



# 5

# Evaluate Inputs

## Objectives

- Identify and organize potential inputs using a fishbone diagram
- Create a rating-vote ballot to prioritize process-improvement options
- Complete a C&E matrix by creating a ballot from a table

# Contents

Examples and Exercises	Purpose	Page
Fishbone Diagrams		
Example 1 Identify and organize potential inputs	Start to determine which inputs have a significant effect on your response.	5-3
Rating-Vote Ballot		
Example 2 Evaluate the options	Use a rating-vote to establish priorities.	5-15
Exercise F Setting up a group multi-vote ballot	Set up a group multi-vote ballot and vote as a class.	5-25
C&E Matrix		
Example 3 Use a ballot to complete a form	Create a rating-vote ballot from a C&E Matrix, and then update the matrix with the voting results.	5-26

# Fishbone Diagrams

## Example 1 Identify and organize potential inputs

The team wants to determine the potential causes of pizza defects. They create a fishbone diagram to assist their brainstorming efforts.

### Tools

- **Fishbone**

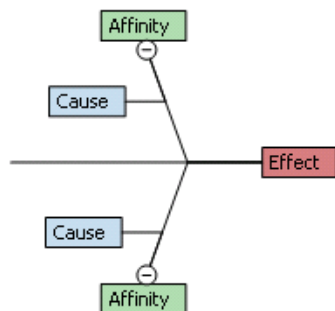
## Creating a fishbone diagram

The fishbone—also called a cause-and-effect diagram or an Ishikawa diagram—is one of 3 brainstorm diagrams that are available in Quality Companion. Use a fishbone diagram to perform brainstorming sessions about potential causes of an effect or problem.


The team determines the potential causes that contribute to incorrect toppings on pizzas. The project leader conducts a brainstorming session with the project team and key stakeholders. Together, they create a fishbone diagram to organize this information.

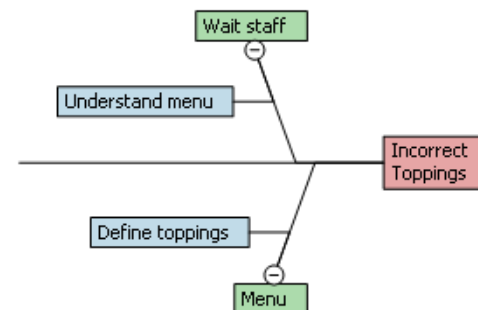
Fishbones contain these elements:

- Effect, or problem
- Affinities are located on the spine of the central effect
- Causes and subcauses



### Create a fishbone diagram



- 1 In the Project Manager, click **Measure 4**.
- 2 On the toolbar, Click , and then choose **Fishbone**. In the **New** dialog, choose **Fishbone**.
- 3 Click **OK**.
- 4 Click **Effect** and type *Incorrect Toppings*.
- 5 Click an **Affinity** and type *Wait staff*.
- 6 Click another **Affinity** and type *Menu*.
- 7 Under the *Wait staff* affinity, click the cause and type *Understand menu*.
- 8 Under the *Menu* affinity, click the cause and type *Define toppings*.




## Adding affinities, causes, and sub-causes

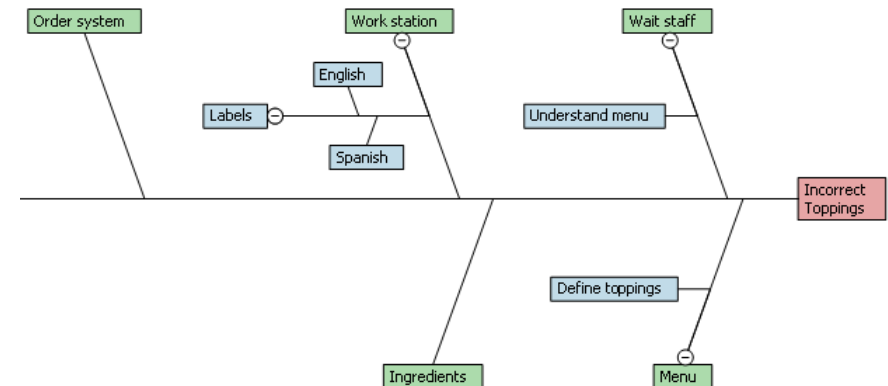
A team member suggests that, in addition to the wait staff and the menu, the work station layout can affect whether the cooks prepare a pizza correctly.

To add affinities, causes, and sub-causes, choose an option:

- Double-click the workspace. Quality Companion adds a new affinity that you can drag to a new location.
- Right-click the shape and choose **Insert ► Affinity** or **Insert ► Cause**.
- On the brainstorm toolbar, click  to insert an affinity or click  to insert a cause.

