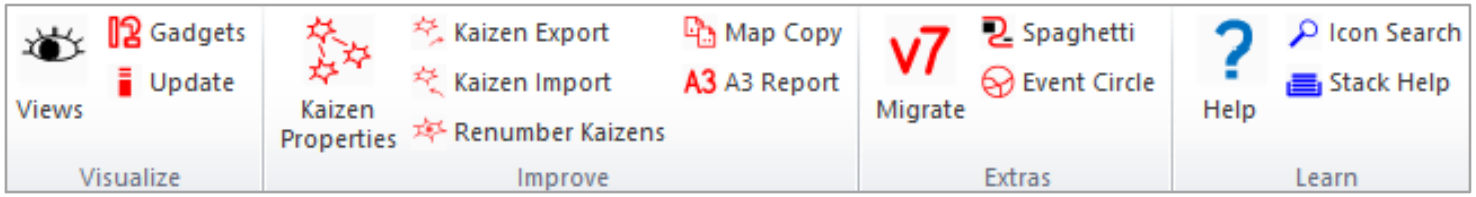
Step 12: Add Capacity Chart

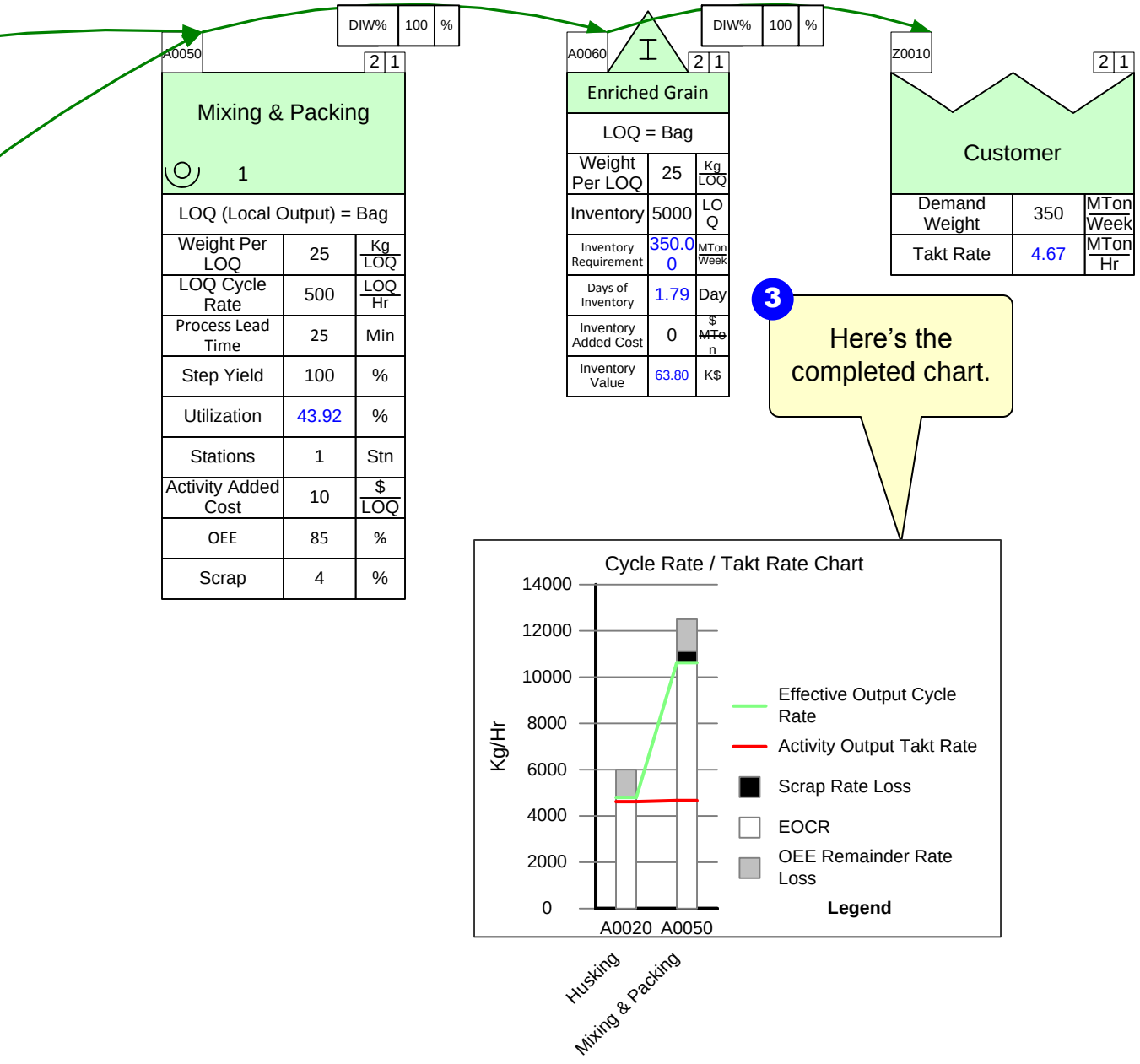




Step 13: Add Cycle Rate / Takt Rate Chart







eVSM Multi-Station Workshop

The Chicago Plant has augmented their old husker with a new husker to increase capacity.

Insert a new page and open the Proc Multi-Station Wizard to calculate the equivalent capacity from the two machines as shown below.

A0040 — 1

Old Husker		
Weight per LOQ_M	1000	Kg / LOQ
LOQ Cycle Rate_M	2	LOQ / Hr
Step Yield_M	80	%
Stations_M	1	Stn
Activity Time_M	15	Hr / Day
OEE Percent_M	78	%
Tot LOQ Cycle Rate	33.33	Kg / Min
CT Capacity Per Day	30000.00	Kg / Day
WPL Contributor	30.00	LOQ / Day
All Stations Time	15.00	Hr / Day
Wt Avg SY Fac_M	18720.00	Kg / Day
Capacity Per Day	23400.00	Kg / Day

A0050 — 1

New Husker		
Weight per LOQ_M	1000	Kg / LOQ
LOQ Cycle Rate_M	4	LOQ / Hr
Step Yield_M	80	%
Stations_M	1	Stn
Activity Time_M	15	Hr / Day
OEE Percent_M	82	%
Tot LOQ Cycle Rate	66.67	Kg / Min
CT Capacity Per Day	60000.00	Kg / Day
WPL Contributor	60.00	LOQ / Day
All Stations Time	15.00	Hr / Day
Wt Avg SY Fac_M	39360.00	Kg / Day
Capacity Per Day	49200.00	Kg / Day

Z0010 — 1

Multiple Station Equiv.		
LOQ Cycle Rate	3.00	LOQ / Hr
Weight Per LOQ	1000.00	Kg / LOQ
Step Yield	80.00	%
Stations	2.00	Stn
OEE	80.67	%
Activity Time	15.00	Hr / Day
MS CT Capacity Per Day	90.00	MTon / Day
MS Capacity Per Day	72.60	MTon / Day
Wt Avg SY Fac	58.08	MTon / Day

Day
15
Hr

eVSM - Improvements Workshop

In looking at the current value stream, there has been concern raised about the shelf-life impact on the enriched rice product of holding large inventories of Quinoa and Whole Grain. It should be easy to manage these stores to an average inventory of 5 days of supply each.

The husking process is running near capacity and often proves to be a bottleneck given variation in demand and unpredictable downtime. Speeding up the equipment unfortunately seems to increase the downtime. It seems important to both improve the cycle rate and the OEE of the equipment here even though its expected to be a challenge.

You can envisage the above by first marking up the current state map

1. Add kaizen bursts to the map

2. Add impact/ease of implementation ratings to the bursts

3. Draw a Kaizen Impact matrix (See back index in eVSM User Guide)

4. Create a Kaizen Key and a Kaizen Report

Assuming that the improvements identified above are targeted to manage the inventories of both the Quinoa and Whole Grain to an average 5 days and that the husking cycle rate is targeted to improve to an average 3.5 MTons/Hr at each station, create a future state map that shows the impact of the changes.

Chicago Rice – Resource Modeling

Exercise

With your group, read the information below and then:

1. Model the resources for the activity.
2. Show the data associated with the resource handling as well as resource pipe data.
3. Calculate the map.
4. Identify what charts would be useful to visualize the value stream and mark these up.
5. Identify where there is a bottleneck.

Background and Overview

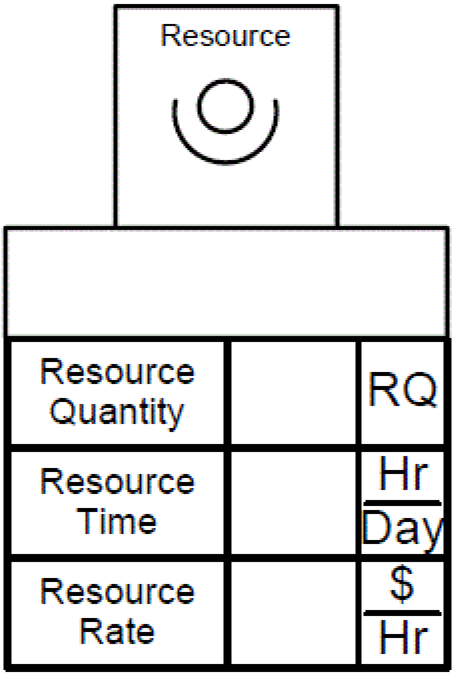
Chicago Rice Inc. sells an enriched grain product which is made from a combination of rice and quinoa. The plant line first husks the whole rice then mixes the rice with the quinoa as an enriched grain product. You take a second value stream walk with the plant supervisor to model the resource allocation for the activity processes.

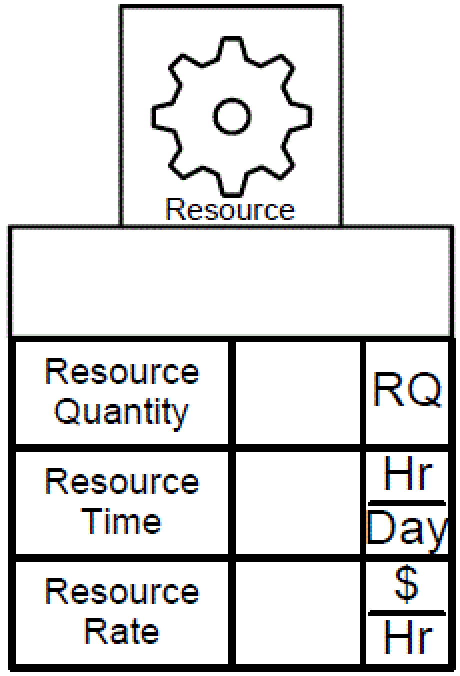
Value Stream Walk

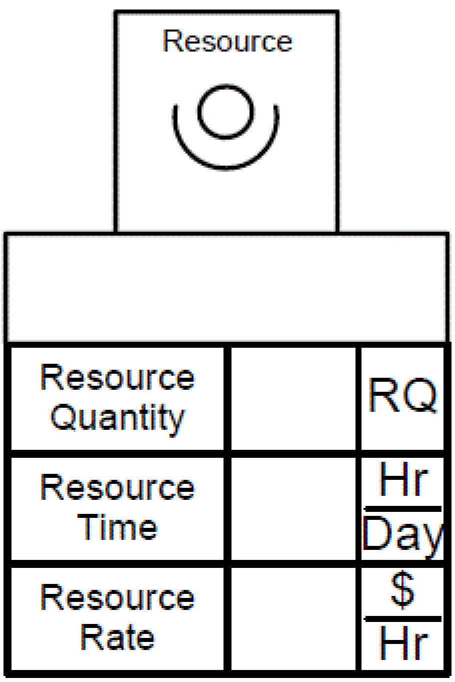
The plant supervisor explains how resources are coming from technicians as well as machines. You first notice that the Husking activity has three different resources being piped into it. The first is a maintenance technician who has a resource quantity of 1 and works 2 hours a day. His setup time takes 60 minutes. The second is a Huskers machine running 15 hours a days with a resource quantity of 2. It has a process time of 20 minutes and a setup time of 50 minutes.

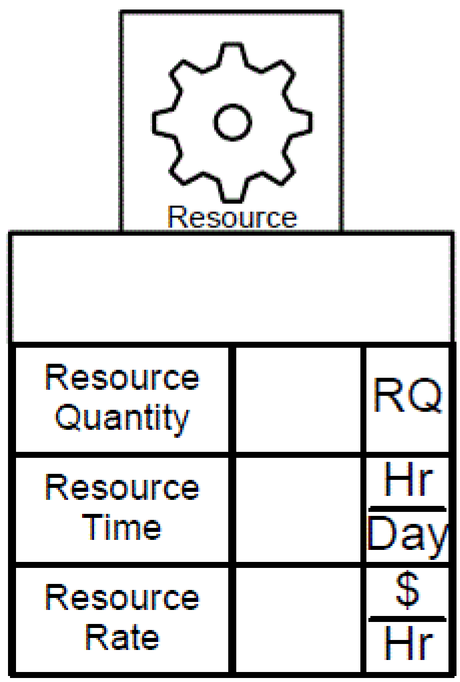
The third resource is an operator who is being shared between the Husking activity and the Mixing & Packing activity. That operator has a resource quantity of 2, and works 15 hours a day. The resource process time for the Husking activity is 15 minutes per LOQ with a walk time of 1 minute. The resource process time is 10 seconds per LOQ with a 5 second walk time for the Mixing & Packing activity. The Mixing & Packing has a second operator working 15 hours day and a resource quantity of 1. The resource process time is 10 seconds per LOQ.

