



1

Map the Value Stream

Objectives

- Create and format a value stream map
- Add data to a value stream map
- Compare a current-state value stream map and future-state value stream map

Contents

Examples and Exercises	Purpose	Page
Value Stream Map		
Example 1 Map the current state	Gain insight into the value stream, or the flow of value, through the process.	1-3
Exercise A Map the future state	Create a future-state value stream map to assess the improved flow of value through the process.	1-23

Value Stream Map

Example 1 Map the current state

Problem

A current-state value stream map identifies waste and helps you to envision an improved future state. A project team at the Belmont Pizzeria must create a current-state value stream map to improve their pizza-making process.

Tools

- **Value Stream Map**

Value Stream Maps

What is a value stream map

The value stream is the collection of all of the value-added and non value-added activities that generate the product or service that is required to meet the customer's needs. A value stream map illustrates the flow of materials and information as the product or service moves through the process.

When to use a value stream map

Use a value stream map to identify one or more of the following types of waste:

- Overproduction
- Waiting
- Transportation
- Inventory
- Motion
- Over-processing
- Defects
- Improper use of human intellect

Why use a value stream map

A value stream map answers questions such as:

- What does the current process look like?
- How does value flow through the process?
- What steps in the process add value and what steps do not add value?
- What are the sources of the waste in the value stream?
- What areas of the process need the most improvement?

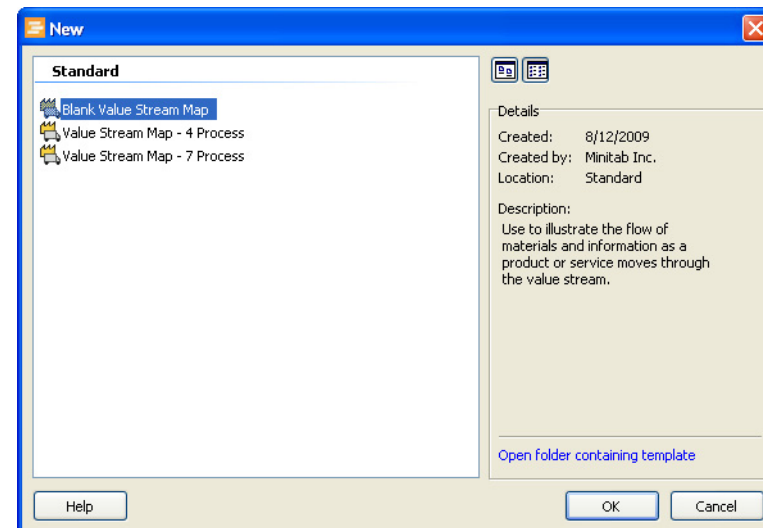
Inserting a value stream map

The project leader gathers a team that includes the wait staff, the kitchen staff, and management to ensure that everyone who is involved in the process is represented. The team creates a high-level map of the process by gathering information about each step, including activities, cycle times, defects, and inventory.

The scope of the pizza-making value stream map is from the time the customer places an order to the time that the pizza is delivered to the customer's table.

Insert a value stream map

- 1 Choose **File** ► **New** ► **Project**.
- 2 Choose **Project**.
- 3 Click **OK**.
- 4 Choose **New** ► **Value Stream Map**.
- 5 Choose **Blank Value Stream Map**.
- 6 Click **OK**.




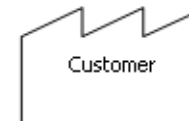
Identifying customer requirements

To begin, the team identifies the customer of the process and determines the customer's demands in terms of product and service quantity, quality, and delivery. Specifically, in addition to a correctly made product, customers expect their pizza to be served within 18 minutes of their order and within 4 minutes of the pizza coming out of the oven to ensure that the pizza is hot enough.

A value stream map typically begins with the customer. The customer is represented in the upper right-hand corner of the map with an Outside Sources icon.