## Add affinities, causes, and sub-causes

- 1 Double-click the workspace to create a new affinity, and type *Work station*.
- 2 Click the *Work station* affinity, then click  on the brainstorm toolbar to create a new cause. Type *Labels*.
- 3 Right-click the *Labels* cause and choose **Insert ► Cause**. Type *English*. Repeat to add another cause and label it *Spanish*.
- 4 Add 2 more affinities and label them *Ingredients* and *Order system*.



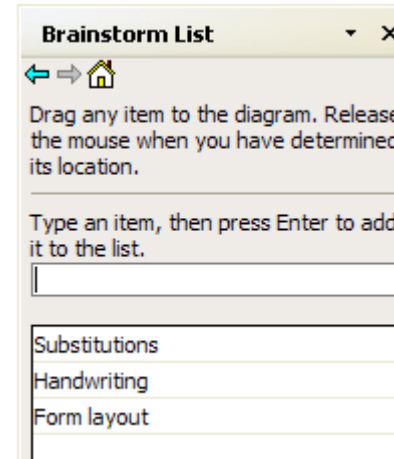
## Using the brainstorm list

The brainstorm list provides a location to enter ideas that you can drag onto an idea map, fishbone diagram, or CT tree.

The team uses the brainstorm list to generate ideas without having to stop and determine the proper placement on the fishbone. After they generate a list, the team can drag the items from the brainstorm list to any level of the diagram.

### Use the brainstorm list

- 1 Click **Brainstorm List** in the task pane.
- 2 Type *Substitutions* in the first empty field near the top of the pane.
- 3 Press **[Enter]** to add the item to the list.
- 4 Repeat to enter the following items as shown.



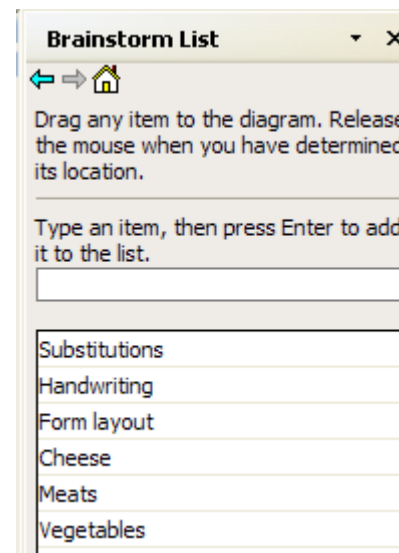
## Importing x and y variables

You can save time and effort by importing shared data, such as x and y variables, into the brainstorm list.

Changes made to a variable in a brainstorm tool are not made to the variable in other areas of Quality Companion.

### Import x and y variables

- 1 Right-click in the Brainstorm List and choose **Import X Variables**.
- 2 In the Data Selection dialog box, check **Cheese**, **Meats**, and **Vegetables**.
- 3 Click **OK**.



## Laying out the diagram

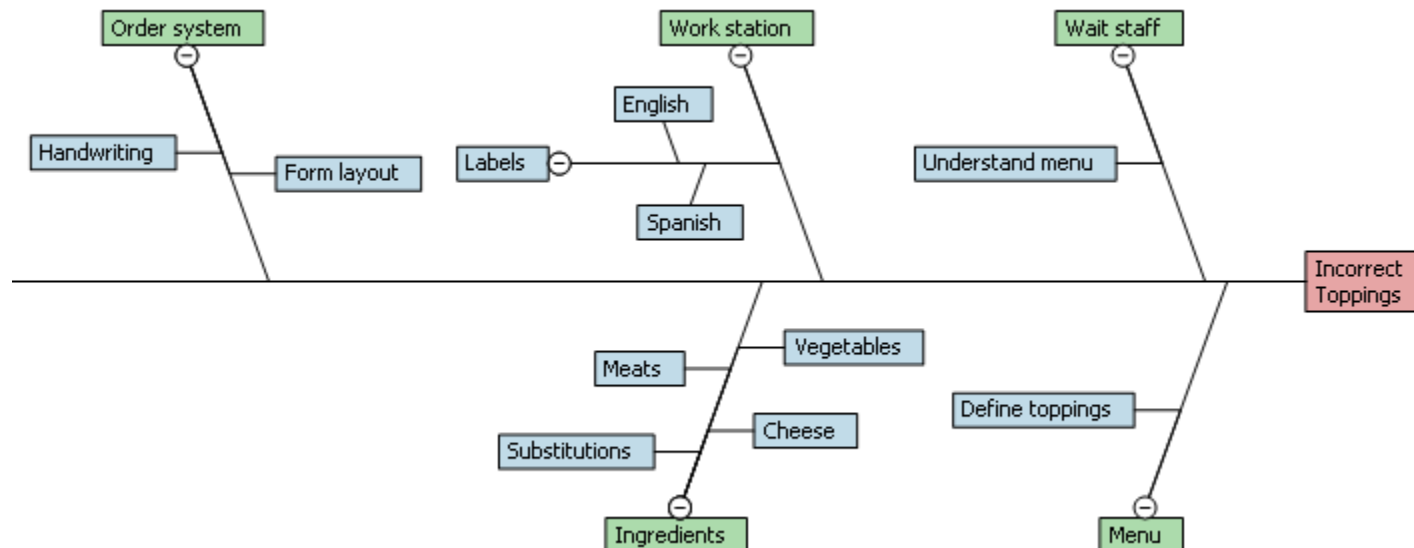
Drag items from the brainstorm list to create your diagram. When you drag an item from the brainstorm list or from anywhere on the map, you see a preview of where the item will be placed. Once you determine the item's new location, release the mouse button.