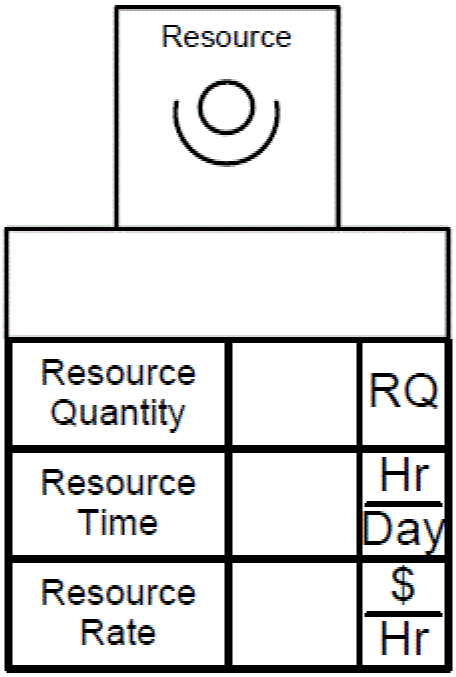
Resource Templates

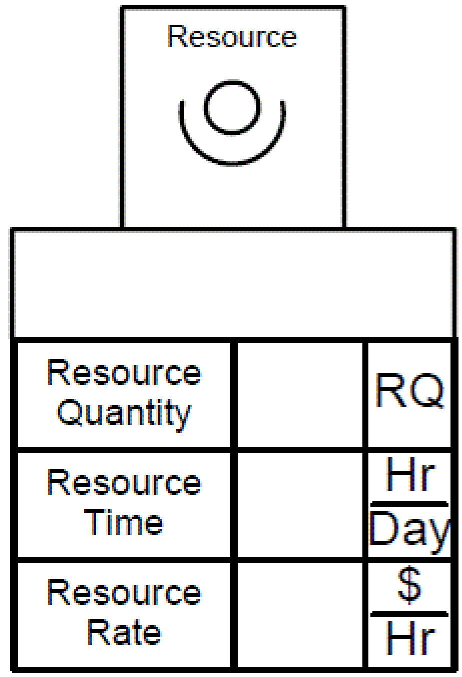


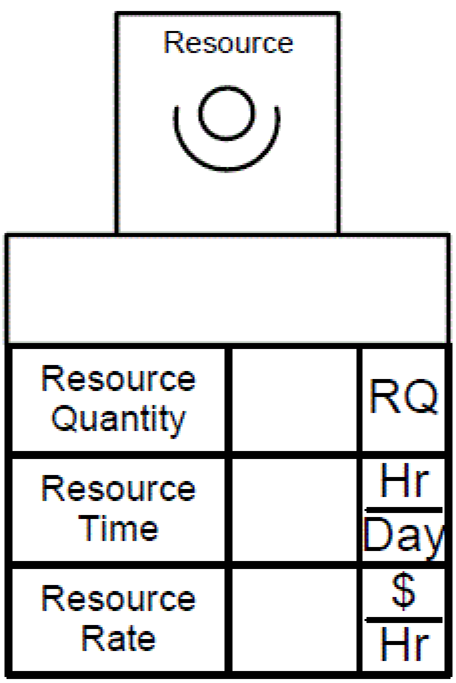


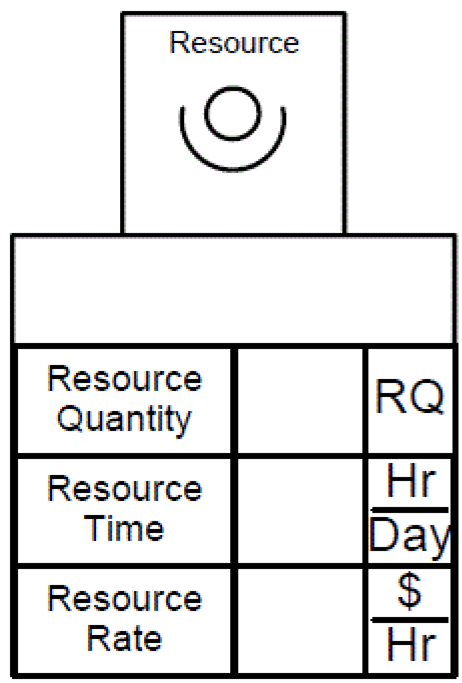






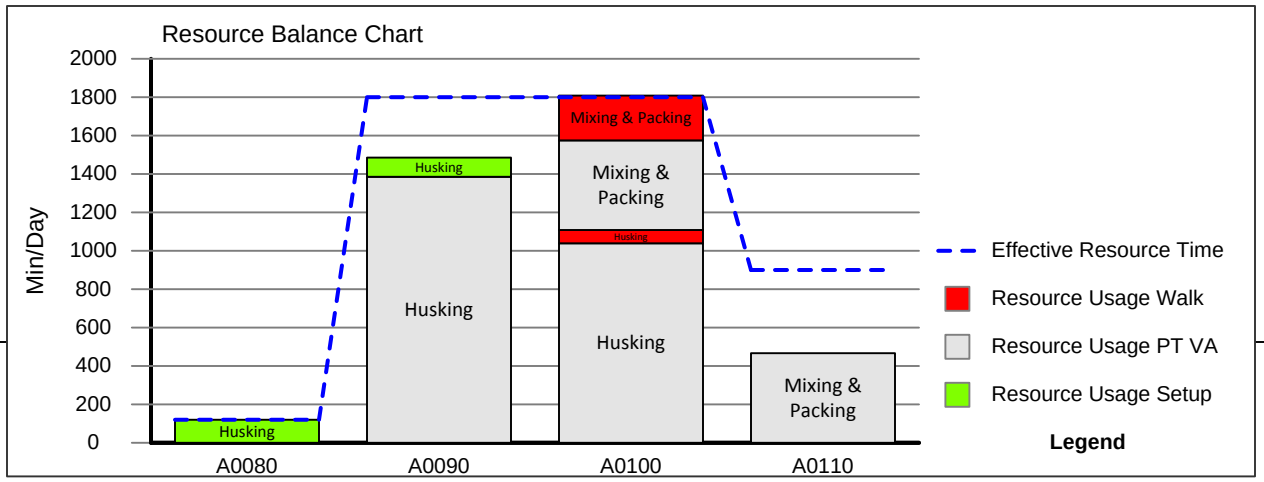






eVSM - Resource Workshop

1. Take the existing Plant map to add the resource centers to using the same Quick Processing stencil.
2. Drag out a Resource Center and fill in the appropriate data.
3. Drag out the Resource Pipe and make sure to glue both ends of an operation tag.
4. Check the map and then Solve for the calculated fields.
5. Make the Walk Time and Setup Time visible using the Views button in the toolbar.
6. Draw the Resource Balance Chart.



Maintenance

Production

Plant Value Stream

A0080 all

MTech

Resource Quantity	1	RQ
Resource Time	2	Hr / Day

MTech

Huskers

Operator 1

Operator 2

Resource PT	0	Min / LOQ
Resource Walk Time	0	Min / LOQ
Resource Setup Time	60	Min / StUp

Resource PT	20	Min / LOQ
Resource Walk Time	0	Min / LOQ
Resource Setup Time	50	Min / StUp

A0090 all

Huskers

Resource Quantity	2	RQ
Resource Time	15	Hr / Day

Resource PT	15	Min / LOQ
Resource Walk Time	1	Min / LOQ
Resource Setup Time	0	Min / StUp

A0100 all

Operator 1

Resource Quantity	2	RQ
Resource Time	15	Hr / Day

DIW% 100 %

A0010 1

Whole Rice

LOQ = MTon		
Weight Per LOQ	1000	Kg / LOQ
Inventory	750	LOQ
Inventory Requirement	432.94	MTon / Week
Days of Inventory	8.66	Day
Inventory Added Cost	60	$ / MTon
Inventory Value	45.00	K$

A0020 1

Husking

1

LOQ (Local Output) = MTon		
Weight Per LOQ	1000	Kg / LOQ
LOQ Cycle Rate	3	LOQ / Hr
Process Lead Time	55	Min
Step Yield	80	%
Utilization	96.21	%
Activity Added Cost	25	$ / LOQ
OEE	80	%
Setups	1	StUp / Day
Time Per Setup	25	Min / StUp
Stations	2	Stn

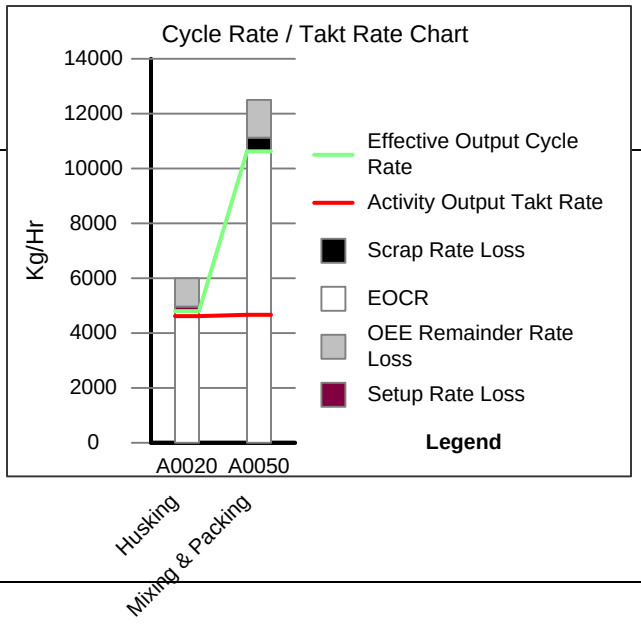
DIW% 100 %

A0030 1

Husked Rice

LOQ = MTon		
Weight Per LOQ	1000	Kg / LOQ
Inventory	100	LOQ
Inventory Requirement	346.35	MTon / Week
Days of Inventory	1.44	Day
Inventory Added Cost	0	$ / Kg
Inventory Value	10.00	K$

Chicago Rice – Resource Modeling



Resource PT	10	Sec / LOQ
Resource Walk Time	5	Sec / LOQ
Resource Setup Time	0	Min / StUp

Resource PT	10	Sec / LOQ
Resource Walk Time	0	Min / LOQ
Resource Setup Time	0	Min / StUp

A0110 all

Operator 2

Resource Quantity	1	RQ
Resource Time	15	Hr / Day

DIW% 95 %

DIW% 5 %

A0040 2

Quinoa

LOQ = MTon		
Weight Per LOQ	1000	Kg / LOQ
Inventory	25	LOQ
Inventory Requirement	18.23	MTon / Week
Days of Inventory	6.86	Day
Inventory Added Cost	220	$ / MTon
Inventory Value	5.50	K$

A0050 2 1

Mixing & Packing

1

LOQ (Local Output) = Bag		
Weight Per LOQ	25	Kg / LOQ
LOQ Cycle Rate	500	LOQ / Hr
Process Lead Time	25	Min
Step Yield	100	%
Utilization	43.92	%
Activity Added Cost	10	$ / LOQ
OEE	85	%
Scrap	4	%
Stations	1	Stn

DIW% 100 %

DIW% 100 %

A0060 2 1

Enriched Grain

LOQ = Bag		
Weight Per LOQ	25	Kg / LOQ
Inventory	5000	LOQ
Inventory Requirement	350.00	MTon / Week
Days of Inventory	1.79	Day
Inventory Added Cost	0	$ / Kg
Inventory Value	63.80	K$

Z0005 2 1

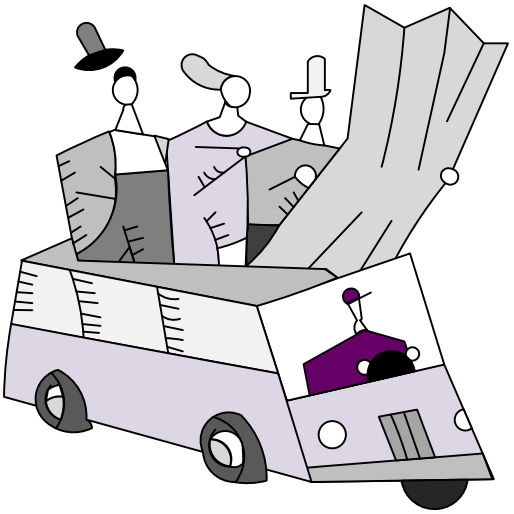
Customer

Demand Weight	350	MTon / Week
Takt Rate	4.67	MTon / Hr

Units	Day	Week
	15	5
	Hr	Day

Part III: Inbound and Outbound Maps

Chicago Rice Inc. sells an enriched grain product which is made from a combination of rice and quinoa. First, the company receives shipments of whole rice from two suppliers and a shipment of quinoa from one supplier. Next, in the plant the rice is husked and combined with the quinoa to form an enriched grain product. Finally, the grain is shipped to two warehouses and then distributed to the two customers.



Enriched Grain - Inbound

Chicago Rice Inc.

Exercise

With your group, read the information below and then:

1. Draw a wall value stream map for the inbound shipments to the plant.
2. Show the data associated with the supplier, transportation, and any costs.
3. Calculate the cumulative costs per step to determine the final cost of the materials when they reach the plant.
4. Calculate the demand for the rice and quinoa and then the demand for each of the suppliers.
5. Identify useful summary metrics for the map.
6. Identify what charts would be useful to visualize the value stream and mark these up.

Background and Overview

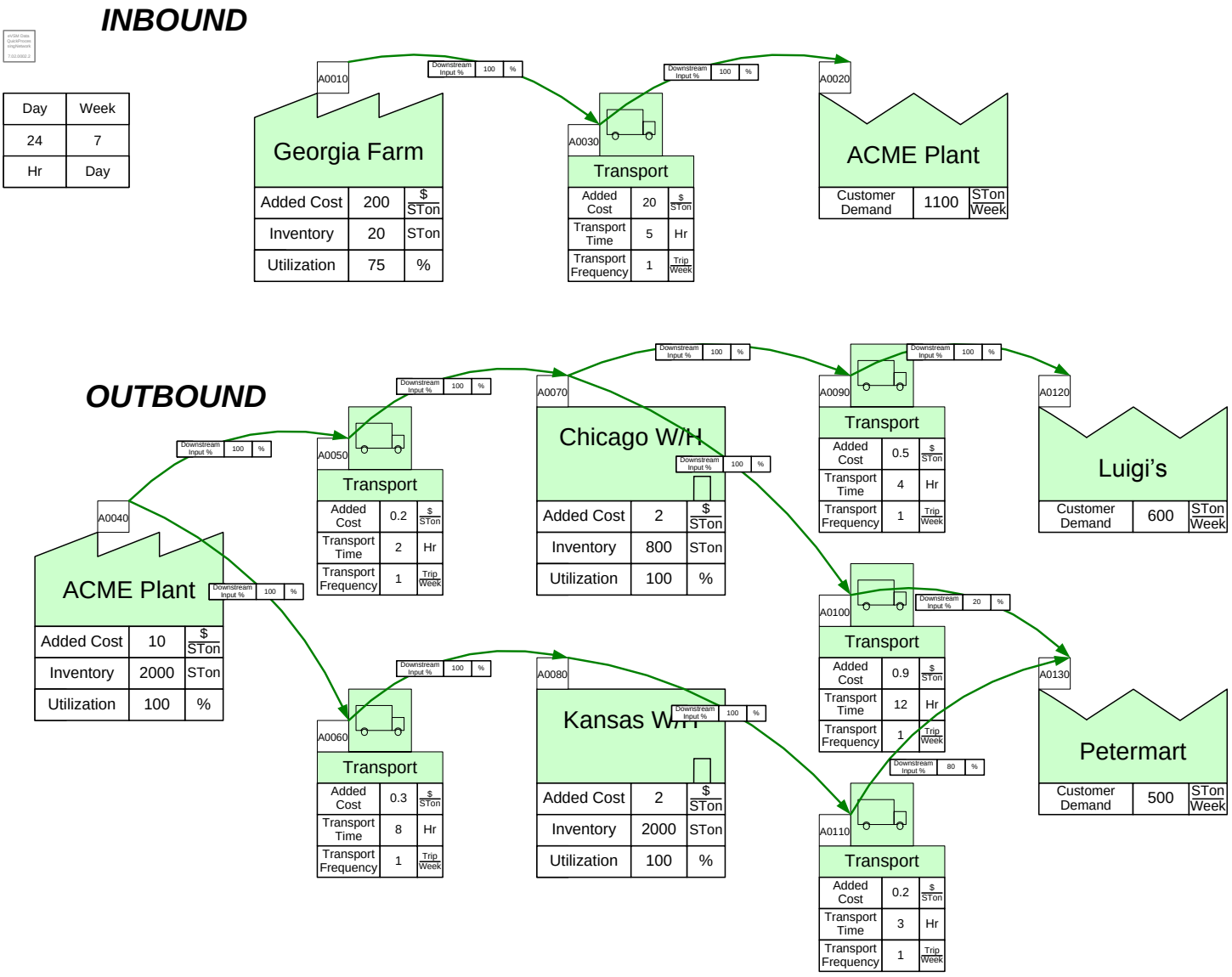
Chicago Rice Inc. sells an enriched grain product which is made from a combination of rice and quinoa. The company buys the whole rice and quinoa from three separate suppliers and has the materials shipped to the plant.