Insert outside sources

- 1 On the value stream map toolbar, click , the **Outside Sources** shape.
- 2 Place it in the upper right-hand corner.
- 3 In the shape, type *Customer*.





Mapping the current-state process

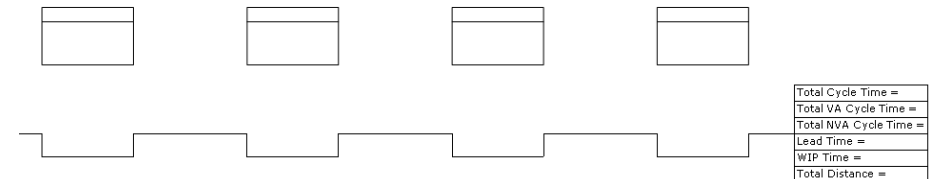
The team maps the end-to-end flow of the pizza-making process. To accomplish this, they create a high-level view of the operation using these process steps:


- Make dough, add sauce
- Add cheese and toppings
- Cook
- Deliver

Place process shapes at the bottom of a value stream map from left to right in the order that they occur in the process, not in the order of their physical layout.

Insert process shapes

- 1 On the toolbar, click the **Multi-Insert Mode** button .
- 2 On the toolbar, click  and insert 4 process shapes. Leave enough room to the left of the left-most shape to add the new shape on page 1-12.



- 3 On the toolbar, click the **Select Mode** button .
- 4 Click a shape and then type the text for each process shape as shown.



Adding process data

Add data to process shapes on a value stream map to see how materials or transactions flow through the system. Quality Companion shares this data throughout the project so that you can compare the current-state value stream to the future state.


When you add data to shapes, consider the following:

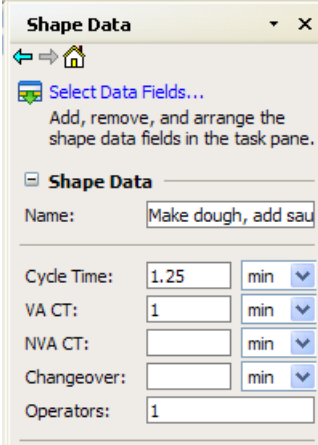
- Units are not shared. To ensure that data is calculated accurately in the VSM Comparison form or custom forms, keep units consistent.
- Data that you enter on a Value Stream Map is distinct from the Lean data on a Process Map and in Process Map Data.

As you add data, Quality Companion automatically updates the timeline and the timeline calculations across the bottom of the Value Stream Map.

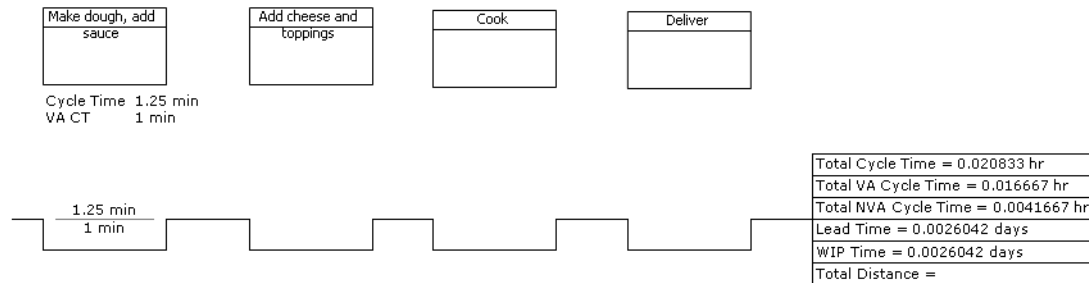
For the pizza-making process, the team measures and records cycle time and value-added cycle time for each process step.

Insert shape data

- 1 Click the *Make dough, add sauce* shape.
- 2 In the task pane, click **Insert Shape Data**. If the task pane is not open, click  on the standard toolbar.
- 3 In **Cycle Time**, enter *1.25*.
- 4 In **VA CT**, enter *1*.