### Lay out the diagram

- 1 In the brainstorm list for the fishbone diagram, click *Substitutions* and drag it to the *Ingredients* affinity.
- 2 When you see the red preview, release the mouse button.



- 3 Use this method to create the following diagram. (Hold down **[Ctrl]** to select multiple items in the brainstorm list.)



## Making x and y variables

You can also select any shape in any brainstorm diagram and make it into an x or y variable. The variable is added to Process Map Data where it can be shared with other tools throughout Quality Companion. You can add and edit detailed information about each variable; however, these changes are not reflected on the brainstorm diagram. The text in the shape on the brainstorm diagram is the name for the variable in Process Map Data.

### Make x and y variables

- 1 Press **[Ctrl]** and click the *Menu* and *Ingredients* shapes on the diagram.
- 2 Right-click and choose **Make X Variables**.
- 3 Click **OK**.
- 4 Double-click **Process Map Data** in the Project Manager. Notice that *Menu* and *Ingredients* appear as unmapped variables.

Process Map - Add toppings	Cheese	Controllable	Attribute
Process Map - Add toppings	Junior cook		
Process Map - Add toppings	Meats	Controllable	Attribute
Process Map - Add toppings	Shell with sauce		Attribute
Process Map - Add toppings	Vegetables	Controllable	Attribute
Process Map - Cook pizza	Temperature	Controllable	Continuous
Process Map - Cook pizza	Oven	SOP	Attribute
Process Map - Remove from oven	Cooked pizza		Attribute
Unmapped Variable	Ingredients		
Unmapped Variable	Menu		

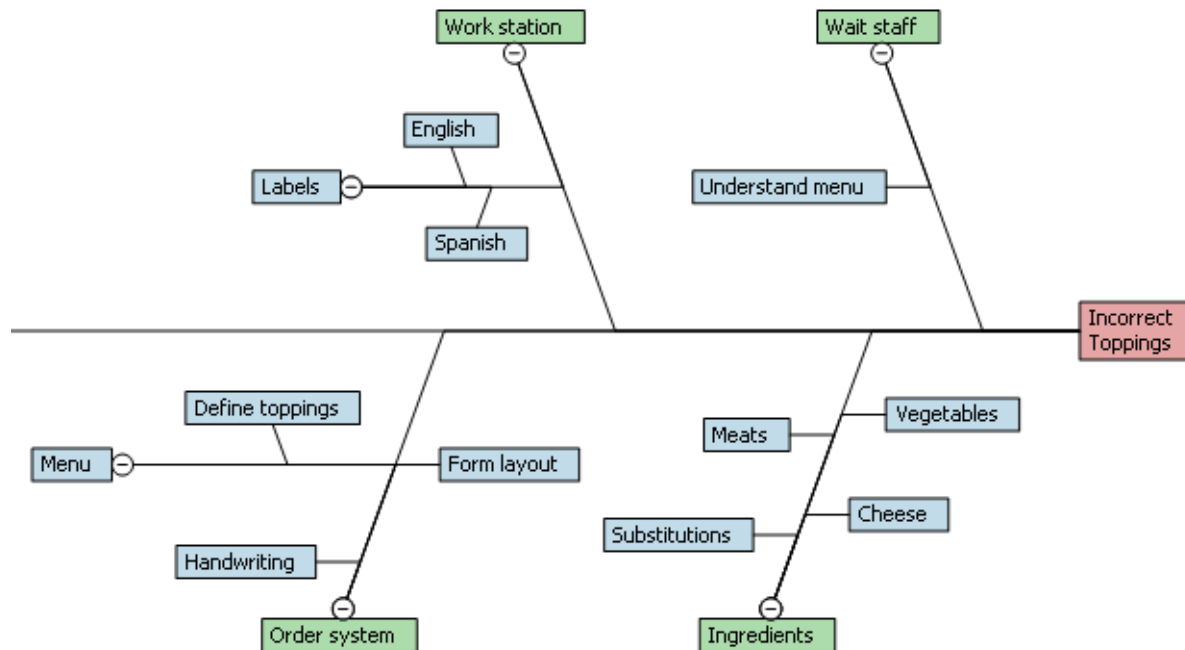
## Rearranging the layout

You can rearrange the layout of your diagram. When you move the affinities on a diagram, all causes and subcauses for the shape also move.

You can also change the side that an idea, cause, or affinity appears on a diagram.