Value Stream Walk

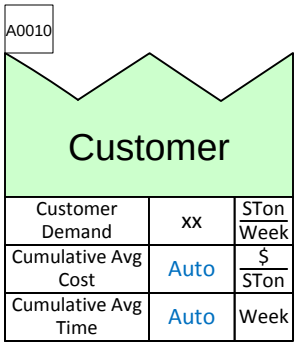
To capture the current state value stream, you meet the purchasing supervisor on Monday morning. The whole rice is supplied by two different suppliers, Rickerman Rice and Juniper Rice. Rickerman Rice charges $50 per metric ton (MTon) and holds an inventory of 1000 MTons. It has a utilization of 75% and Chicago Rice Inc. purchases 50% of their whole rice. Chicago Rice Inc. gets three shipments from Rickerman Rice each week with each shipment taking 8 hours. The shipping costs an additional $10 per MTon. Chicago Rice Inc. purchases the rice from Juniper Rice for $40 per MTon. This supplier has a utilization of 100%, and Chicago Rice Inc. is their only customer. Juniper Rice currently holds 1500 MTons of rice. They send shipments 7 times per week, with each shipment taking 2 hours to deliver. The additional cost of shipping each MTon of rice is $20. Chicago Rice Inc. needs 600 MTons of rice per week, 80% coming from Juniper Rice and 20% coming from Rickerman Rice.

The quinoa is supplied by Quaker Quinoa at a cost of $200 per MTon. Quaker Quinoa has a utilization of 75% and Chicago Rice Inc. purchases 40% share of their quinoa. This supplier currently holds 20 MTons of quinoa at their warehouse and sends out shipments once a week. Each shipment takes 5 hours to reach Chicago Quinoa and adds an additional cost of $20 per MTon. The Chicago Rice Inc. needs 20 MTons of quinoa per week.

Basic Layout of a Network Processing Map



Cheat Sheet for Processing Network Shapes



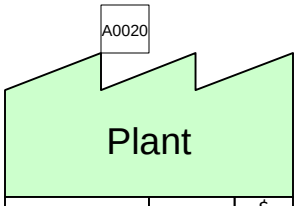
Customer Demand	xx	STon / Week
Cumulative Avg Cost	Auto	$ / STon
Cumulative Avg Time	Auto	Week

The Customer Center is used at the end of a map to show the demand for each product.

The periodic demand for goods produced by this value stream

Cumulative average cost of items at this point in the value stream

Cumulative average time elapsed at this point in the value stream



Added Cost	0	$ / STon
Inventory	0	STon
Utilization	0	%
Share	100	%
Demand	Auto	STon / Week
Cumulative Avg Cost	Auto	$ / STon
Inventory Time	Auto	Day
Inventory Value	Auto	K$
Cumulative Avg Time	Auto	Week

The Plant Center shows the amount of inventory held and the costs and data associated with that inventory.

Added cost due to this step in the value stream

The number of items waiting to be worked upon.

Required Output /Possible Output.

Percent of output or inventory attributable to this value stream

The customer demand.

Cumulative average cost of items at this point in the value stream

The time value associated with this inventory.

The total value of inventory at this location.

Cumulative average time elapsed at this point in the value stream

Cheat Sheet for Processing Network Shapes

A0010

Warehouse or Mixing Center		
Added Cost	0	$/STon
Inventory	0	STon
Utilization	0	%
Share	100	%
Demand	Auto	STon/Week
Cumulative Avg Cost	Auto	$/STon
Inventory Time	Auto	Day
Inventory Value	Auto	K$
Cumulative Avg Time	Auto	Week

The Warehouse or Mixing Center shows where multiple shipments are sent, mixed, and then re-shipped.

Added cost due to this step in the value stream

The number of items waiting to be worked upon.

Required Output /Possible Output.

Percent of output or inventory attributable to this value stream

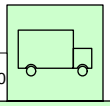
The customer demand.

Cumulative average cost of items at this point in the value stream

The time value associated with this inventory.

The total value of inventory at this location.

Cumulative average time elapsed at this point in the value stream



A0020

Transport		
Added Cost	0	$/STon
Transport Time	0	Hr
Transport Frequency	0	Trip/Week
Transport Inventory	Auto	STon
Demand	Auto	STon/Week
Cumulative Avg Cost	Auto	$/STon
Inventory Value	Auto	K$
Cumulative Avg Time	Auto	Week

The Transport Center tracks shipments and the associated times and costs with each shipment.

Added cost due to this step in the value stream

The time taken to deliver items.

How often each transport trip occurs.

The quantity of inventory on this transport.

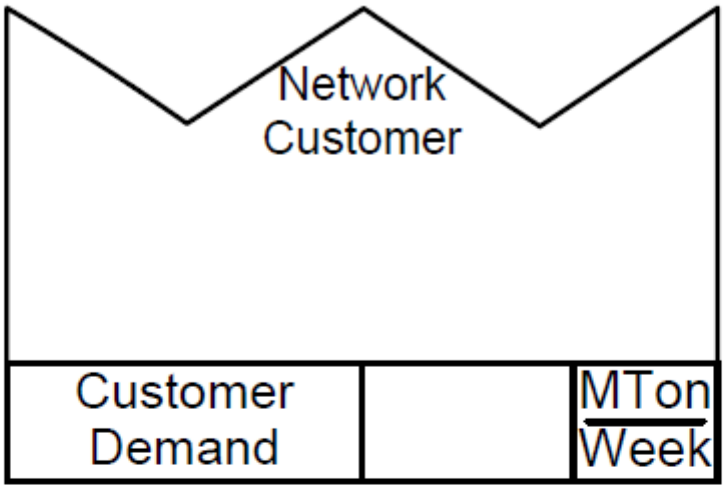
The customer demand.

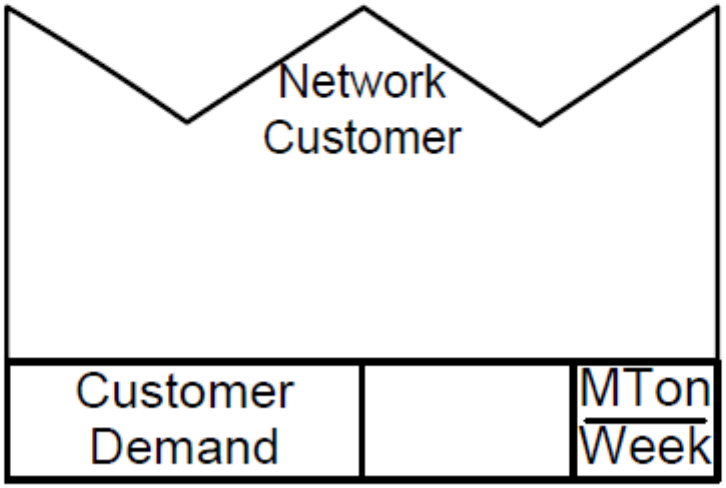
Cumulative average cost of items at this point in the value stream

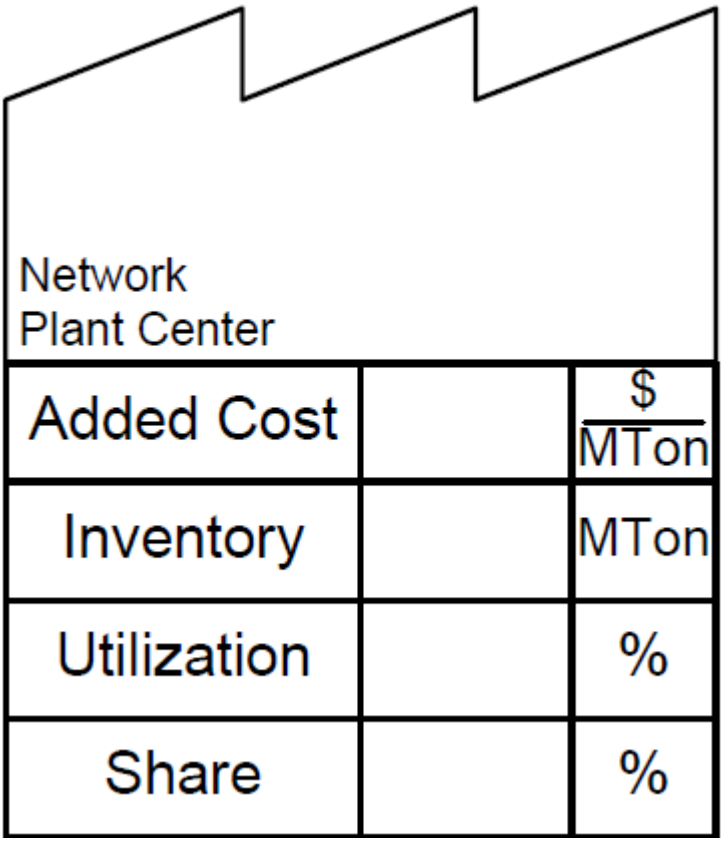
The total value of inventory at this location.

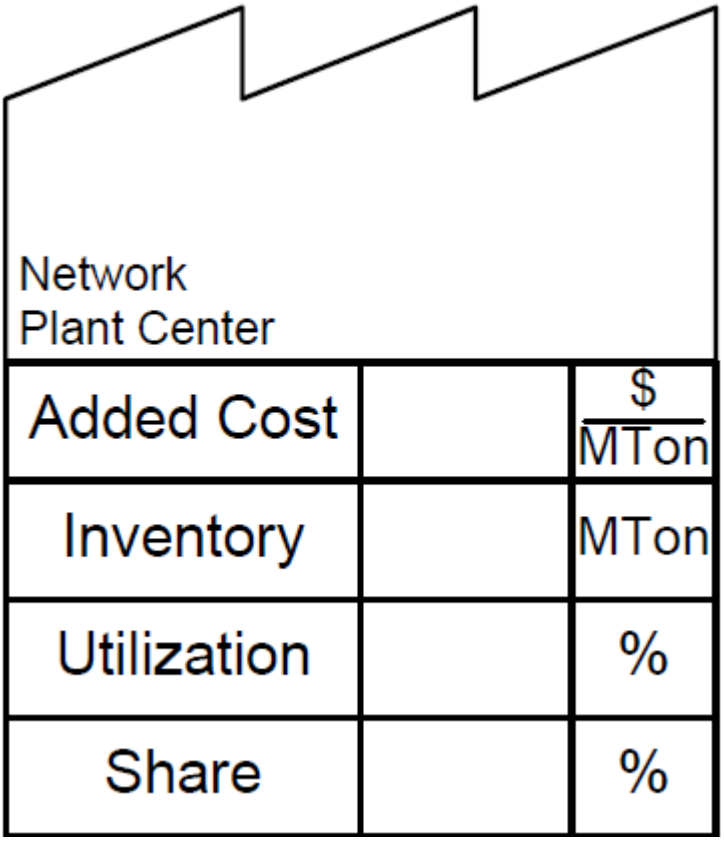
Cumulative average time elapsed at this point in the value stream

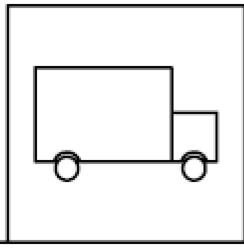
Inbound Network Templates



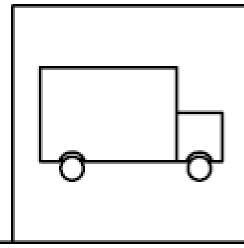




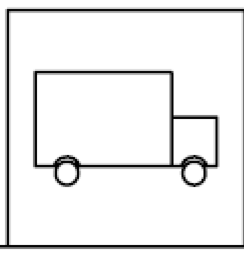




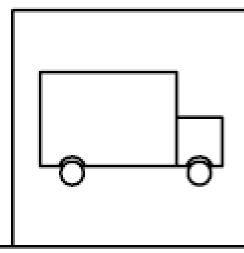
Transport		
Added Cost		$ / MTon
Transport Time		Hr
Transport Frequency		Trip / Week



Transport		
Added Cost		$ / MTon
Transport Time		Hr
Transport Frequency		Trip / Week



Transport		
Added Cost		$ / MTon
Transport Time		Hr
Transport Frequency		Trip / Week