Interpreting your results

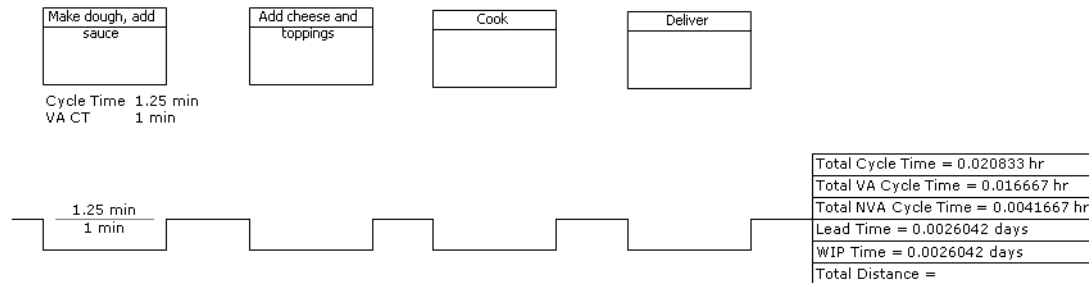


Once you add data to the shapes on a value stream map, the timeline calculates lead time, WIP time, and cycle time.

Cycle time represents the time from one completed output to the next completed output for a specific process step. Cycle time can be broken down into value added cycle time and non value-added cycle time:

- Value-added cycle time is the time that is associated with an activity that the customer is willing to pay for, or that when left out would impact customer satisfaction. In the pizza process, the time the pizza spends in the oven would represent value-added cycle time.
- Non value-added cycle time is the time that is associated with activities that do not directly impact the customer. For example, the time it takes to gather supplies needed to make the dough is non value-added cycle time.

Interpreting your results



Lead time is the time that is required to produce a single unit of product or service, from receipt of the order through delivery to the customer. In a manufacturing environment, lead time might include the following:

- Time that is needed to obtain raw materials to produce the product
- Time that the product is actually in process also called WIP time.
- Time that the product spends in a warehouse awaiting shipment
- Time that is needed for shipping and delivery

For the pizza process, the lead time is the time from when the customer places an order to when the pizza arrives at the table. In this case, lead time includes the time that the order sits waiting for the cooking staff to start making that pizza, in addition to the time that is involved with making the pizza.

WIP time is the time the product is in process. For the pizza project, it is the time in which the pizza is being made and does not include the time that the order waits in inventory before work on the pizza has started.


Note | On a Quality Companion value stream map, the default for WIP time displayed in the Timeline Summary box is an 8-hour day, but you can change it when you click Edit Map Calculations in the task pane.

The timeline also displays total distance that is traveled if your shape data include distance measures.

Editing the timeline

You can also edit what appears on the timeline:


- To edit timeline values and calculations, select a shape, click **Insert Shape Data** in the task pane, and enter data.
- To edit the units in the timeline summary box, click **Edit Map Calculations** in the task pane.

To hide the timeline, choose **View ► Timeline** or click  on the toolbar.

In addition to calculating the timeline, Quality Companion can calculate and display takt time on the value stream map. Takt time is the pace of customer demand. It is calculated by dividing the total time that is available for production by customer demand. Because the customer demand for pizzas is not steady, this calculation is not relevant to the pizza-making process.

For the pizza-making process, viewing the data in minutes is more useful than in hours.

Edit map calculations

- 1 In the task pane, click the Home button  and then click **Edit Map Calculations**.
- 2 Under **VSM Timeline Summary**, change the units to minutes.

VSM Timeline Summary		
Total Cycle Time:	1.25	min
Total VA Time:	1	min
Total NVA Time:	0.25	min
Lead Time:	1.25	min
WIP Time:	1.25	min
Total Distance:		ft

Adding an inventory shape

As you examine a process, you see where inventory accumulates. Inventory shapes on a value stream map represent locations where products or materials are placed and wait to be processed. Inventory is an indicator of points in the process where over-production occurs. Reducing or eliminating inventory is a goal of many lean projects.