## Rearrange the layout

- 1 Double-click **Fishbone** in the Roadmap.
- 2 Right-click the *Order System* affinity and choose **Switch Sides**.
- 3 Drag the *Menu* affinity to the *Order System* affinity. *Menu* becomes a cause and *Define our toppings* becomes a subcause.



## Adding comments and priorities

You can insert comments and priorities for any of the shapes on an idea map, fishbone diagram, or CT tree. When you add a comment or priority, the appropriate icon appears next to the shape. To read or edit the comment, double-click the comment icon to display it in the task pane.

The priority icon indicates the priority level. Each priority level has its own color icon.

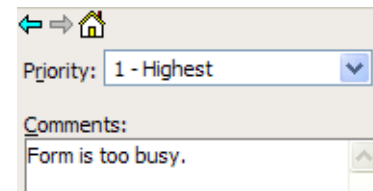
Icon	Color	Priority Level
	Red	Highest
	Orange	High
	Yellow	Medium
	Blue	Low
	Green	Lowest

To show or hide comment or priority icons choose:

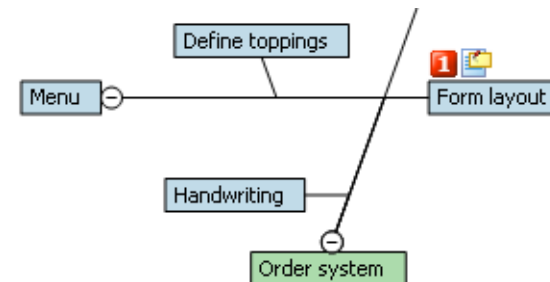
- **View > Icons > Comments**
- **View > Icons > Priorities**

## Add comments and priorities

- 1 Right-click the *Form layout* cause and choose **Insert > Comments**.
- 2 In the task pane, from **Priority**, choose **1 - Highest**.
- 3 Type **Comments** as shown below.




- 4 Click the workspace and note the icons next to shape.



- 5 Pause your mouse over the comment icon to display comment text.

## Formatting shapes and text

You can format shapes individually or as groups:

- To select all of one type of shape, such as affinities, choose **Actions** ► **Select** ► **Affinities**.
- To select multiple shapes:
  - Drag your mouse around a selection
  - Click shapes while pressing [**Shift**] or [**Ctrl**]
- To copy and paste the format of a shape or text box and its font style to other shapes, use the Format Painter  button on the toolbar.

## Format shapes and text

- 1 Right-click the *Incorrect Toppings* effect and choose **Format** ► **Text**.
- 2 Increase the font size and click **OK**.
- 3 Choose **Actions** ► **Select** ► **Subcauses**.
- 4 Choose **Format** ► **Fill**.
- 5 Change the color and click **OK**.

## Changing the layout

In addition to fishbone diagrams, Quality Companion also provides 2 other brainstorm diagrams: idea maps and CT trees.

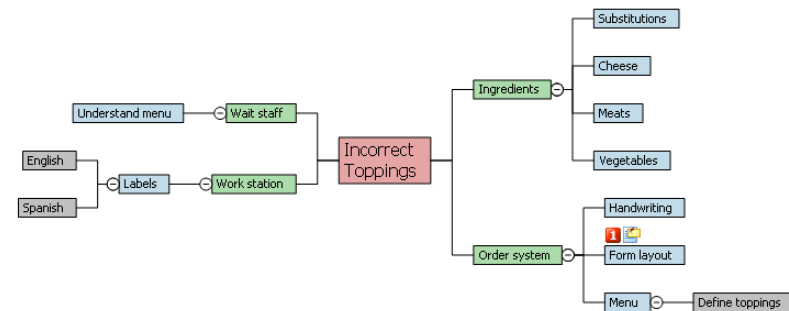
These brainstorm diagrams share similar features but differ slightly in their use, layout, and terminology:

Tool	Common Use	Terminology
Idea Map	General purpose mind-mapping or brainstorming	Central Question, Affinity, Idea
Fishbone	Cause/effect mappings	Effect, Affinity, Cause
CT Tree	Critical-to-quality mappings	Critical To, Affinity, Input

To change the layout of your current brainstorm diagram, you can convert it to another layout. You can also change shape parameters.

### Change the layout

- 1 Choose **Format** ► **Layout**.
- 2 From **Layout style**, choose **Tree**.
- 3 From **Direction**, choose **Center to Left/Right**.
- 4 Click **OK**.





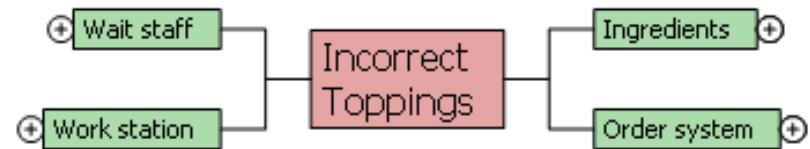
## Final considerations

### Summary and conclusions



The team created a fishbone diagram using structured brainstorming to identify causes that could contribute to pizza defects.