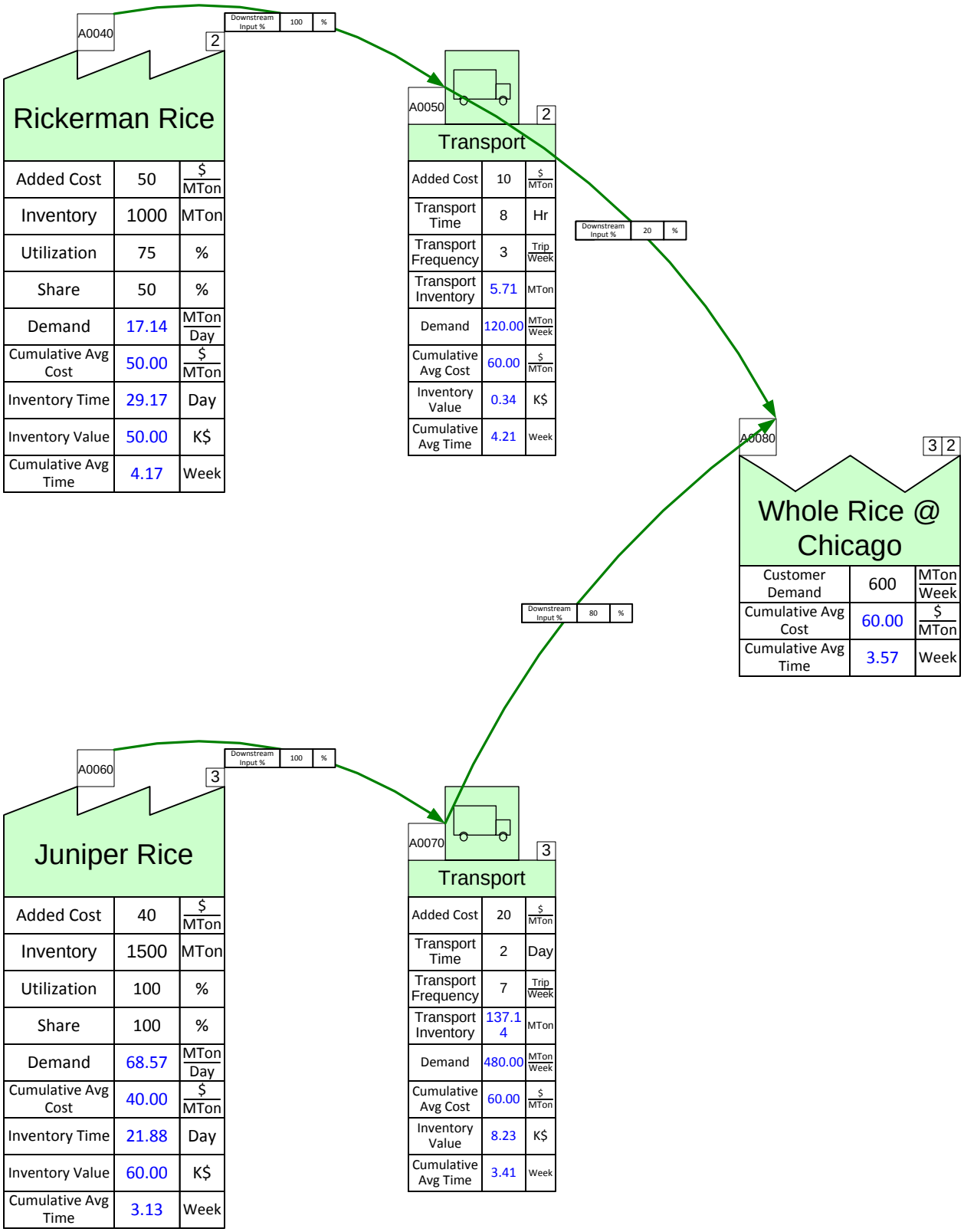
Transport		
Added Cost		$ / MTon
Transport Time		Hr
Transport Frequency		Trip / Week

eVSM Inbound Workshop

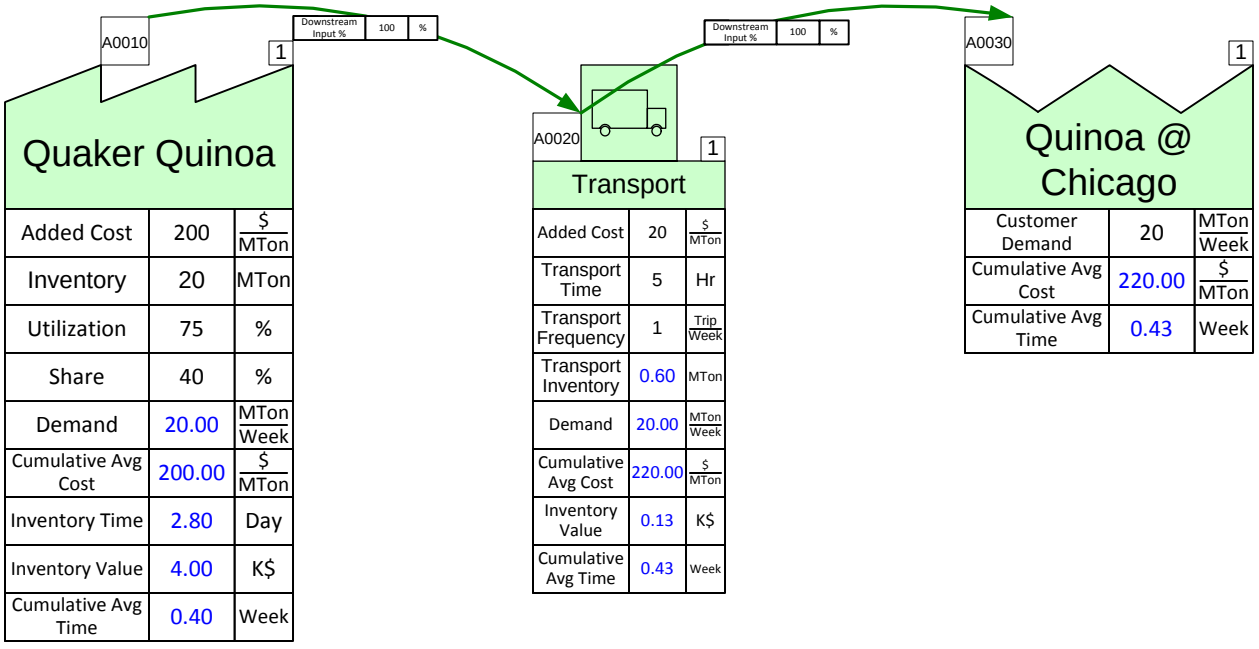
1. Insert the picture of the wall map using the Wall Map button in the eVSM toolbar.
2. Use the Open command in the eVSM toolbar to open the Quick Processing Network stencil.
3. Draw the map in eVSM.
4. Create sequence arrows and note that the sum of the DIW values coming into an activity needs to add up to 100%.
5. Use the Auto Path button in the toolbar to assign path numbers.
6. Use the Auto Tag button to sequentially number the tags. (this affects charting)
7. Check the map and then Solve for the calculated fields.

Day	Week
24	7
Hr	Day

Inbound – Whole Rice



Inbound – Quinoa



Enriched Grain - Outbound

Chicago Rice Inc.

Exercise

With your group, read the information below and then:

1. Draw a wall value stream map for the product showing the supplier, warehouses, transportation, and customers.
2. Show the data associated with the warehouses, transportation, and customers.
3. Calculate how many days of inventory you have at the plant and warehouses.
4. Calculate the demand at each warehouse and at the Chicago plant based on the customer demand.
5. Identify useful summary metrics for the map.
6. Identify what charts would be useful to visualize the value stream and mark these up.

Background and Overview

Chicago Rice Inc. sells an enriched grain product which is made from a combination of rice and quinoa. The outbound operations transport the enriched grain product to mixing centers and then to the two customers, Maple Leaf Groceries and Jason Foods.

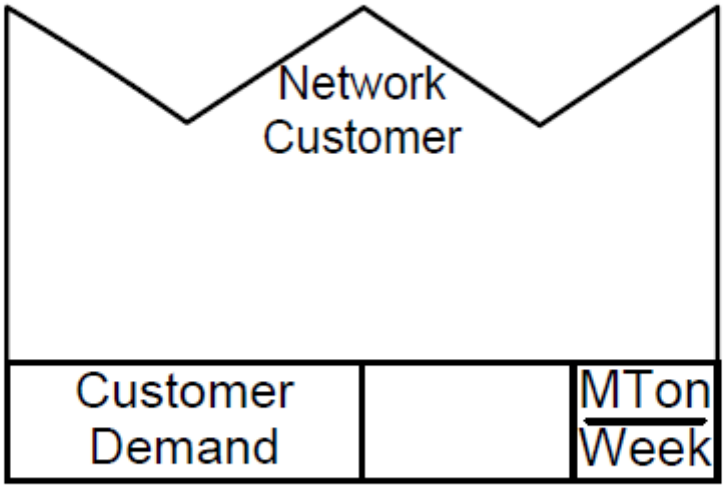
Value Stream Walk

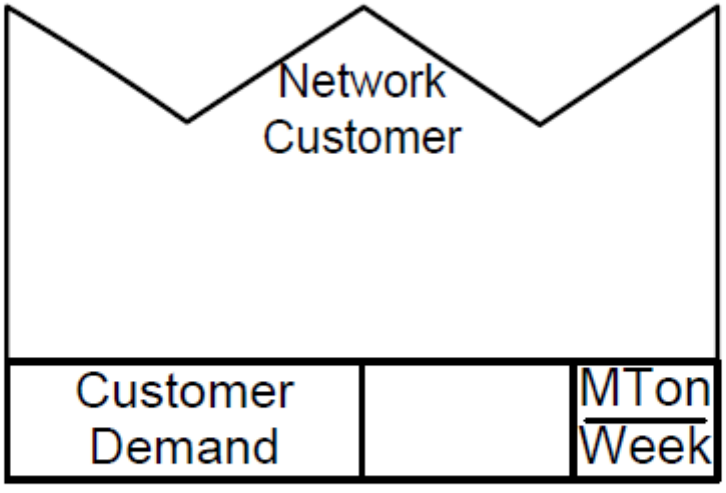
To capture the current state value stream, you meet the logistics supervisor on Monday afternoon. You learn that the outbound operations transport the enriched grain product to two different warehouses. From there, trucks take the product to Maple Leaf Groceries and Jason Foods. The grain product is shipped as bags each weighing 25 kilograms. Occasionally grain has to be shipped from warehouse 1 to warehouse 2.

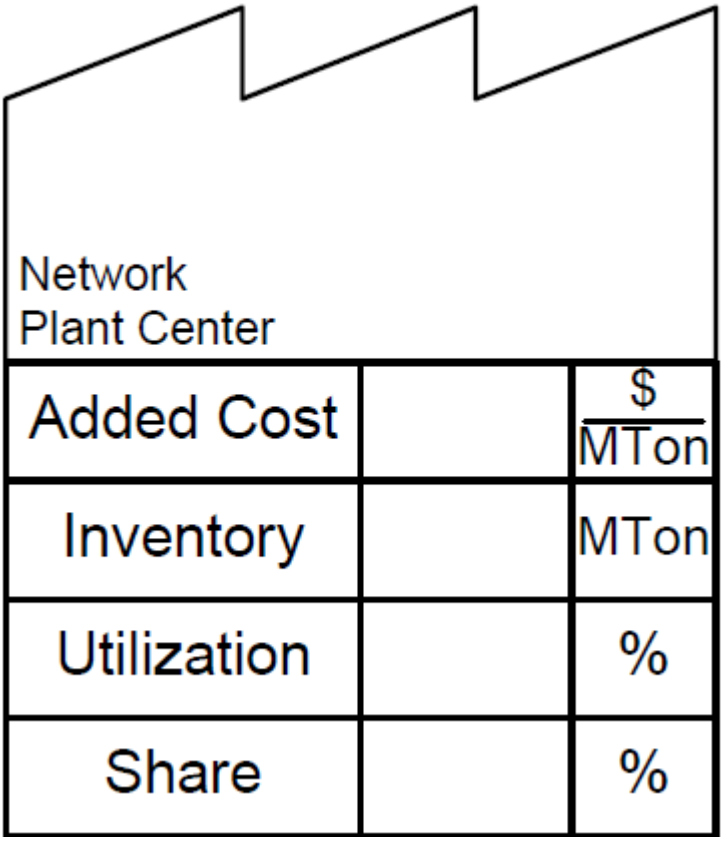
The logistics supervisor explains how the enriched grain product starts at our Chicago plant, which has a utilization of 95%. Maple Leaf Groceries has a customer demand of 150 metric tons (MTons) per week and is located close to Warehouse 1, which has a utilization of 75%. Chicago Rice Inc. ships 70% of Maple Leaf Groceries' demand to Warehouse 1 once a week with the transportation taking 6 hours and costing an additional $20 per MTon. Warehouse 1 currently holds 200 MTons and incurs an added cost of $15 per MTon. The remaining 30% of Maple Leaf Groceries' demand is sent in a shipment from Warehouse 2 to Warehouse 1 that occurs once per week. The shipping takes 12 hours and adds a cost of $20 per MTon. Finally, Warehouse 1 ships to Maple Leaf Groceries once per week, with each trip lasting 2 hours and adding a cost of $10 per MTon.

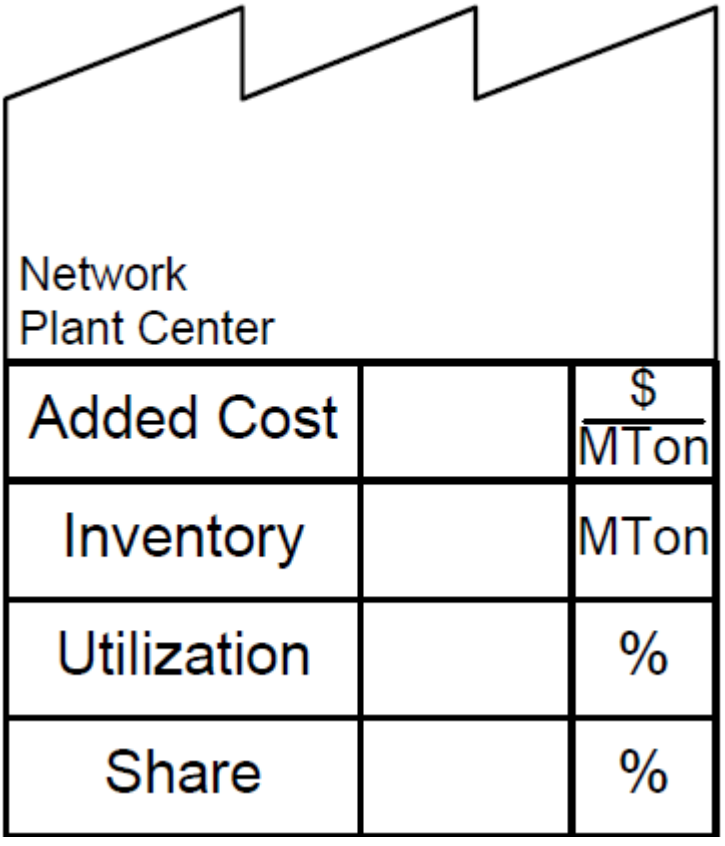
Jason Foods has a customer demand of 200 MTons per week. They receive their product from Warehouse 2, which has a utilization of 97%. Warehouse 2 gets all of its supply directly from the Chicago plant. The shipment from the Chicago plant to the warehouse takes 1 day and only occurs once a week. Additional transportation costs are $10 per MTon. Warehouse 2 currently holds 200 MTons which each have an added cost of $25 per MTon. Jason Foods then receives a shipment from Warehouse 2 once per week. The transportation takes 1 day and adds a cost of $5 per MTon.

