Module 2, Lesson 3:
Supply-chain threats
Lesson guide
Module 2, Lesson 3: Supply-chain threats

What we'll learn

In this lesson; we're going to cover what supply-chain vulnerability is, so we're really clear on what we're looking for. We're also going to look at what we call targeting when carrying out supply chain mapping.

Then; we'll look at what you'll need to complete your scoping exercise, of your supply-chain threats, then finally, we'll go through our example, to scope out threats from the supply-chain, so you know how to do it.

Supply-chain vulnerability

We know that the supply-chain is an important part of the vulnerability process.

All the standards refer to the length and complexity of the supply-chain, but none of them provide the requirements for compliance.

You've most likely heard of the term supply-chain mapping, but we need to be clear about what this means and how we should go about doing it.

Professor Chris Elliott

Professor Chris Elliott in the video explains what went wrong in the supply-chain which allowed the horsemeat scandal to occur.

The beef supply-chain was so long and complex that it was really difficult to know where the product had been and who was responsible for each step. This made it easier for the fraudsters to carry out the fraud.

It reiterates, how important it is to know the supply-chain of your ingredients and make sure that the chain is as simple as it can be.

The length and complexity of the supply-chain

We need to be able to understand our supply-chains in order to know what's going on and where the ingredient has come from.
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We need to be able to know each step of the supply-chain from farm level, at each point where it changes hands, to when it arrives with you.

Shown in the above diagram, is an example of a typical supply-chain, one which you may think would be simple. But when you think at farm level, produce can come from many, many farms. Then the farm may send their product to a processor, before the ingredient reaches a manufacturer.

It could then go to a warehouse for storage, before being transported overseas.

An agent may purchase it and then store it too, before it’s sold and sent to you.

Between each of these points, it’s transported and each movement may be by a different third-party haulier. So, you can see, even a typical and fairly simplistic supply-chain can get complicated quickly.

Targeting

Mapping out each step in a supply-chain is a very time consuming process. We need to make sure we prioritise the supply-chains which we think may be vulnerable. To do this, we use something that called targeting.

What to target?

To prioritise the supply-chains which we think are vulnerable we have to ‘target’ these vulnerabilities.

How do we know what do we target? We target:

- The supply-chains for the ingredients we think may be vulnerable
- The parts of that supply-chain where we think there may be vulnerabilities

Targeting vulnerable ingredients

We know which ingredients have known or plausible threats, or product claim threats associated to them, which therefore, make the ingredient vulnerable.

Therefore, we only target the supply-chains of ingredients that have known or plausible threats, or product claim threats.

These are the ingredients, that we target to carry out supply-chain mapping on.

<table>
<thead>
<tr>
<th>Raw material</th>
<th>Threat</th>
<th>Product claim threats</th>
<th>Supply-chain</th>
<th>Supply-chain threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olives</td>
<td>Olive oil with cheese, salmon, nuts</td>
<td>No product claims</td>
<td>Supplier: X Ltd</td>
<td>BD20449</td>
</tr>
<tr>
<td>Eggs</td>
<td>Free-range eggs with vegetable</td>
<td>No product claims</td>
<td>Supplier: X Ltd</td>
<td>BD20449</td>
</tr>
<tr>
<td>Meat</td>
<td>Beef</td>
<td>Briq</td>
<td>Supplier: X Ltd</td>
<td>BD20449</td>
</tr>
<tr>
<td>Spices</td>
<td>Black pepper, nutmeg</td>
<td>Briq</td>
<td>Supplier: X Ltd</td>
<td>BD20449</td>
</tr>
<tr>
<td>Bread</td>
<td>Seedless multi-seed muffins</td>
<td>No product claims</td>
<td>Supplier: X Ltd</td>
<td>BD20449</td>
</tr>
</tbody>
</table>

From our example, we would target:

- Olive oil
- Free-range egg
- Mince pork
- Black pepper and nutmeg

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Targeting vulnerable parts of the supply-chain

To find the vulnerable point we need to follow the threat. We follow the threat, back to the point at which it is assured.

When we say assured, we mean the point at which the threat is no longer a risk.

We then assess the risks from that point: to the point when it’s delivered to you, as these would be the steps in the supply-chain where it is vulnerable.