### Additional considerations




Collapse  or expand  affinities, causes, and subcauses to view specific levels of the fishbone diagram. You can also choose **Actions** > **Collapse** > **Affinities** or **Causes**.



You can export a fishbone diagram, or any brainstorm diagram, to a new Microsoft Word document or PowerPoint presentation. Choose **Actions** > **Export to** > **PowerPoint** or **Word**, or use the export toolbar.

Button	Description
	Export to PowerPoint
	Export to Word

Use Pan Window, auto scroll, or zoom to navigate a large diagram.

Button	Description
	Pan Window
	Auto Scroll
100% 	Zoom

# Rating-Vote Ballot

## Example 2 Evaluate the options

### Problem

The team identifies 5 actions to reduce customer wait times. The project leader wants the whole team to have input into which action to pursue, but there is no time when everyone can meet. The leader creates a ballot so the team can vote as their schedules allow.

### Tools

- Rating-vote ballot

### Support files

17Ballots.qcp










18RatingVote.qcp

## Ballot – Overview

Quality Companion supports these voting methods:



- **Multi-vote:** Individuals select one or more candidates from a list. This can be done remotely and over a period of time.
- **Group multi-vote:** The group votes for one or more candidates in a single voting session. Votes are counted and entered by one person.
- **Rating-vote:** Individuals rate candidates on specific criteria, such as cost, time, acceptance, and so on. This can be done remotely and over a period of time.

When you open a new ballot, status icons appear in the ballot header. Because these icons represent sections of the ballot setup, they vary based on ballot type.

Ballot Type	Icons			
Multi-vote	 General	 Voters	 Candidates	
Group Multi-vote	 General	 Candidates		
Rating-vote	 General	 Voters	 Candidates	 Criteria

You can click these icons to move through ballot setup.

When you complete a section successfully, a checkmark appears. If you do not provide all of the required information, however, an exclamation point appears. You cannot complete the ballot until you enter all of the required information.

Icon	Description
 General	Section complete
 General	Section incomplete

## Creating a ballot

The project leader chooses a rating-vote ballot to prioritize the 5 improvement options to reduce customer wait time.

### Create a ballot

- 1 Open 17Ballots.qcp.
- 2 Right-click **Analyze 1** in the Roadmap and choose **New ► Ballot**.
- 3 Choose **Ballot**.
- 4 Click **OK**.
- 5 In **Central issue**, type *Best option?*.
- 6 Choose **Rating-vote**.
- 7 Click **Next**.

## Adding voters


On the voters page, add the names of those who will vote on the issue. Voters are not limited to team members. You can type a voter name in the input row or select a team member from the drop-down list.

You can also:

- Add all of your team members at once
- Allow team members to abstain from voting
- Use the up and down arrows to change the voting order, or delete a voter, if necessary
- Check **Use anonymous voting** to prevent voters (even the person setting up the ballot) from seeing individual voting results

The project leader decides not to include the staff in this vote and limits it to only project team members.

## Add voters


- 1 Click  to add all of the team members.

Name	Can Abstain
Click here to add a voter	No
Bill Rand	No
Bill West	No
Christene Long	No
Frank Ray	No
Jeffrey Harmony	No
JP Marsh	No

↑

↓

✕



- 2 Click **Next**.

## Adding candidates

On the candidates page, type an item in the input row to add it to the list of items that team members will rate when they cast their votes.

You can also:

- Use the up and down arrows to change the order, or to delete a candidate from the list
- Add comments to a candidate to help voters understand the candidate
- Inform voters of the number of candidates that they can choose

When you set up a ballot, cast a ballot, or view the results of a vote, you can insert comments or edit existing comments about a candidate.

After you add a comment, the comment icon on the final ballot changes to indicate that a comment exists.











No comment




Comment

## Add candidates

- 1 Under **Candidate**, type *Fix oven*.
- 2 Press **[Enter]**.
- 3 Add the remaining candidates as shown below.

Candidate	
Click here to add a candidate	
 Fix oven	  
 Prep area	
 More staff	
 Delivery	
 Ordering	

- 4 Click **Fix oven**, and then click  .
- 5 In the task pane under **Comments**, type *Need parts*.
- 6 Click **Next**.

## Adding criteria








On the criteria page, add the criteria on which to rate candidates. Voters can rate criteria on a variety of scales. For example, from low to high, weak to strong, worst to best, and so on. When Quality Companion tabulates the results, it associates negative criteria with low numbers on the scale and positive criteria with high numbers on the scale. If you create a custom scale, enter values from negative to positive.

You can also:

- Insert comments or edit existing comments about a criterion.
- Choose the scale level, up to 10, that voters will use to rate the candidate.
- Set up the ballot to let voters evaluate the importance of each criterion. Otherwise, all criteria are weighted equally.