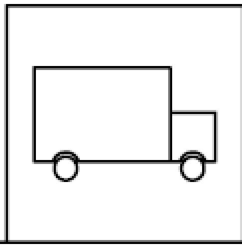
Outbound Network Templates



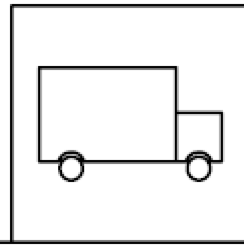




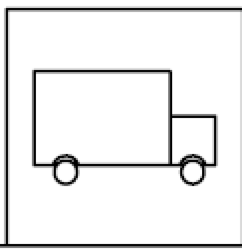




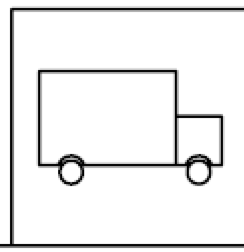
Transport		
Added Cost		$ / MTon
Transport Time		Hr
Transport Frequency		Trip / Week



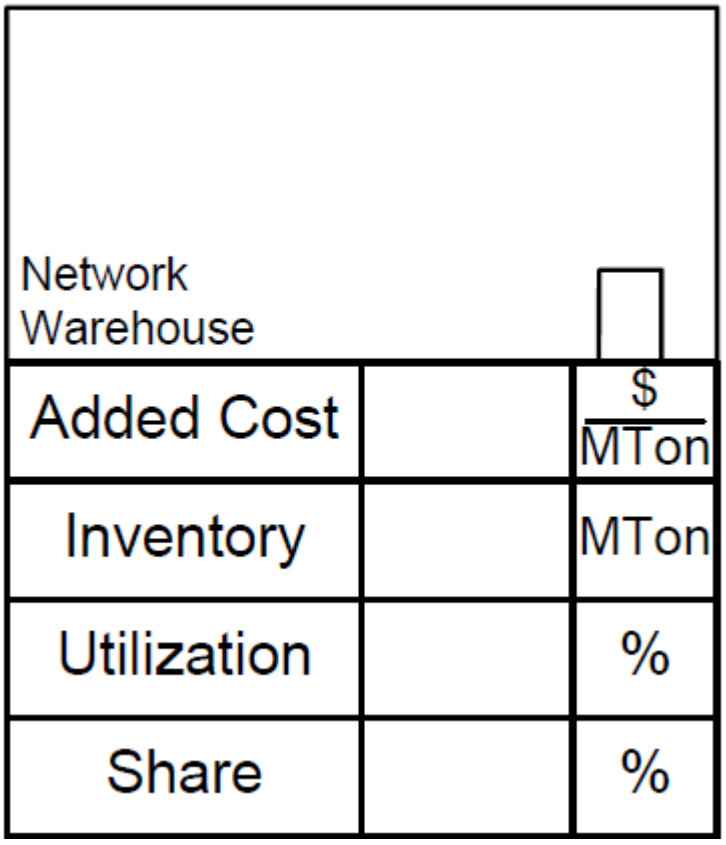
Transport		
Added Cost		$ / MTon
Transport Time		Hr
Transport Frequency		Trip / Week

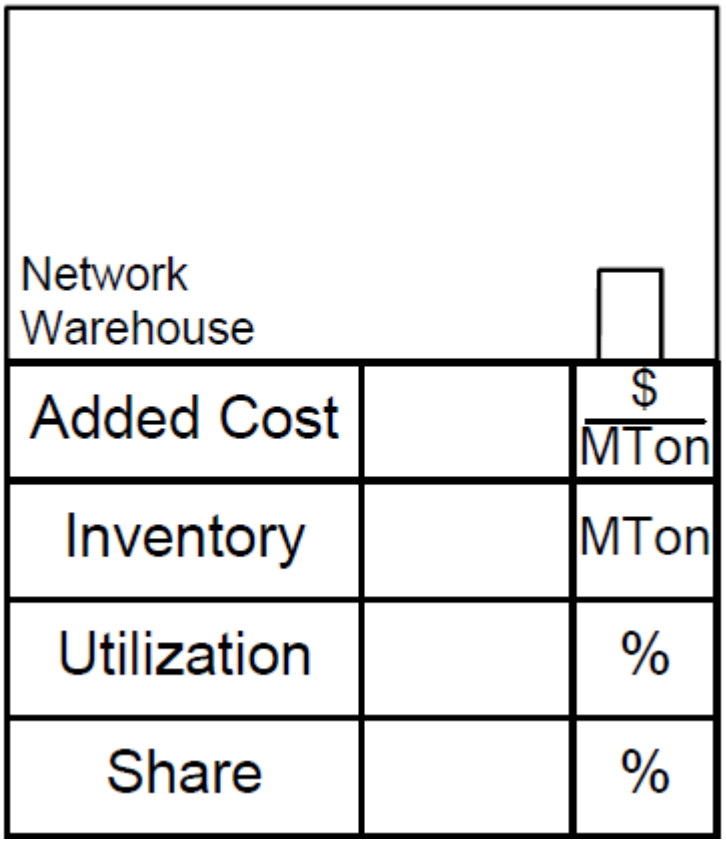


Transport		
Added Cost		$ / MTon
Transport Time		Hr
Transport Frequency		Trip / Week



Transport		
Added Cost		$ / MTon
Transport Time		Hr
Transport Frequency		Trip / Week

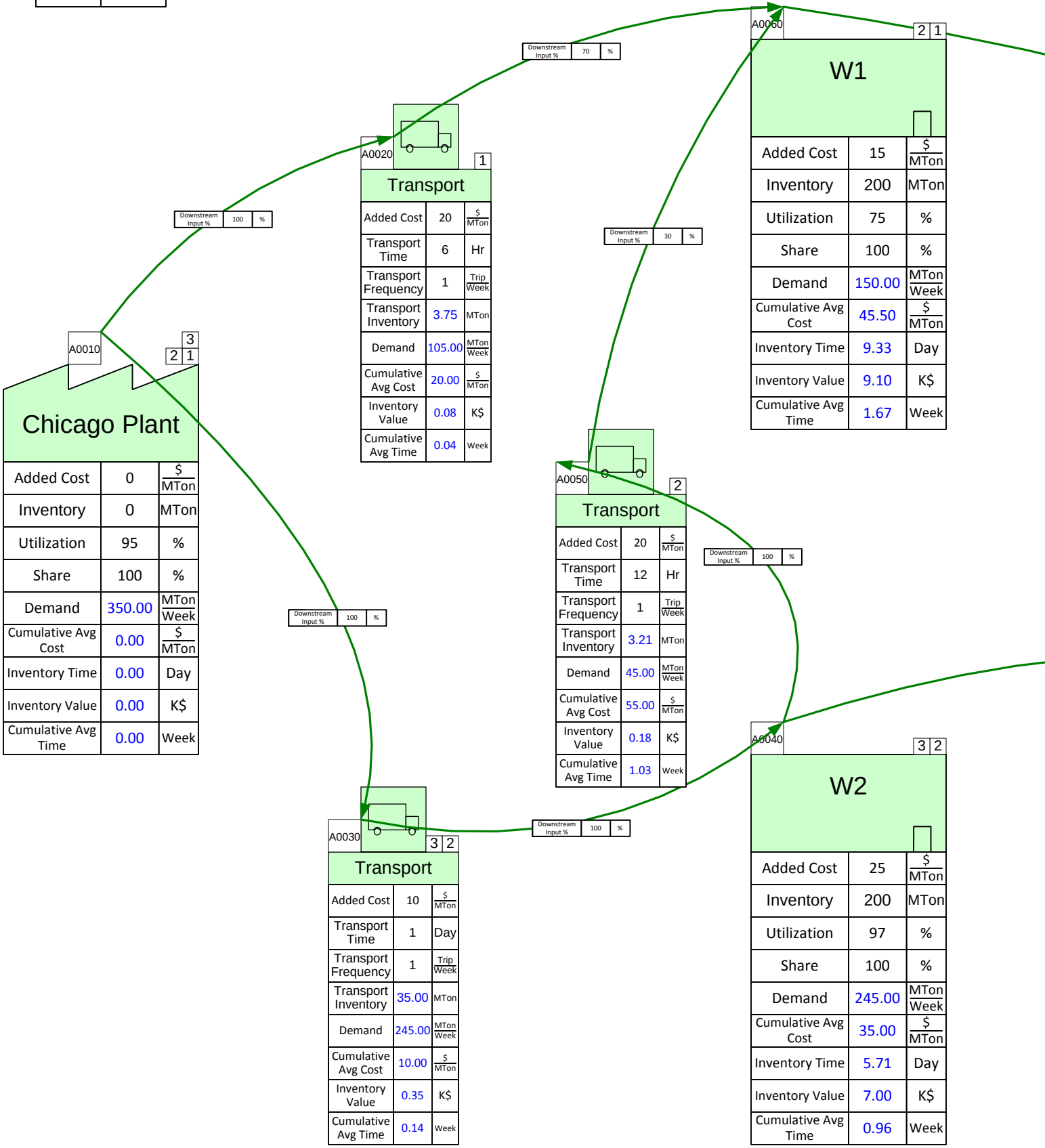




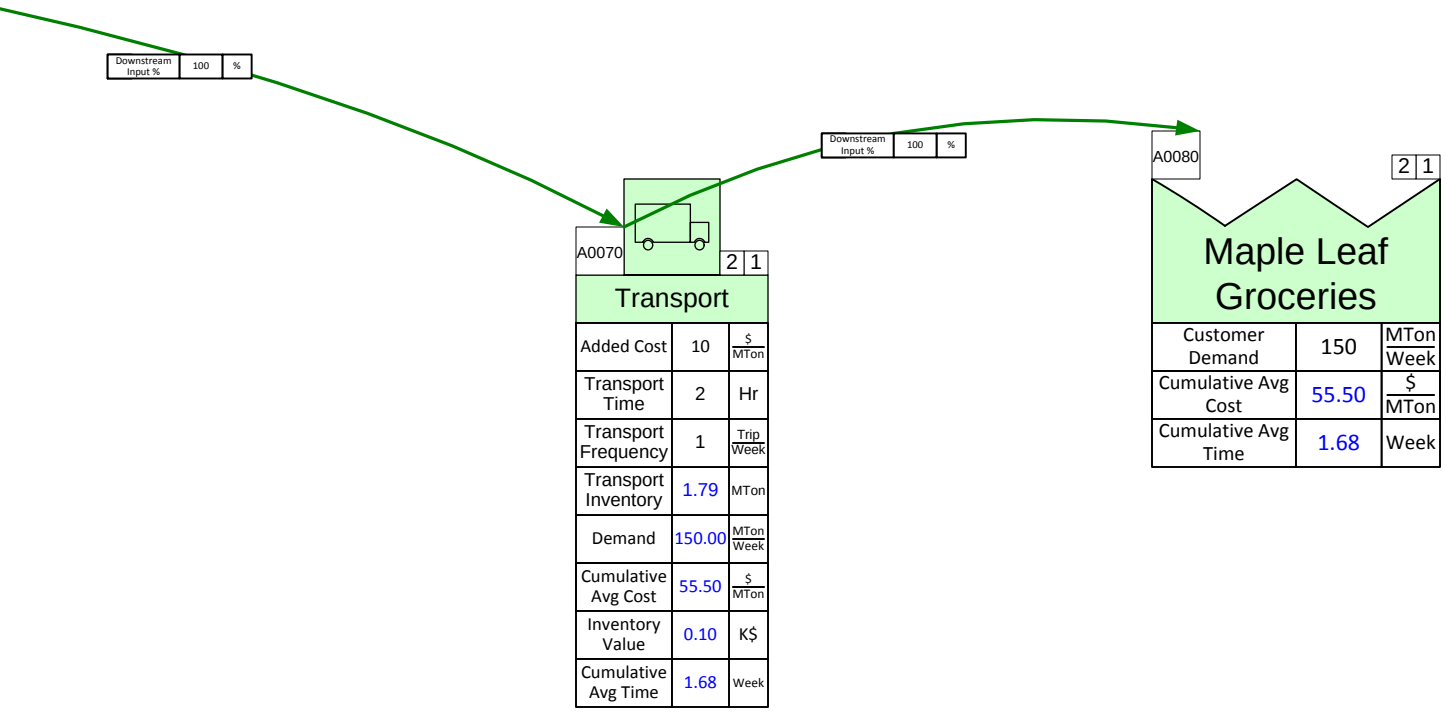
eVSM Outbound Workshop

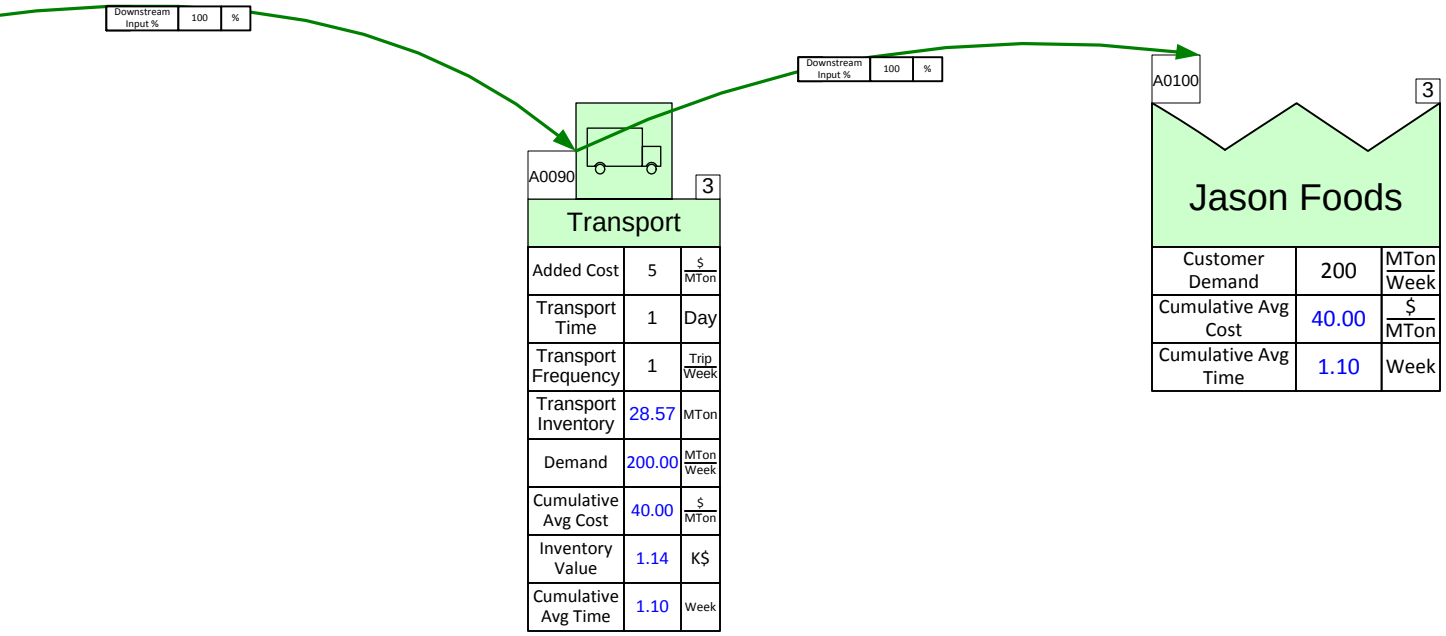
1. Insert the picture of the wall map using the Wall Map button in the toolbar.
2. Use the Open command in the eVSM toolbar to open the Quick Processing Network stencil.
3. Draw the map in eVSM.
4. Create sequence arrows and note that the sum of the DIW values coming into an activity needs to add up to 100%.
5. Use the Auto Path button in the toolbar to assign path numbers.
6. Use the Auto Tag button to sequentially number the tags. (this affects charting)
7. Check the map and then Solve for the calculated fields.