You can add these types of inventory to a value stream map:

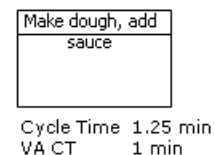
- Raw materials inventory
- Inventory between process steps (WIP)
- Finished goods inventory

For the pizza project:

- The raw materials inventory includes the cheese, flour, sauces, and other ingredients in addition to the orders that sit waiting for the cooking staff to start work on.
- Inventory between process steps are pizzas that have made it part-way through the process and await the next step.
- Unlike some cases where goods move from the final process step to a warehouse before delivery, here the final process step is the delivery and is under our control as a part of the process. Because finished pizzas move directly from the last process step to the customer—not placed in a warehouse—no finished goods inventory exists.

Add an inventory shape

- 1 On the toolbar, click .
- 2 Add an inventory shape before the *Make dough, add sauce* process shape.




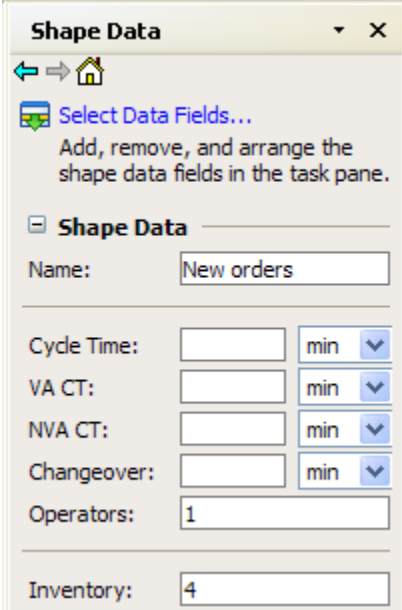
Adding inventory data

For the pizza-making process, the team measures and records the amount of inventory and the inventory time for each process area. Quality Companion uses this information to calculate WIP Time. WIP time is the sum of all inventory time values on inventory shapes, excluding raw materials inventory and finished goods inventory, plus the sum of all cycle time values on all process shapes on the timeline.

Because the pizza making process has no finished goods inventory, the WIP time is the sum of all inventory and cycle times, excluding the time that the order sits before it enters the process. The team wants to minimize WIP time by reducing inventory and non value-added cycle time as much as possible.


Insert shape data

- 1 Select the inventory shape on the value stream map.
- 2 In the task pane, click the Home button  , and then click **Insert Shape Data**.
- 3 In **Name**, enter *New orders*.
- 4 In **Inventory**, enter 4 to indicate the number of orders that are held in inventory.



Shape Data

← → 🏠

 **Select Data Fields...**
Add, remove, and arrange the shape data fields in the task pane.

Shape Data

Name:

Cycle Time: min ▼

VA CT: min ▼

NVA CT: min ▼

Changeover: min ▼

Operators:

Inventory:

Adding inventory data

Inventory Time, or the time a product waits to be processed, does not appear in the task pane by default. To make fields appear in the task pane, click **Select Data Fields**.

Team members conducted a brief study and determined that a typical pizza waits in inventory for 1.5 minutes before being placed in the oven.

If you do not enter an inventory time, Quality Companion uses the highest cycle time from the process shape to the right and the inventory quantity to calculate the inventory time. See Quality Companion Help for more details about this calculation.

Select data fields

- 1 In the **Shape Data** task pane, click **Select Data Fields**.
- 2 Double-click **Inventory Time** to move it to the right side of the Configure Task Pane dialog box.
- 3 Click **OK**.
- 4 Add an inventory shape between the *Add cheese and toppings* and *Cook* process shapes.
- 5 Complete the task pane as shown. The 1.5 minute inventory time that is shown is the time that a single pizza waits in inventory.