### Add criteria

- 1 Under **Criteria**, type *Impact*.
- 2 From **Legend**, choose **Weak...Strong**.
- 3 Press **[Enter]**.
- 4 Repeat to add the remaining criteria as shown.

Criteria	Legend	
Click here to add a criterion		
 Impact	Weak ... Strong	
 Speed	Low ... High	
 Acceptance	Least ... Most	
 Customer	Dislike ... Like	

- 5 From **Scale**, choose **1...9**.
- 6 Click **Finish**.

## Casting a vote

The project leader lets voters cast their votes from within the Quality Companion project. All voters must have access to the shared network drive where the project file is located.


After opening the project, the voter clicks the ballot in the Roadmap. From the voter selection page, the voter can:

- Display the ballot by clicking his or her name from the list of voters
- View current voting results by clicking **View Results**

## Cast a vote

- 1 Click **Bill Rand** from the list of voters.
- 2 Complete the ballot.

Best option?






 Ballot is set up, ready for voting.

Voters	Results
0 Votes Completed 6 Votes Remaining  <a href="#">Bill Rand</a> <a href="#">Bill West</a> <a href="#">Christene Long</a> <a href="#">Frank Ray</a> <a href="#">Jeffrey Harmony</a> <a href="#">JP Marsh</a>	You may view the results of cast ballots before voting is complete. To view the results click below.  <div style="background-color: #003366; color: white; padding: 2px 10px; border-radius: 5px; display: inline-block; text-decoration: none;">View Results</div>  On the results page, you will have access to: An in-depth ballot breakdown table... An interactive chart to visualize your results... Consensus threshold tool...






OR

Best option?

**Current voter: Bill Rand**

		Criteria	
Candidate	Impact	Speed	
	Weak ... Strong	Low ... High	
 Fix oven	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	
 Prep area	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	
 More staff	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	
 Delivery	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	
 Ordering	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	

		Criteria	
Candidate	Acceptance	Customer	
	Least ... Most	Dislike ... Like	
 Fix oven	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	
 Prep area	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	
 More staff	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	
 Delivery	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	
 Ordering	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	

Cast Ballot

When you cast a vote on a rating-vote ballot, you evaluate each candidate by criteria chosen by the team. Always read rating scales from negative to positive.

If you try to cast an incomplete ballot, Quality Companion indicates missing information with a yellow highlight.

- 3 Click **Cast Ballot**.
- 4 Click **View Results** to view current voting results.
- 5 Click **Continue Voting**.
- 6 Close the project so that the next voter can open the project to vote.

## Interpreting the results

After the last vote is cast, Quality Companion displays the voting results.

### Overall Results

The Overall Results table displays the average vote for each criteria and the average weighted value for each candidate.

### Individual Results

The Individual Results table displays the selection for each criteria by voter. This table does not appear if anonymous voting was selected during ballot setup.

### Our results

The results of this example indicate that 2 options, changes to **Prep area** and **Delivery**, are likely to provide a quick benefit and seem to be most acceptable to the staff and customers.

### Interpret results

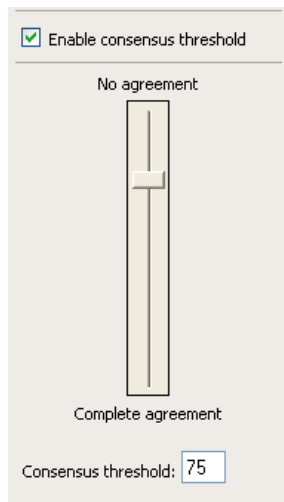
- 1 Open 18RatingVote.qcp.
- 2 Double-click **Ballot** in the Roadmap.
- 3 Close the Project Manager for a full view of the results.
- 4 In the **Overall Results Table**, right-click the **Average** column header and choose **Sort ► Descending**.

Overall Results Table

	Candidate	Criteria				Average
		Impact	Speed	Acceptance	Customer	
	Prep area	8.00	8.17	7.33	5.00	7.13
	Delivery	6.33	8.17	5.50	7.50	6.88
	Ordering	7.00	5.00	6.67	5.00	5.92
	More staff	7.00	5.17	4.83	6.50	5.88
	Fix oven	7.67	1.83	7.17	5.67	5.58


## Setting the consensus threshold

The Consensus Threshold task pane, available only with rating-vote ballots, is used to flag areas of disagreement among voters. The consensus threshold is represented as a number on a scale from 1 to 100. By default, this threshold is 75, but you can adjust it. A lower number flags more items, and a higher number flags fewer.












When a candidate receives ratings that are especially far apart on the scale, it indicates a lack of consensus. In this example, the greatest disparity occurs in the **Acceptance** rating for the **More staff** candidate. The wait staff might view **More staff** as a potential loss of income, but management sees this as a way to speed up service.