Day	Week
24	7
Hr	Day

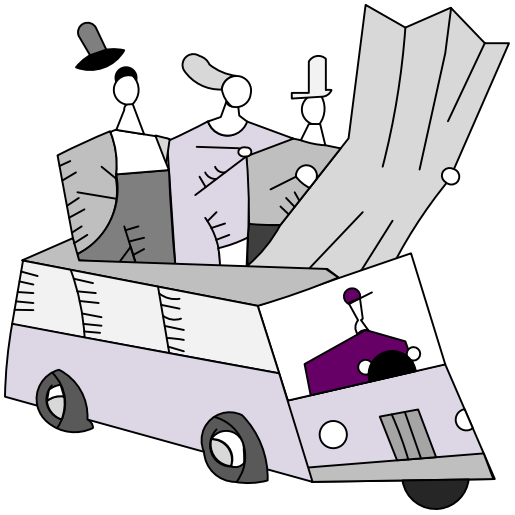


Outbound – Enriched Rice





Part IV: Linking Maps Together



Source and Target

What is it?

- A way to link values on one or more maps
- All of the linked maps must be in the same file
- A means to write simple equations (sum, min, max, average) visually and to link multiple source values to a target value
- Source values get updated on every “Solve”.

How does it work?

- Connect source shapes from the Quick Extras stencil to the source variables and give them an ID (like “SI”)
- Connect target shape from the Quick Extras stencil to the target variable and select one of sum, avg, min, or max as the operator
- If the source and target shapes are on separate pages, then point the source page to the target page

  - Via “Source/Target Pages” button in the Name and Unit Manager

- Use the “Solve” button to update source variables

Chicago Rice Inc. is part of an extended value stream. The demand and cost flow through the extended stream such that changes in the end customer demand ripple through the whole stream.

Linking Demand

Demand starts at the customer shape on the outbound map and must be linked back to a demand on the plant and via that to demand on the suppliers.

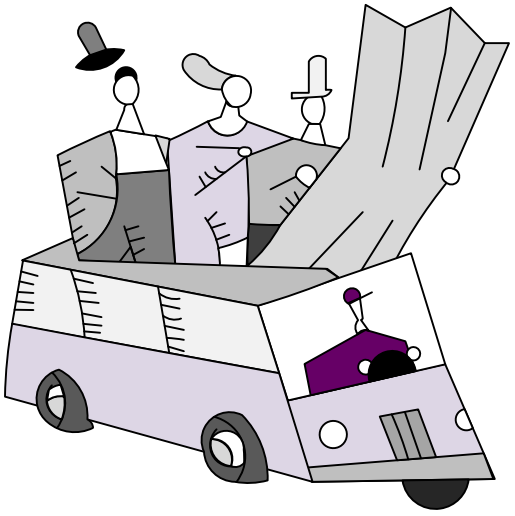
Linking Cost

Cost starts accumulating at the suppliers and must be linked forward so that cumulative cost is visible at all points in the value stream and leading to a delivered cost at each customer.

eVSM Workshop

1. Open the file with the 3 maps (Inbound, Plant, Outbound).
2. Add a “Source Shape” called “OD” to the Chicago Plant “Demand” value on the Outbound map. We want to use this value for the demand on the plant map.
3. Add a “Target Shape” called “OD” to the customer shape on the Plant map. Click on the “Name and Unit Manager” button in the toolbar and use the “Source/Target” pages to select the “Outbound” page.
4. Solve the Plant map.
5. Add a “Source Shape” called “PQD” to the “Inventory Requirement” variable in the Quinoa inventory on the Plant map.
6. Add a “Source Shape” called “PWRD” to the “Inventory Requirement” variable in the Whole Rice inventory on the Plant map.
7. Add “Target Shapes” called “PQD” and “PWRD” to the appropriate “Customer Demand” values on the Inbound map, and use the Name and Unit Manager to access the “Source/Target Pages” button and select the “Plant” page.
8. Solve the Inbound map.
9. Do a “What-If” study where you change the demand for Jason Foods to 225 MTons/Week and need to understand the resulting weekly demand for Quinoa.

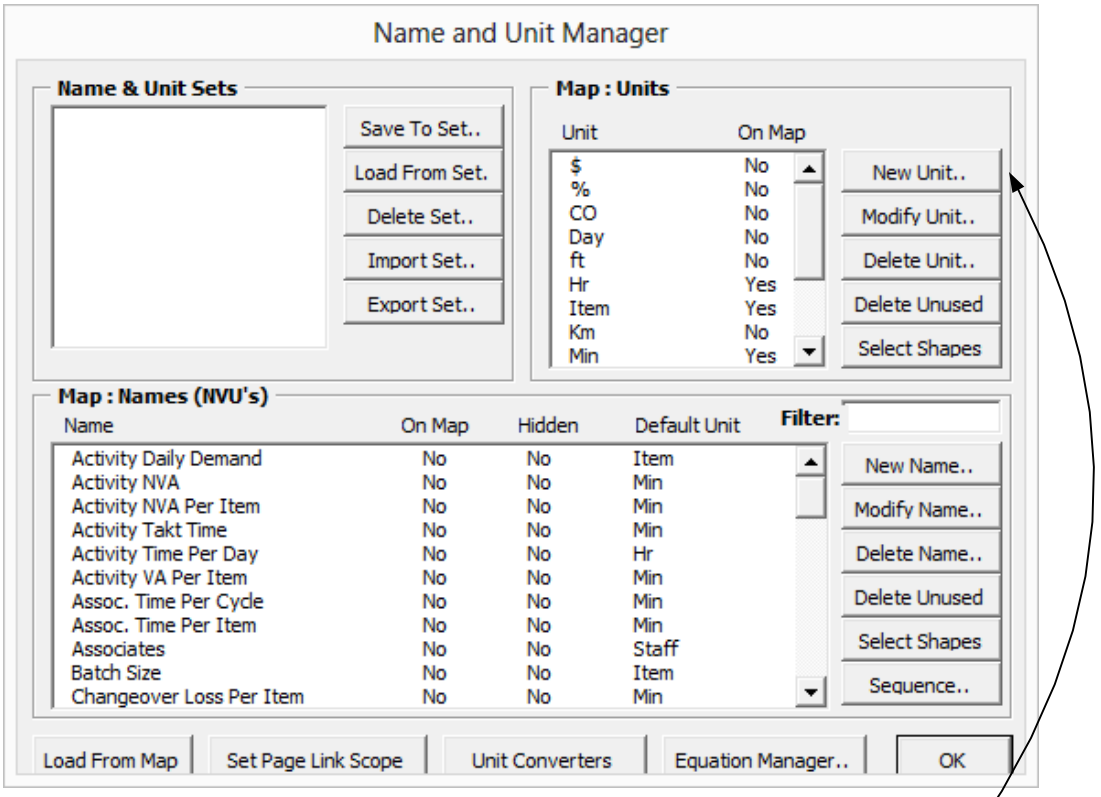
eVSM Extras



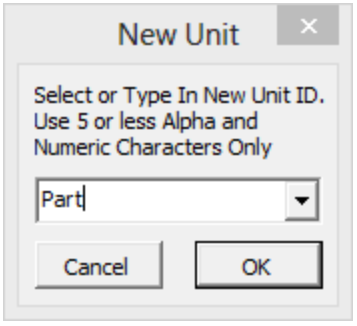
Units Handling

If you want to create a custom unit that you would like to use throughout the map, start with the Name and Unit Manager. If you want to use a built-in unit but need to convert it, such as Weeks to Days, start with Step 3.

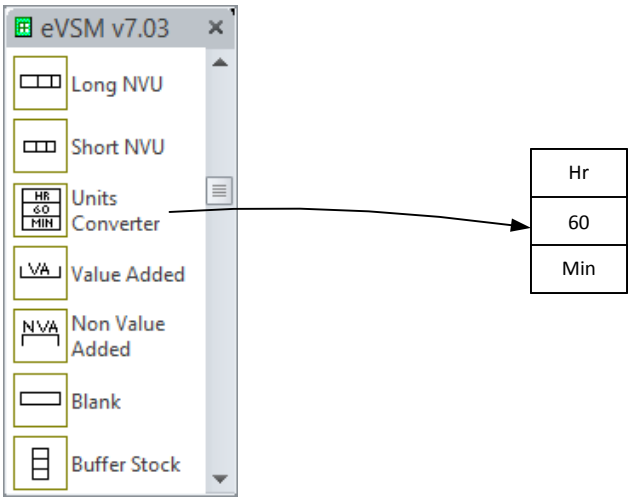
1. Click the Name and Unit Manager button in the eVSM toolbar. 

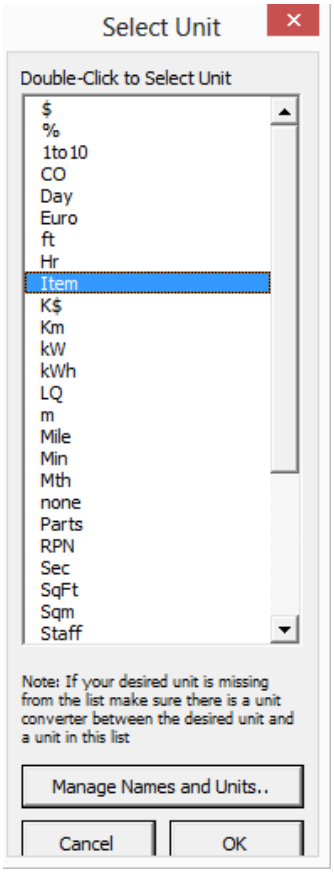


2. Add a new unit called “Part” by clicking on “New Unit…”

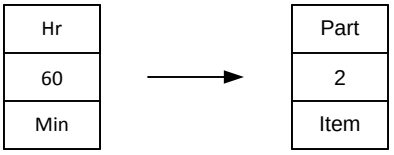


3. Drag out a Units Converter shape from the eVSM stencil.





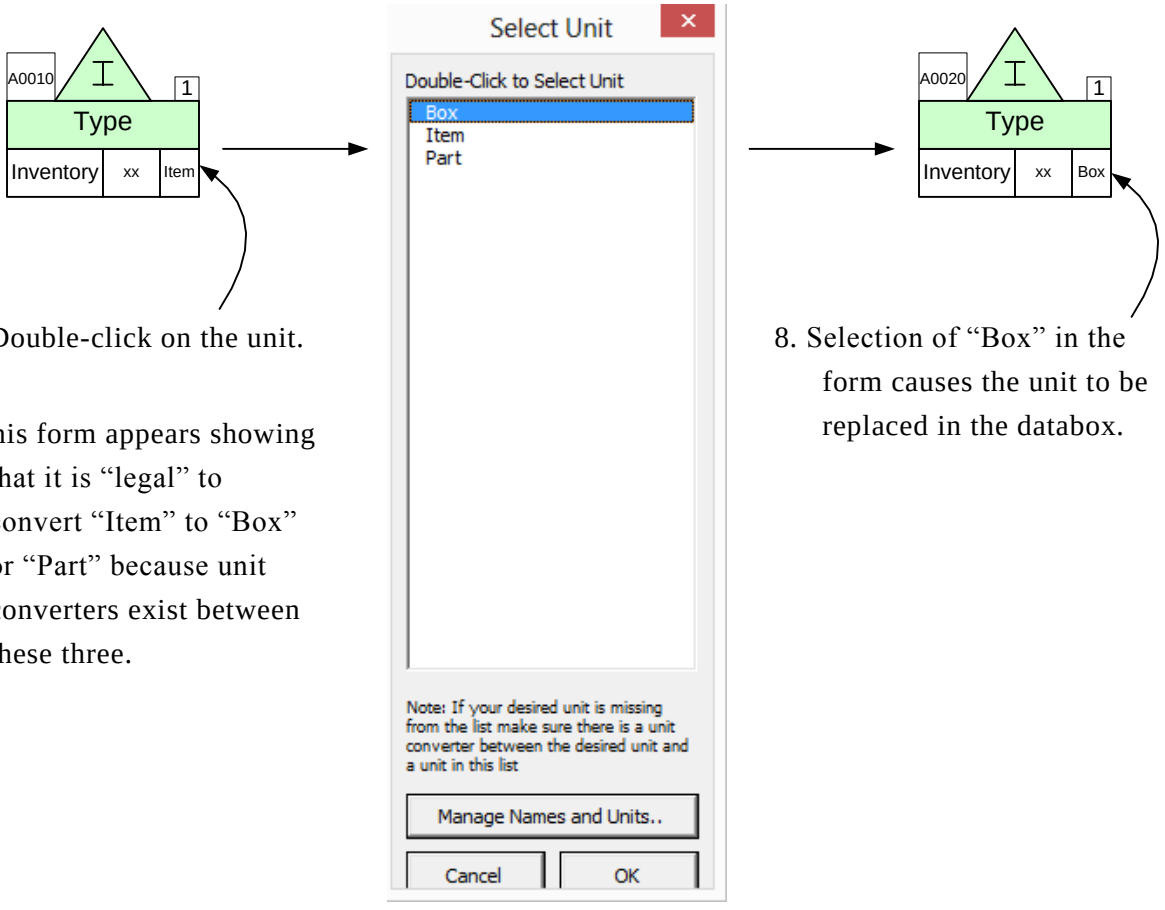
4. Double click on the default unit "Hr" to change the top unit to "Part" and the default unit "Min" to change the bottom unit to "Item." This allows the calculator to account for the new unit. The top unit is the original unit, while the number specifies how many of the bottom unit makes up one of the top unit.



5. If you have more than one custom unit, repeat step two and three.

Part	Box
2	60
Item	Part

Note: Only the custom units that you created via a unit converter(s) will appear in the form when trying to change a variable unit on a center. This is to avoid (for example) people converting quantity units to time units for a center, like the Inventory Center. To ensure that the units you want to change appear in the form, create the converters first between any units you plan to use.



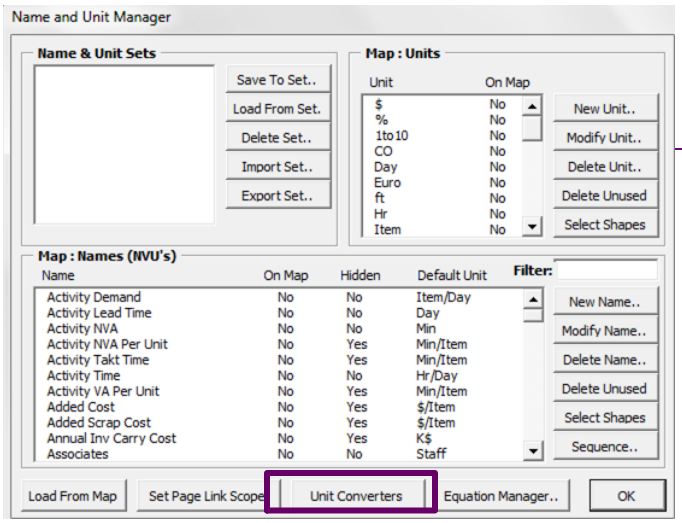
6. Double-click on the unit.