The screenshot shows the 'Shape Data' dialog box with the following fields and values:

- Name:** Uncooked pizza
- Cycle Time:** [] min
- VA CT:** [] min
- NVA CT:** [] min
- Changeover:** [] min
- Operators:** 1
- Inventory:** 4
- Inv Time:** 1.5 min

Managing the data display

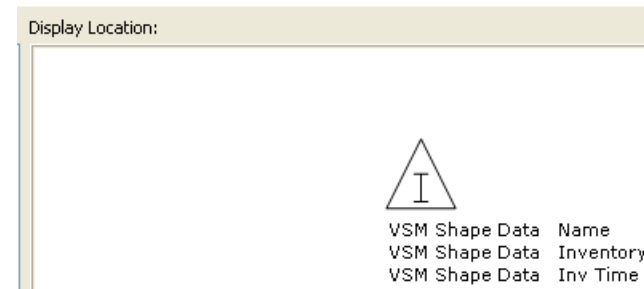
Data appears on a map only when the fields that you choose to display contain a value. If you add data to a shape, you can:

- Display it on the map
- Specify where it appears relative to the shape
- Set the display defaults

To hide data that appears on the map, select the shape, choose **View ► Shape Data**, and uncheck **Show on Map**.

Manage Data Display

- 1 Choose **View ► Shape Data ► Manage Data Display**.
- 2 From **View the current display settings for**, choose **Inventory Shapes**.
- 3 Drag **Name** to the display location as shown.



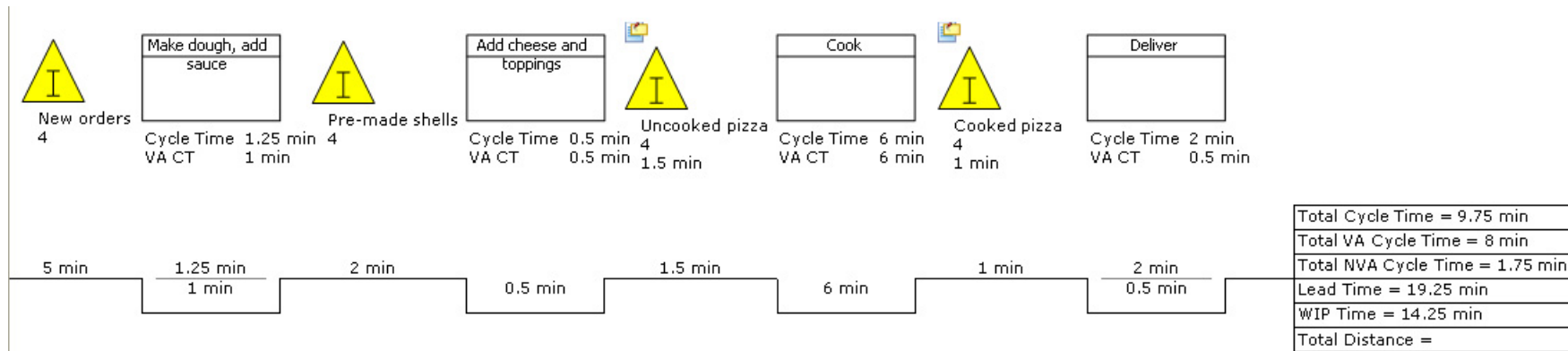
- 4 Click **OK**.

Viewing shape data and timeline

Cycle time is the time from one completed output to the next completed output for a process step. Specifically, it is the time that it takes an operator to go through all of the work elements before repeating that action or it is the time between two parts coming out of the process.

Total cycle time is the sum of all of the cycle time values for all of the process shapes on the timeline. The value-added cycle time is only 8 minutes. Improvement opportunities exist to reduce or to eliminate non value-added cycle time and inventory time.

The lead time is the time that it takes to produce a single pizza from order through delivery to the customer. The current lead time is 19.25 minutes. This means that the restaurant is not meeting its goal of an 18-minute lead time.