Spices example

Let’s just remind ourselves of the threat for spices (ground black pepper and ground nutmeg):

‘Dilution of spices with cheaper materials which in the worst case could be nut shells’

At what point in the supply-chain do you think the ingredient is assured?

Or to put it another way: At what point in the supply-chain, working backwards, do you think the spices are not at risk from dilution anymore?

Fraudsters can mix other materials into ground spices, because when they are ground, you can’t see the material that they’ve mixed in.

Therefore, when it’s ground, it’s at risk. Which means, when it’s not ground, it’s not at risk, or, it’s not ‘vulnerable’.

We can therefore, discount all of the steps prior to the grinding process. Because, when the seed is still whole, you can generally tell what the seed is, so it’s not at risk.

If you were supply-chain mapping spices for this reason, you would identify the point, from which the spices are ground, as vulnerable and assess the potential threats from there.

Horsemeat scandal example

Let’s imagine, that we are assessing the horsemeat scandal supply-chain. We need to target the point in the supply-chain where the product is at risk. We’re following the threat of substitution or dilution of beef with another cheaper cut of meat.

To target the vulnerable points in the supply-chain we follow the threat of substitution or dilution of beef, back to where the product is assured. i.e. where we know it’s definitely beef.

If the product is delivered as minced beef; when it’s delivered, it is difficult to tell, unless we’re going to test it, if it’s beef or not. Therefore, we need to go back to the next step.

Prior to this the mince is made from cuts of meat. At this stage, depending on the expertise and knowledge available on-site, you may not be able to visually identify a cut of beef from another type of meat.
Therefore, you would need to go back to the stage further, to where the carcass is whole. This means, for your assessment, depending on the knowledge and expertise within your business you may define the point at which it is assured as being the point where it is a whole carcass, or a joint of beef.

This would mean, that you would assess the threats of substitution or dilution from this point forward. Let’s look at how that would work in the supply-chain, here is our adapted supply-chain below.

Here we have the farm where the cows are bred and raised. We know that they’re cows here, so that’s ok. The cows are taken to the processor and cut into joints.

Depending on the knowledge and expertise in your business; you may decide that this is where the risk begins, so you may decide that this is where you would focus your attention.

The joints are then taken to the manufacturer and processed into mince. Again; this may be the point where your business may focus its attention, because after this point you can’t really determine what the meat is, without testing it.

To determine if there any potential threats from substitution at these points in the supply-chain, you may contact the businesses involved and find out if they process any other meat for example. If they only process and produce beef, then the risk of dilution of beef, with something else, is obviously less, and you may decide that there is not a significant threat.

If, however, they process horse, or any other similar meat, you may decide that there is a potential for dilution of the beef with something else, and therefore a significant threat, that needs including in your assessment.

Let’s continue with our example horsemeat scandal supply-chain.

Let’s say a broker purchased the mince and imported it into Ireland. An agent then purchased it and at that point, we now know, that the meat was actually horse.

It is then delivered to the manufacturers and used as beef, because it is labelled as beef.

This means, that at some point between it being dispatched as processed product and arriving in Ireland, it was switched with horse meat. Meaning that it was substituted with horse meat.

At any point, during its transportation to Ireland, it was substituted. To do this, the fraudsters must have relabelled the product to disguise the fact that it was horse.

For our supply-chain mapping, we would need to establish who is responsible for the product from when it leaves the manufacturer, to when it arrives with us, as the customer.
Even being able to determine the supply-chain of the product will give us some protection, because it means if we can do this, essentially, we have some control, because we know what’s going on. This is in contrast to what happened in the horsemeat scandal, where the supply-chain was so long and complicated, nobody knew what was going on.

Once you know the supply-chain, you will then be able to assess it, to establish if there any risks. For example: Does the product go anywhere, where it could be re-packed or re-labelled? If you suspect a substitution issue, you may decide to carry out a traceability exercise, to make sure that all paperwork matches at each step, to ensure that it’s not been doctored.

What you’ll need

To carry out your scoping exercise for supply-chain threats, you will need:

- The threat scoping document to find vulnerabilities from:
  - Known and plausible threats
  - Product claim threats
- Supplier details for vulnerable ingredients
- Your detective hat on!

Scoping supply-chain threats

To carry out this exercise we will use two templates, the threat scoping template and the supply-chain mapping template.

We take the vulnerable threats from our threat scoping template and carry out supply-chain mapping on each one, following the threat, back to the point at which it is assured.