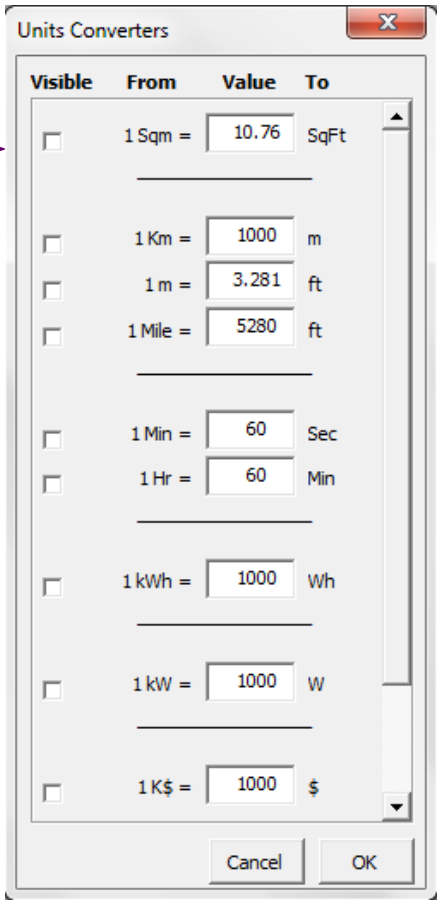
7. This form appears showing that it is "legal" to convert "Item" to "Box" or "Part" because unit converters exist between these three.

8. Selection of "Box" in the form causes the unit to be replaced in the databox.

Miscellaneous Tips

eVSM comes with built-in basic unit conversions that don't require a Units Converter. To check and see which unit conversions are included, open the NUM and click "Unit Converters."

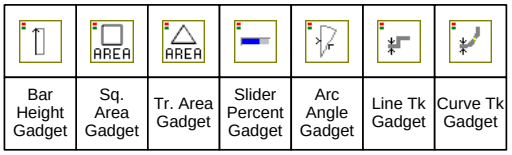




If the conversion you need isn't listed, you will need to include a Units Converter on your map in order to use your units. If the conversion you need is listed then you will not need to include a Units Converter. An error may appear if you add an additional Units Converter for a conversion that is included in eVSM, such as hours to minutes.

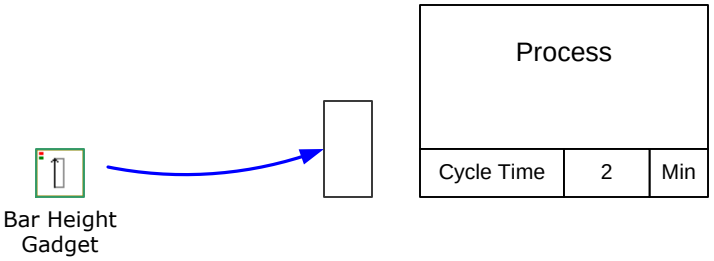
Using Gadgets to Visualize Data

Any data on the map can be linked to visual gadgets that change in size and color with change in the data. Some gadget types are shown below:



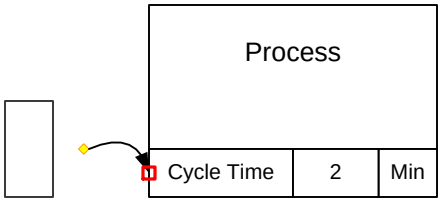
Each gadget has exactly one size parameter that can be tied to a data value on the map. Here's the typical means used to apply and manipulate gadgets:

1. Drag out the gadget from the main eVSM stencil and position it near the data value with which it will be associated (in this case the "Cycle Time"). In this example the Bar Height Gadget is being used.



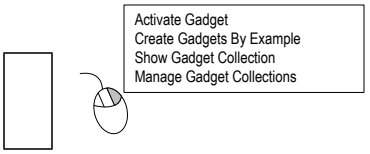
2. This system shape will be automatically dropped on the page the first time a gadget is used. If you copy a map to a new page make sure you also copy this shape because it is used to hold gadget data for the map.

3. Select the gadget, drag and glue the gadget's yellow flying connector to the side of the NVU data shape (avoid gluing to the top or bottom of the data shape).

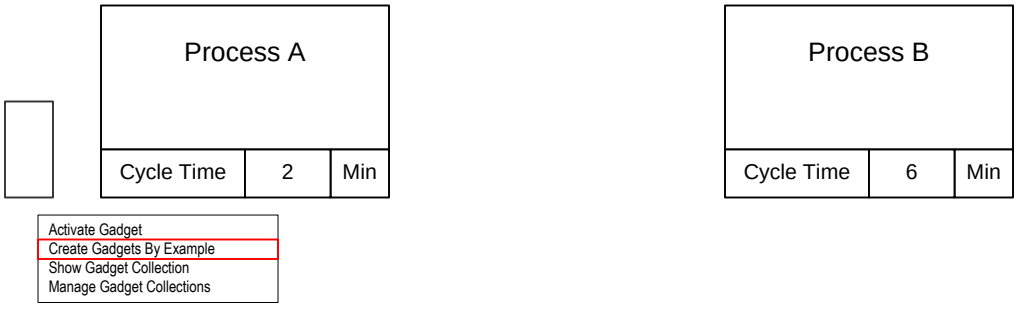


4. Right click on the gadget and use the “Activate Gadget” option to create a new gadget collection. The collection name will be “Bar_Cycle Time”. The name is created from the gadget type and the data variable name.

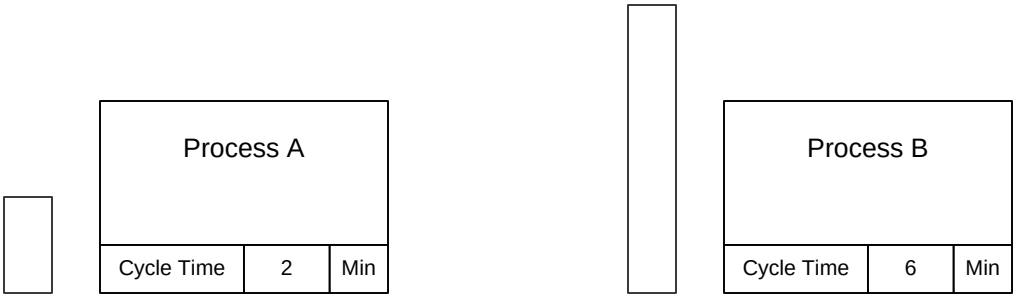
   A gadget can only belong to one collection. Each collection can only have a single type (eg. “Bar”) of gadget.



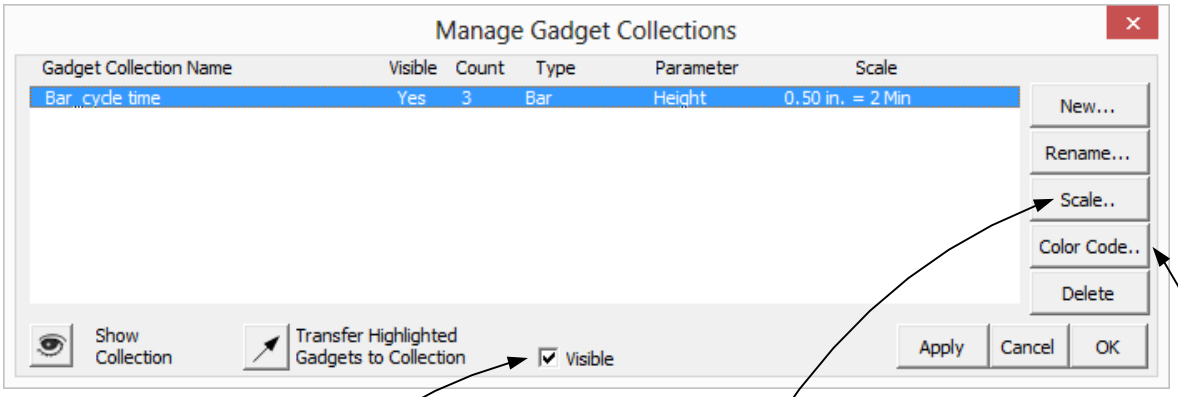
5. You can change gadget scale factors and color code them by modifying the properties of the associated Gadget Collection. You can easily create additional gadgets tied to other instances of the same data on the map. Just click on the gadget and use the right mouse button to select “Create Gadgets By Example” to create the gadget for Process B below.



6. Note that the new gadget is automatically positioned, scaled and put into the same “Bar_Cycle Time” collection. If you do not wish to have new gadgets created for the whole map than select the original gadget, then sub-select an area of the map before using the “Create Gadgets By Example” menu.



7. To modify a gadgets scale factor or to color code it, you need to change the properties of its associated collection. Right mouse click on the gadget and select "Manage Gadget Collections," or click the Gadgets button in the toolbar.



To hide or show gadgets in a collection, first select the collection from a list, then click this button.

Note: the collection list has a column indicating visibility status.

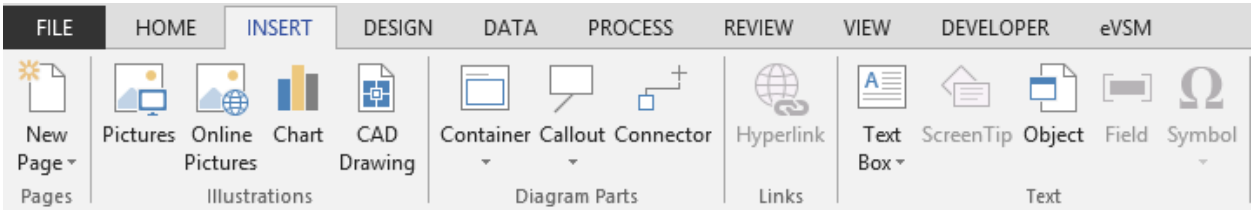
You can modify the scale factor for a collection that controls gadget size in relation to data value. Use the Apply button to see the new gadget sizes on the map before exiting the form.

You can color code the gadget fill and font colors based on the value of the data to which the gadget is glued. You can also simply "inherit" the color from the data shape or assign a color to a gadget manually.

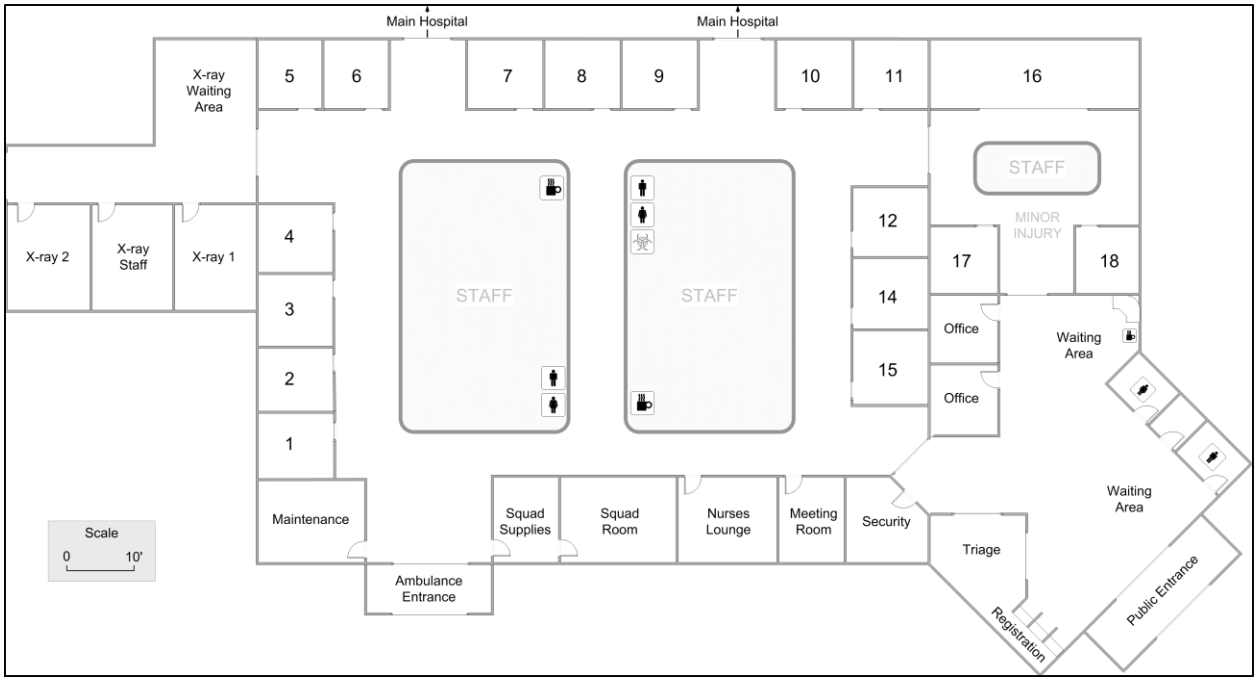
Gadget Tips

- Gadgets have a single size parameter that will scale to the data value in which a gadget is glued via the flying yellow connector.
- Gadgets are typically glued to NVU, VA or NVA shapes. When gadgets in a collection are glued to data shapes with different units, Units Converters are needed on the map to compute the correct scale factors.
- Gadgets have to belong to a collection. They can be put in a collection using the Activate Gadget command or by transferring them into a collection via the Manage Gadgets form.
- Gadget scale factors and color coding can be controlled via the Manage Gadgets form.
- An easy way to create a gadget "set" after creating a first gadget is to use the Create Gadgets By Example in the right mouse button menu.
- The Visible switch on the Manage Gadgets form is very useful in showing different metrics on the map in a presentation environment.
- A starter set of gadgets is provided with eVSM. Additional gadgets can be requested by contacting support@evsm.com.