Shape data and timeline

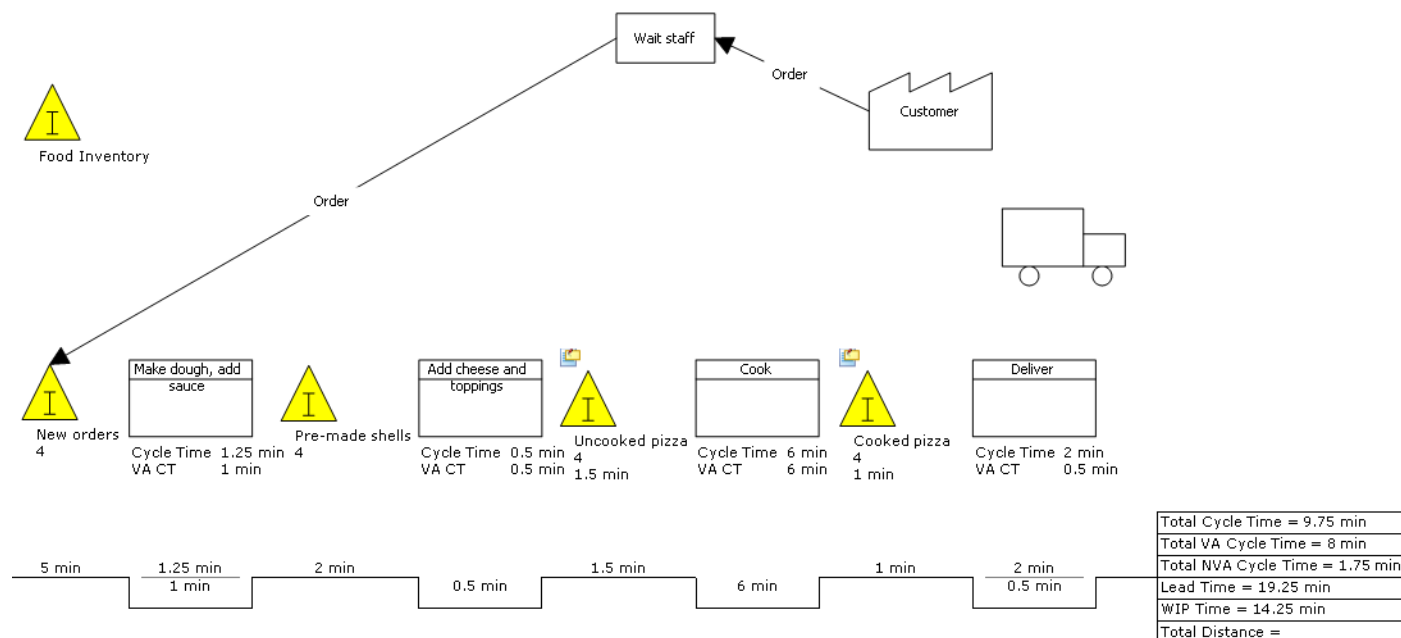
- 1 In the **Roadmap**, double-click **Value Stream Map**.
- 2 View the updates to the map, including the shape data and additional comments.

Mapping the information flow

Once the shapes appear on the value stream map, add connectors to show how the information flows through the process. For example, the customer places an order the wait staff; the wait staff then passes the order to the kitchen. This is an example of manual information flow and is represented on the value stream map with a straight arrow connector.

Add connectors

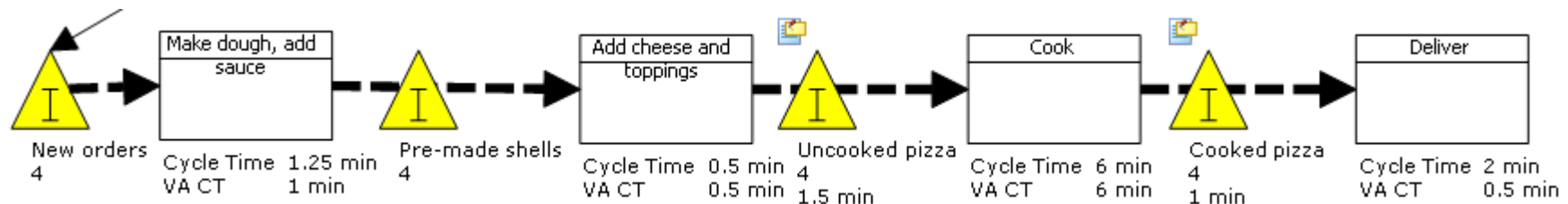
- 1 Click and add a **Manual Information Flow** connector between the *Customer* and *Wait staff* shapes.
- 2 Select the connector and type *Order*.
- 3 Click and add a **Manual Information Flow** connector between the *Wait staff* and *New orders* shapes.
- 4 Select the connector and type *Order*.