Below is an example of what a supply-chain map might look like. The template that we have provided to you, is just that, a template, you will find that every supply-chain is very different, so you’ll need to be flexible and adapt the template to suit the supply-chain that you’re working on.
Free-range egg example

Here is the template completed, as an example, for free-range egg.

<table>
<thead>
<tr>
<th>Raw Material: Free-range British Egg</th>
<th>SUPPLY-CHAIN MAPPING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vulnerable threat:</strong> British and free-range</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Is the supplier 1 step back contract 3rd party transport for delivery?</th>
<th>Does the supplier 1 step back contract 3rd party storage to slow the product prior to delivery?</th>
<th>Supplier 1 step back</th>
<th>Is the supplier 2 steps back contract 3rd party transport for delivery?</th>
<th>Does the supplier 2 steps back contract 3rd party storage to slow the product prior to delivery?</th>
<th>Supplier 2 steps back (Supplier 1’s supplier)</th>
</tr>
</thead>
<tbody>
<tr>
<td>If so, provide logistic contractor details for each contractor used (name, address)</td>
<td>Supplier details for each supplier (name, address)</td>
<td>Description of what happens at this step</td>
<td>If so, provide logistic contractor details for each contractor used (name, address)</td>
<td>Supplier details for each supplier (name, address)</td>
<td>Description of what happens at this step</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trucking Ltd, 12-15 Common Road, Sago 3PN</th>
<th>At Eggs, He1 Lane, Feathery Eggs+177</th>
<th>At Eggs pick up</th>
<th>No</th>
<th>Honeyrose Farm, Liberty Hill, TR10 5HT</th>
<th>Farm (free-range only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expedit Express, Rush Way, Rmi 3AA</td>
<td>At Eggs does not store product prior to delivery</td>
<td>(Processing plant handles free-range and non-free-range eggs)</td>
<td>No</td>
<td>Alcades Farm, Test Lane, PLY 05 6XW</td>
<td>Farm (free-range only)</td>
</tr>
</tbody>
</table>

Document the raw material at the top, for which you are completing the supply-chain mapping for. Then, detail what type of threat you are following.

This template gives you the columns to fill in for just 2 steps back in the supply chain, so your supplier, and your supplier’s supplier. If you needed more steps back in the supply chain (which is likely) you’ll need to repeat this form, or extend it to cover the additional steps.

Start by filling out the supplier details of your supplier. Where you have more than one supplier for an ingredient you would need to complete one form for each supplier. This is because you’re going to have to send this form to your supplier for them to complete. Once you have all the information back from your supplier, you could combine the information back on to one form.

When you’ve added your supplier’s details to the form, you can send it to them, for them to complete the rest. The supplier needs to give you a description of what happens at their step in the supply-chain. Prior to your supplier delivering the ingredient to you, they may store it somewhere and if they employ the services of a contractor to do this, you need to know, which is why the template asks this question.

If your supplier uses a 3rd party to deliver the product to you, they would need to provide these details, in the relevant column. Your supplier would then need to complete the supplier details, for their supplier, under the column for ‘supplier – 2 steps back’. Your supplier would then need to send this form, to each of their suppliers, for them to fill in the rest of the columns.

And so, it would go on, until the point at which the ingredient was assured.

**Updating the threat scoping template**

Once we’ve completed the supply-chain mapping, we need to assess the supply-chain mapping information, to establish if there are any supply-chain threats.

It is beneficial to detail the results of the supply-chain mapping assessment. This can be done on the threat scoping template, in the supply-chain column. Then, the threats from the supply-chain can be added to the threat scoping template.