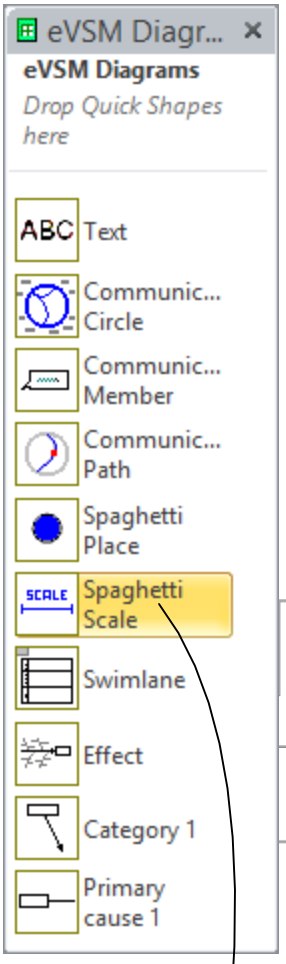
Spaghetti Diagram Tutorial



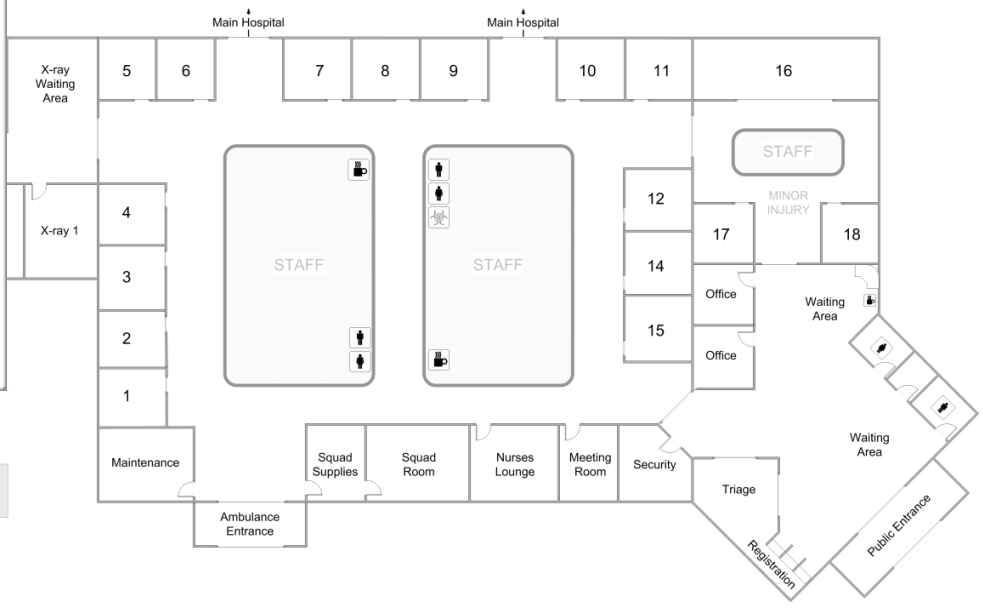
1. Draw or import a floor map. Visio can import most bitmap formats as well as AutoCAD drawings. Either use the “Insert” tab in Visio or simply copy and paste the picture into a new drawing.



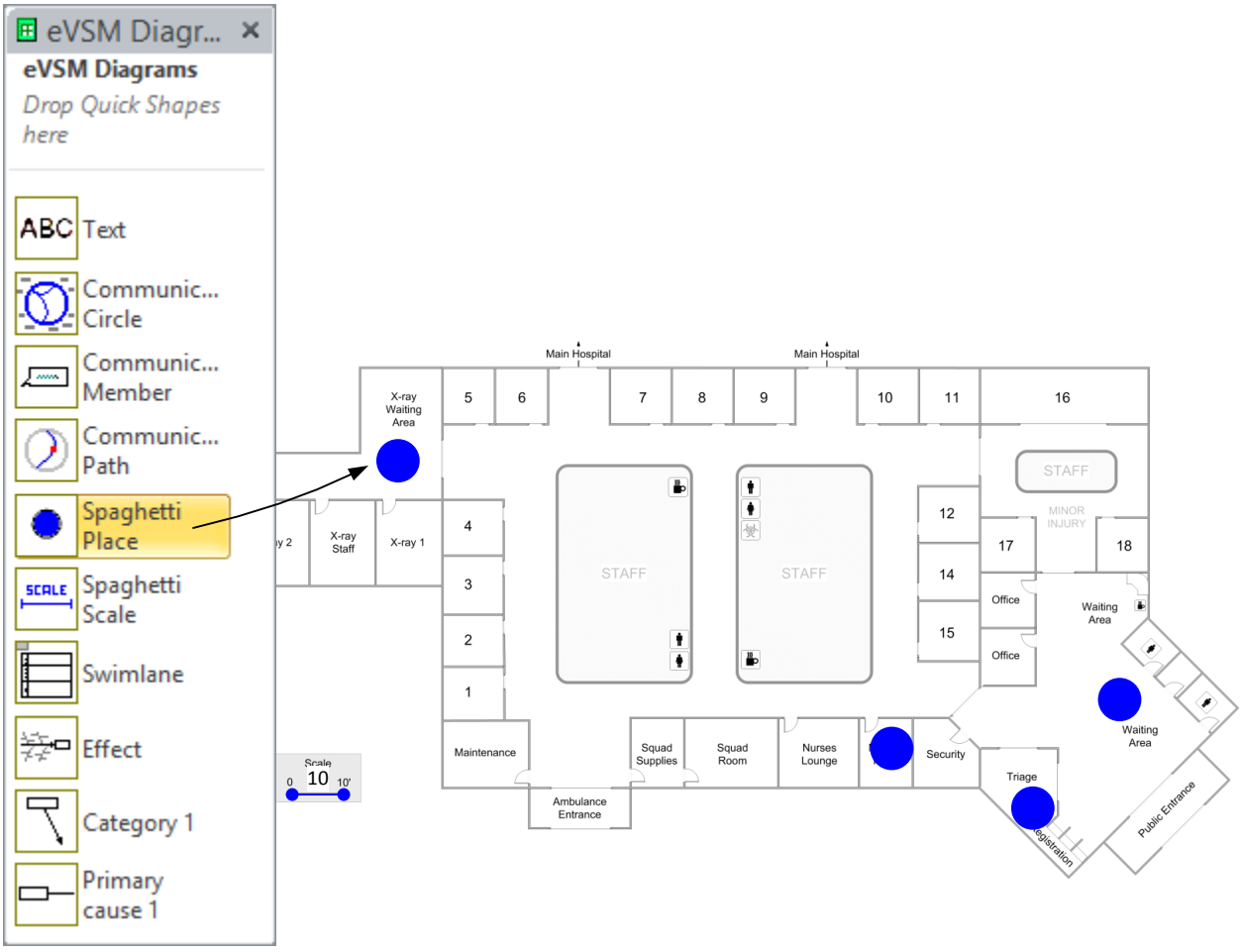
2. Click the Spaghetti Diagram button in the eVSM toolbar. This will open the eVSM Diagrams stencil.

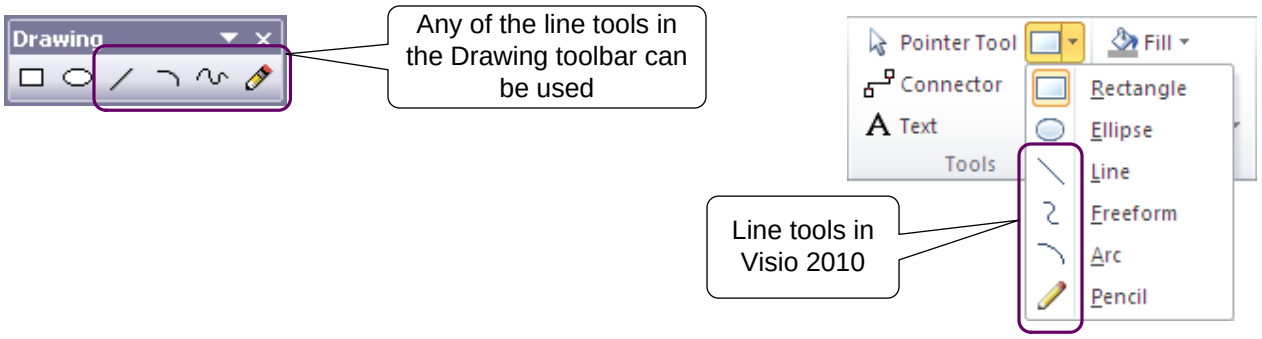


3. Drag out a Spaghetti Scale shape from the eVSM Diagrams, and stretch it out to exactly fit a known dimension on the map. The known dimension could be a map scale if available, or a floor dimension you have measured. Enter the actual dimension value on the scale shape.



4. Define Activity Centers by dropping and naming a Spaghetti Place icon onto the diagram for each place.

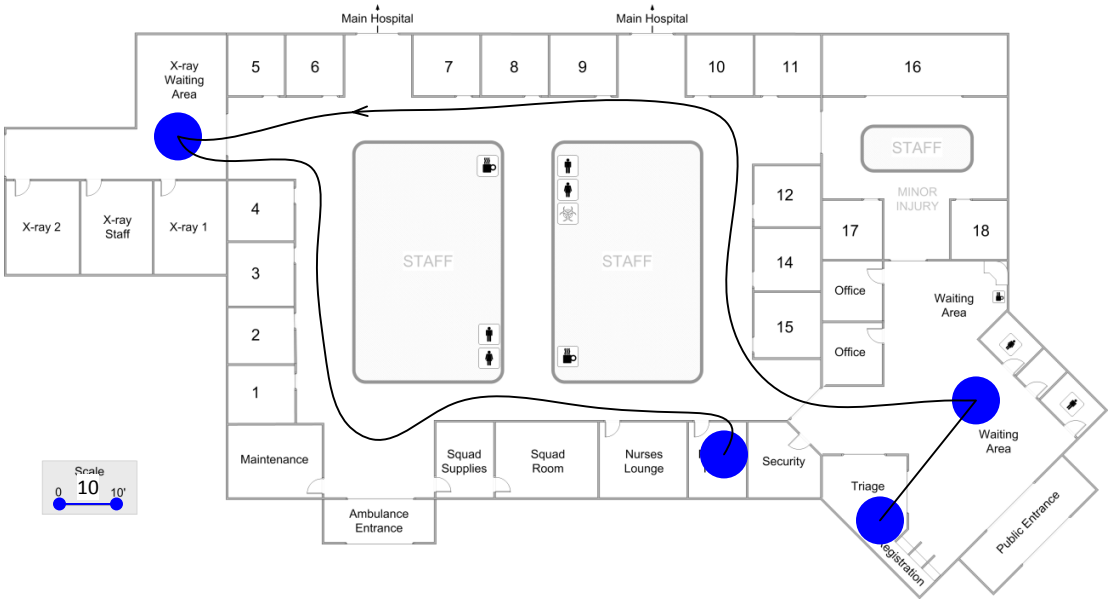




5. Use the Visio line drawing tools to map the paths. You must ensure that each path starts and ends in a Spaghetti Place icon. You can set color and line thickness of the paths using standard Visio formatting.

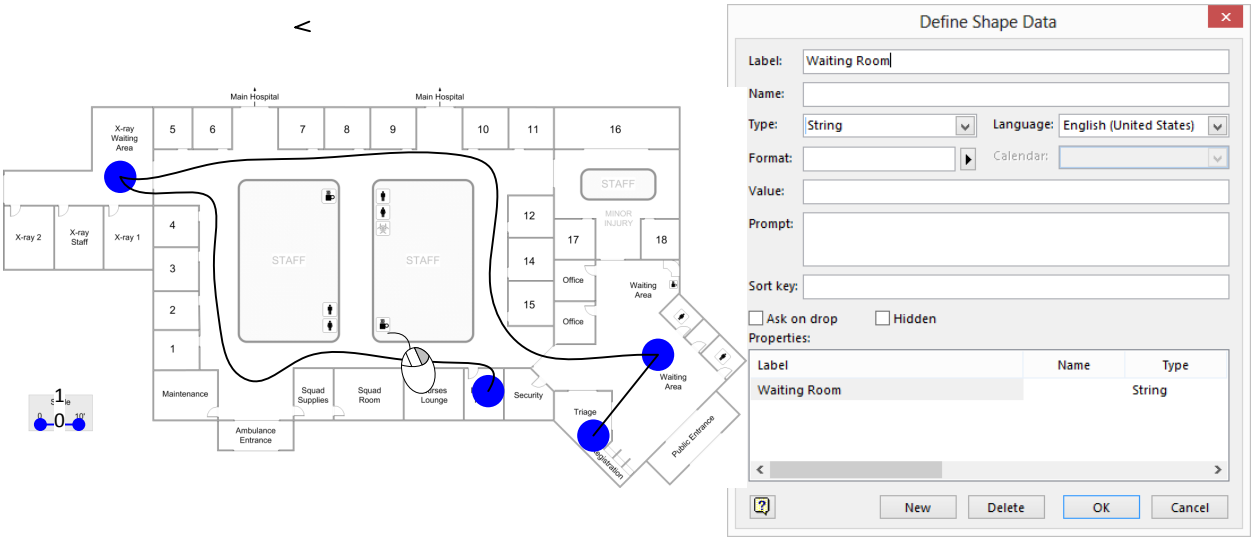
   In Visio 2003/2007, the line drawing tools are in the Drawing Toolbar. This can be opened via the right-mouse menus on the Visio Toolbars.

   In Visio 2010, the drawing tools are near the center of the "Home" ribbon.



6. Click the Spaghetti Diagram button again. eVSM will create a spreadsheet report of the paths.

7. Additional attributes can be added to the path lines via Visio Custom Properties. Select a path line, and right-click “View>Custom Properties”.



The next time the Spaghetti report is generated, the path attributes will be transferred to the report.

Note that the Spaghetti Diagram button recreates the Excel report. It DOES NOT update it.

Custom Prop...

FROM	Registration
TO	ER Bay 9
DISTANCE	102
SEQUENCE	1
DESCRIPTION	Patient assisted in wheelchair
DATE	3/3/2007
TIME	5:36pm

eVSM Training Evaluation Form

Name:_____ **Title/Role:**_____

Email:_____

Please indicate your impressions of the items listed below.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. The training met my expectations	❑	❑	❑	❑	❑
2. I will be able to apply the knowledge learned.	❑	❑	❑	❑	❑
3. The training objectives for each topic were identified and followed.	❑	❑	❑	❑	❑
4. The content was organized and easy to follow.	❑	❑	❑	❑	❑
5. The materials distributed were pertinent and useful.	❑	❑	❑	❑	❑
6. The trainer was knowledgeable.	❑	❑	❑	❑	❑
7. The quality of instruction was good.	❑	❑	❑	❑	❑
8. The trainer met the training objectives.	❑	❑	❑	❑	❑
9. Class participation and interaction were encouraged.	❑	❑	❑	❑	❑
10. Adequate time was provided for questions and discussion.	❑	❑	❑	❑	❑

11. How do you rate the training overall?

Excellent	Good	Average	Poor	Very Poor
❑	❑	❑	❑	❑

12. What aspects of the training could be improved?

eVSM Training Evaluation Form

1. Describe the next VSM activity you are involved in. (Role, Training, Purpose, Team, Sponsor)

2. Do you plan to use the tools you have learned about in the workshop? If so, how?

3. What challenges do you envisage in applying these tools?

4. What advantages will you realize in applying these tools?

5. Other Comments?

THANK YOU FOR YOUR FEEDBACK!