Mapping the piece flow

In a push process, each step of the process pushes its product to the next phase where the product stays in inventory until that phase is ready to receive it.

In the current-state pizza making process, each process has its own schedule and materials are pushed from one process area to the next. A value stream map displays push arrow connectors to represent processes that push work from one process to the next, often before the next step is ready to receive that work.




Add connectors

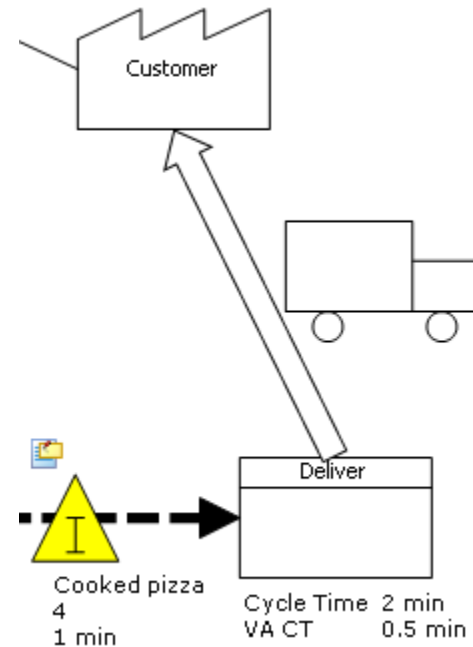
- 1 On the toolbar, click the **Multi-Insert Mode** button .
- 2 Choose  from the list of connectors and add a **Push Arrow** connector between each of the process steps.
- 3 Click the **Select Mode** button .
- 4 Press [Ctrl] and click the *Pre-made shells*, *Uncooked pizza*, and *Cooked pizza* inventory shapes.
- 5 Choose **Actions** > **Orders** > **Bring to Front**.

Delivering the finished goods

The final connection is from the finished goods to the customer. Value stream maps typically use a special finished goods connector to connect the final product to the customer.

Add connectors

- 1 Choose  from the list of connectors and add a **Finished Goods** connector from the Deliver process shape to the Customer shape.