## Set the consensus threshold

- 1 In the task pane, click **Set Consensus Threshold**. (If the task pane is not open, click  on the standard toolbar.)
- 2 Check **Enable consensus threshold**.
- 3 Drag the indicator button on the slide bar to 40 or type *40* in **Consensus threshold**.
- 4 Evaluate any areas of disagreement, which are highlighted in red.

Overall Results Table

	Candidate	Criteria				Average
		 Impact	 Speed	 Acceptance	 Customer	
	Prep area	8.00	8.17	7.33	5.00	7.13
	Delivery	6.33	8.17	5.50	7.50	6.88
	Ordering	7.00	5.00	6.67	5.00	5.92
	More staff	7.00	5.17	4.83	6.50	5.88
	Fix oven	7.67	1.83	7.17	5.67	5.58

## Final considerations

### Summary and conclusions

Using the rating-vote ballot, the project leader was able to:

- Allow all team members to vote to choose an improvement action, despite schedule conflict
- Review neatly tabulated results
- Flag areas of disagreement among voters with the Consensus Threshold

### Additional considerations

In this example, voters cast their votes in the project file. However, you can also have voters cast votes via e-mail.

- 1 In Ballot, from the voting page, choose a voter.
- 2 From the ballot workspace, right-click the ballot and choose Copy Ballot.
- 3 Paste the ballot in the body of an e-mail.
- 4 Delete the voter name.
- 5 Set the mail format to HTML.
- 6 Send the e-mail with a request to reply.

When the recipient chooses Reply, the e-mail becomes editable so that the voter can cast and return a vote.

## Exercise F Setting up a group multi-vote ballot

### Problem

Use a group multi-vote to determine whether the class is ready to take a break.

### Support files

None

### Instructions

- 1 Add a new ballot to the Roadmap.
- 2 In **Central issue**, type *Break time?*.
- 3 Under **Ballot type**, choose **Group multi-vote**.
- 4 Click **Next**.
- 5 List *Yes* and *No* as the 2 possible candidates.
- 6 Click **Finish**.
- 7 Using a show of hands, vote for the candidates.
- 8 Click **Cast Ballot** and review the results.

# C&E Matrix

## Example 3 Use a ballot to complete a form

### Problem

The project leader uses a C&E Matrix to identify possible causes of the defects at the Add Toppings process step, where 2% of the pizzas are scrapped and 3% are reworked.

The team wants to use balloting to complete a C&E matrix.

### Support files

18Rating Vote.qcp

19Matrix Ballot.qcp

### Tools

- C&E Matrix
- Rating-vote ballot

## Opening a C&E Matrix

The C&E Matrix, or cause-and-effect matrix, quantitatively evaluates a set of x inputs versus a set of y outputs. Use a C&E Matrix to reduce the list of potential inputs before you perform expensive testing.


### Open a C&E Matrix

- 1 Open 18Rating Vote.qcp.
- 1 Right-click **Measure 4** in the Roadmap and choose **New ► Form**.
- 2 Choose **C&E Matrix**.
- 3 Click **OK**.

## Adding outputs

You can add the outputs, or y variables, to the form manually or you can import them from Process Map Data. Y variables form the columns in the matrix. These outputs will be weighted in terms of importance to the customer.

### Add outputs


- 1 Pause the cursor over a column in the table, click , and choose **Create New Y Variable** ► **Multiple**.
- 2 In **Number of columns**, enter 3.
- 3 Click **OK**.
- 4 In the output row, double-click each column and type: *Correct toppings*, *Attractive look*, *Correct sauce*.
- 5 Type the importance of each output to the customer. Type 9, 4, and 7. Press **[Tab]** to move between fields.

Importance of each output to the customer	9	4	7
Outputs	Correct toppings	Attractive look	Correct sauce



# Adding inputs

Add outputs, or x variables, to the form manually, or import them from Process Map Data. X variables form the rows of the matrix.

## Add inputs

- 1 Pause the cursor over a row in the table, click  when it appears, and then choose **Select Existing X Variables**.
- 2 In the Data Selection dialog box, check the following, and then click **OK**.

Process - Map Activity	Name
Process Map - Add toppings	Cheese
Process Map - Add toppings	Meats
Process Map - Add toppings	Vegetables
Process Map - Add toppings	Junior cook
Process Map - Add toppings	Shell with sauce

- 3 Pause the cursor over the last row in the table, click  when it appears, and then choose **Create New X Variable**  **Below**.
- 4 Next to **Unmapped Variable**, double-click **xvariable1** and type *Wait staff training*.



- 5 Press **[Enter]**.