Here is the threat scoping template, completed with our examples.
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<table>
<thead>
<tr>
<th>Raw material group</th>
<th>Raw materials in the group</th>
<th>Known &amp; plausible threats</th>
<th>Product claim threats</th>
<th>Supply-chain threats</th>
<th>Supply-chain threats</th>
</tr>
</thead>
</table>
| Oils               | Olive oils               | Threat: Olive oil diluted with cheaper oils  
Supplier: Great Oils Ltd  
Raw material code: RM045 | Threat: No product claims identified  
Supplier: n/a  
Raw material code: n/a | Olive oil is supplied by Great Oils Ltd. in the UK, who are GFSI accredited.  
Bulk oil is supplied to Great Oils by 3 Italian suppliers, 2 of which only process olive oils. The 3rd also produces oils from other vegetable sources (Olives Oils).  
Bulk oil is delivered by 3rd party contractors to Great Oils, all on tailed tarpers. | Threat: Olive oil diluted with cheaper oils by bulk supplier  
Supply-chain step: Processor  
Olives Oils  
Raw material code: RM045 |
| Egg                | Free-range shell egg    | Threat: Free-range egg substituted with non-free-range egg  
Supplier: At Eggs Ltd  
Raw material code: RM002 | Threat: British egg  
Supplier: At Eggs Ltd  
Raw material code: RM002 | As Eggs supply free-range eggs from 3 farms  
As Eggs are a processor who also handle non-free-range eggs  
As 3 farms only produce free-range eggs  
As 3 farms are in the UK (British)  
Eggs are supplied in their shell, so dilution is not a threat | Threat: Non-free-range egg being supplied instead of free-range egg by processor  
Supply-chain step: Processor  
At Eggs Ltd  
Raw material code: RM002 |
| Meat               | Minced pork             | Threat: Substitution or dilution of pork filet mince with other cheaper cuts of meat  
Supplier: The Protein Company  
Raw material codes: RM0099 | Threat: British pork  
Supplier: The Protein Company  
Raw material codes: RM0099 | Mining process takes place at The Protein Company.  
The Protein Company use a range of meats and cuts of pork  
Pork is supplied in filets by 2 suppliers. Pork is identifiable at intake and assessed for compliance to the standard for filet  
The 2 suppliers are supplied pork, by a total of 13 farms altogether  
All 13 farms are in the UK  
based on those farms meet the requirements for outdoor bred | Threat: Dilution of pork filet mince with cheaper cuts of pork by manufacturer  
Supply-chain step: The Protein Company  
Raw material code: RM0099  
Threat: Supply of pork mince from farms not approved to the Quality pork standard  
Supply-chain step: The Protein Company  
Raw material code: RM0099  
Threat: Supply of pork mince from farms who do not meet outdoor bred requirements  
Supply-chain step: The Protein Company  
Raw material code: RM0099 |
| Species            | Black pepper, nutmeg   | Threat: Dilution of spices with cheaper materials which in the worst case could be nut shells  
Supplier: Nice & Spice Ltd  
Raw material codes: Black pepper RM004, Ground nutmeg RM009 | Threat: No product claims identified  
Supplier: n/a  
Raw material code: n/a | Black pepper is supplied by Nice & Spice and ground on-site from whole black pepper corns. The site is GFSI accredited.  
Ground nutmeg is supplied to Nice & Spice in bulk by a supplier (JT Seeds) where it is ground in Indonesia. | Threat: Dilution of ground nutmeg in Indonesia, with cheaper materials  
Supply-chain step: JT Seeds  
Raw material code: RM007 |
| Breadcrumbs         | Seeded multi-grain breadcrumb | Threat: No known or plausible threats identified  
Supplier: n/a  
Raw material code: n/a | Threat: No product claims identified  
Supplier: n/a  
Raw material code: n/a | Raw material not deemed to be vulnerable | Threat: No supply-chain threats identified  
Supply-chain step: n/a  
Raw material code: n/a |

### What we’ve learnt

- Length and complexity of the supply-chain can create vulnerabilities
- The horsemeat scandal highlighted how long and complicated supply-chains can get
- We need to be aware this, to ensure we stay in control
- Supply-chain mapping is a process of documenting each step in the supply-chain
- We only carry out supply-chain mapping of vulnerable ingredients
- We use the known and plausible threats and the product claim threats, as a way of pin-pointing the vulnerable ingredients
- We follow the threat when supply-chain mapping
- To find the point at which the ingredient is assured
- Then assess the potential threats from this point forward
Right, now it’s your turn to scope out your supply-chain threats.

Use the threats that you’ve already highlighted from your known and plausible threats, and your product claim threats, to determine which ingredients you need to carry out supply-chain mapping on.

Think about where each of those threats will be assured in the supply-chain and target to that point.

Gathering the information to put together your supply-chain mapping is not a quick task, so you may find you can only request the information from your suppliers at this stage. While you’re waiting for the information to come back to you, you could move on to Module 3, where we’ll go through how to do the vulnerability assessment.