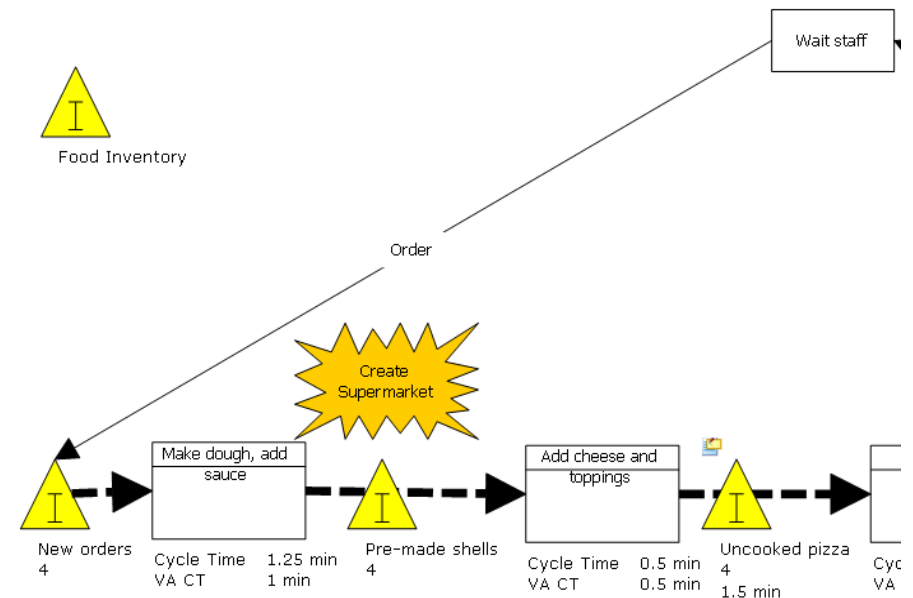
Adding a kaizen burst

As the team creates and explores the current-state value stream, they begin to envision a plan for the future state. Add a kaizen burst to the value stream map to highlight a planned improvement to the value stream.

For example, to reduce the customer's wait time, the team can add a supermarket of pre-made pizza shells with all of the combinations of sauces and cheeses.

Add a kaizen burst shape

- 1 Click the **Kaizen Burst** button  to add a kaizen burst next to the connector between *Wait staff* and *New orders*.
- 2 In the kaizen burst shape, type *Create*, then click enter, then type *Supermarket*.



Creating a future-state map

Push processes in the current-state value stream map may indicate excess inventory and often present lean improvement opportunities. In addition to implementing an electronic ordering system, the team also considers the use of supermarkets, FIFO lanes, and kanbans to reduce or eliminate inventory between processes:

- A supermarket is a specific location that holds a controlled amount of inventory that is pulled from the next operation.
- A kanban, often in the form of a printed card, signals the need for action, or additional inventory, in this case.
- FIFO, or First In, First Out, lanes hold a set amount of inventory with the supplying process at the entrance of the lane and the receiving process at the exit. If the lane gets full, the supplying process stops production.

Copy Value Stream Map

- 1 Right-click the workspace and choose **Copy Value Stream Map**.
- 2 Choose **New ► Value Stream Map**.
- 3 Choose **Blank Value Stream Map**.
- 4 Click **OK**.
- 5 Right-click the workspace and choose **Paste**. Companion copies the data from the current map to the new value stream map.

Final considerations

Summary and conclusions

While the total value-added cycle time is 8 minutes, the lead time from when the customer places the order to the time that the order reaches the table is 19.25 minutes. This difference indicates that opportunities for improvement likely exist by reducing waste, reducing inventory, and reducing non value-added cycle time.

Currently, a push system connects the first two process areas. The team wants to replace this system with a pull system so that the receiving process can withdraw from the supermarket when necessary. Specifically, pizza shells can be pre-made with all of the combinations of sauces and cheeses. While this does not eliminate the cycle time necessary for creating the pre-made shells, this time is now spent outside of what goes into the lead time, or the wait time that the customer experiences.

The team also implements a conveyor pizza oven to create a FIFO lane between the *Add cheese and toppings* step and the *Cook* step. This will help the process flow without building up inventory that must wait for oven space.

In addition to replacing the push system, the team identifies an improvement in an electronic flow of information between the wait staff and the cook staff. As a result, the team replaces the paper orders with an electronic ordering system.

Additional considerations

A successful lean implementation reduces the total lead time by incorporating lean improvements such as continuous flow, pull supermarkets, or FIFO lanes. As a result, each process produces only what customers need, when they need it.

Value stream mapping is an iterative process. As you map the value stream, you identify improvement opportunities, implement them, often in kaizen events, and then repeat the process. As the future state becomes the current state, you create a new future-state map and implement a plan to achieve it.

Exercise A Map the future state

Problem

Now that the current-state value stream map is complete, the team creates a future-state map to guide their efforts to improve the process and information flow.

Instructions

- 1 Open 02Future State Map.qcp.
- 2 In the **Roadmap**, double-click **Future State Map**.
- 3 Complete the future-state value stream map as shown on the next page.

Support files

02Future State Map.qcp

03Final VSM.qcp (for reference)

Value stream map for Exercise A