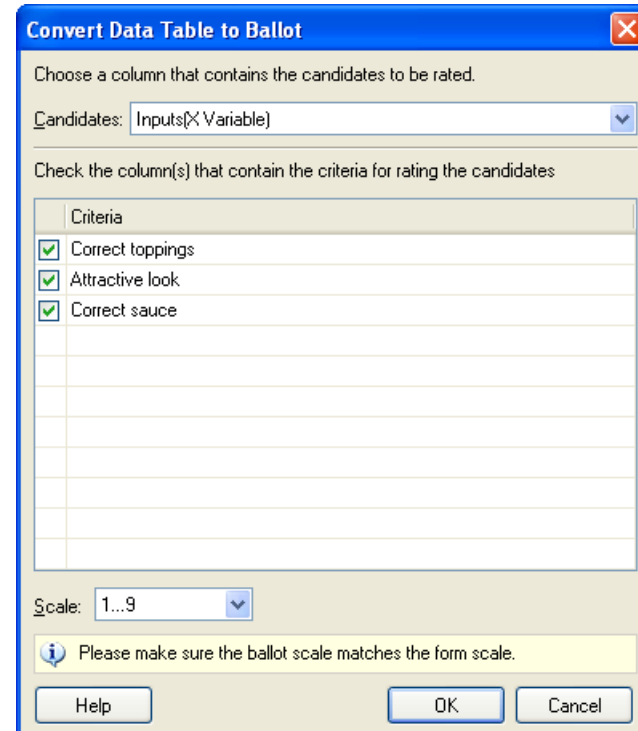
## Creating a ballot from table

After it adds the variables to the form, the project team rates the effect of each input on each output. Scores are based on opinions from the entire team.

You can create a ballot from any form that contains a data table. In this example, you create a ballot from the C&E matrix, have team members vote on scoring for outputs and inputs, and, when voting is complete, import the results directly back to the form.

### Create a ballot from table

- 1 Right-click in the data table, and then choose **Create Ballot from Table**.
- 2 Complete the dialog box as shown below.












- 3 Click **OK**.








# Creating a ballot from table

Quality Companion pre-populates the ballot with information it already has from the data table in the form. Here, the candidates and criteria come directly from the C&E matrix.

## Create ballot from table

- 1 Click **Next**.
- 2 Click  to add all team members.
- 3 Click **Finish**.
- 4 Select any voter and view the resulting ballot.

		Criteria	
		 Correct toppings	 Attractive look
Candidate		Low ... High	Low ... High
 Cheese		<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
 Meats		<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
 Vegetables		<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
 Junior cook		<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
 Shell with sauce		<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
 Wait staff training		<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>

		Criteria
		 Correct sauce
Candidate		Low ... High
 Cheese		<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
 Meats		<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
 Vegetables		<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
 Junior cook		<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
 Shell with sauce		<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
 Wait staff training		<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>



# Updating the C&E Matrix

After you rate the inputs and outputs, Quality Companion calculates the Weighted Value by Input and % of Net Effect by Input. The higher the rated value of an input, the more likely that it contributes to the overall effect on the organization’s objectives.

Because of their high scores, **Meats** and **Wait staff training** appear to contribute to the problem. The project leader can change their status to critical.

## Update the C&E Matrix

- 1 Open 19Matrix Ballot.qcp.
- 2 Double-click the **C&E Matrix** in the **Measure 4** section of the Roadmap. Notice that the ratings are not in the form.
- 3 Double-click **Ballot 1** in the **Measure 4** section of the Roadmap and view the results.
- 4 Click **Update Form**.
- 5 Notice that the C&E matrix now contains the results from the ballot.

Importance of each output to the customer		9	4	7			
Outputs		Correct toppings	Attractive look	Correct sauce			
Process Map - Activity	Inputs (X Variable)				Weighted Value by Input	% of Net Effect by Input	Status
Process Map - Add toppings	Cheese	4.17	4.17	1.33	63.52	11.5%	Potential
Process Map - Add toppings	Meats	8.17	6	1.17	105.72	19.2%	Potential
Process Map - Add toppings	Vegetables	6.17	5	1.17	83.72	15.2%	Potential
Process Map - Add toppings	Junior cook	2	7	4.5	77.5	14.1%	Potential
Process Map - Add toppings	Shell with sauce	1.83	5	7.67	90.16	16.4%	Potential
Unmapped Variable	Wait staff training	8.67	1.17	6.83	130.52	23.7%	Potential
Weighted effect on each output		279.0	113.3	158.6			
		9	6	9			

# Final Considerations

## Summary and conclusions

Inadequate wait staff training and wrong meats are thought to be the largest contributors to defects at the Add Toppings step of the process. Incorrect toppings result when menu options are not clearly explained and when cooks receive wrong order information. Wait staff training would address this problem.

## Additional considerations

To evaluate competing improvement proposals, use the Solution Desirability Matrix. This team-based form lets you select an improvement strategy that best matches the improvement goals of your organization.

You can create a ballot from any form that contains a data table. For example, you can create a ballot from the Solution Desirability Matrix, have team members vote on the proposed solutions and, when voting is complete, import the results directly back into the form.

Once you choose an improvement strategy, you can use the Solution Implementation Checklist to ensure that your team has accounted for any potential problems when making changes to the process or process input settings.

