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AS91358 (2.5): Demonstrate understanding of how technological modelling supports risk management.

Technological modelling is important and useful during the process of developing a new product as it helps to ensure correct analysis of all information is gathered to help make decisions about what could and should be done. If technological modelling is carried out in each stage of development, this minimises the risk factors to ensure a product is fit for purpose and safe to use. Functional modelling is the first step in technological modelling as it includes the research behind ideas and evaluation of trials for potential outcomes/products. Parts of this research includes brainstorming, market research (surveys), initial trials, product disassembly, stakeholder feedback. Questions such as 'Could it happen' and 'Should it happen', helped me in the decision making process and analysis with my stakeholders, which affected my final product outcome. Prototyping is about evaluating the 'fitness for purpose' of the product when it is close to being completed. The main processes that happened during prototyping were the final trials, sensory testing, packaging development, and stakeholder feedback on my finalised product. Does it do what it was designed to do? It helped give the indication of whether this product will actually work and what changes would have to be made to make it work. In this process the evaluation of risk or hazards, comes into place and are analysed to identify if the product is safe, and what needs to be done to make it shelf ready.

Brief Project Overview of my task in Food Technology this year:

This year for the CREST challenge, my group was assigned to work with Tasti Foods. Our Mentor was _____, who is a Product developer and a packaging Technologist at Tasti Foods. We were given a brief to make a novelty snack product for teenagers, that had a health claim, and also complemented Tasti's existing product range. Individually and as a group we did market research on the products Tasti had already produced, but we also researched their leading competitors/ what products were already out there. We found that there were few snack products at Tasti, giving us the opportunity to broaden in that area. Also there was a gap in the market for a high protein popcorn snack for teenager's lunchboxes. As our brief was so broad we had many possible ideas and snack ranges to venture into, our ideas included rocky road slice, flapjack/munchkin slice bars, bliss balls, and popcorn clusters. We trialled all 4 products and found that the most appealing and the product that most suited our brief was the popcorn cluster. We quickly decided on a 'good source of protein' as our nutritional claim. The first problem we faced was finding a syrup that wasn't too thin but also wasn't too heavy. After discovering that maple syrup was too thin and rice malt syrup was too heavy, we were given a recipe for a syrup typically made at Tasti. I was

given this recipe during my time on work experience at Tasti Foods. As our teenage target market normally doesn't buy products that looked healthy, we had to cut down the amount of seeds in the cluster as it looked more like bird seed, than popcorn. Another problem we faced was the development and finalising of our flavours. We had many different flavour ideas but managed to decide on BBQ, Sweet and Salty, and Caramel.




Certain types of technological modelling is done at different times, to ensure the process of minimising and reducing risk. Stages in functional modelling are normally in the first half of the project as they minimise initial risks, which are very hard to change in the later stages of the project. Functional modelling such as research, talking and thinking, initial trials, moodboards, stakeholder feedback, and surveys were used to minimise the risk of not meeting the brief, and identify any safety hazards that should be put in place before the main development begins. Trialling with evaluations, sketches, and final concepts, was the main modelling that I carried out for the longest time through the early stages of development. This is because they are the foundation of what I was wanting to put on the market. These stages were essential and helped with risk management, by minimising and/or eliminating risks that could cause harm to the stakeholders. The final part of the whole project is the prototyping stage, where sensory testing, and both packaging and product prototypes, lead to the final production of the product. The prototyping stage is important for risk management as it is the final test, of the safety and functionality of the product. This answers whether the product is fit for purpose, and meets the brief it was given.

Risk Management comes in many different forms and is done at different times during the Technological processes due to its severity. Some risks with low severity can be handled through processes like constant trialling or talking as they are normally small problems that can be fixed quickly and easily. These can include trial errors (not following the method strictly), small packaging errors etc. Other risks can be a moderate severity, which are risks that are easy to pick up on but take a bit longer to solve. These can include risks such as not fully meeting the brief, for example the product is aimed at teenagers, but from sensory testing, none of the teenagers would buy it. All of the technological modelling I do is to prevent risks with a high severity. These risks are normally ones that could possibly cause harm to the consumer. The main serious risks I could come across are, not stating all allergens (results in allergic reactions for some), and not identifying/removing foreign objects in the product (metal, plastics etc).

Research (market analysis, Tasti and competitor existing products):

The first part of research I completed was an analysis of Tasti's existing products in the market from their leading competitors. In this research I was able to

identify existing products, and find a gap in the market to fill with our ideas and outcome. From researching products Tasti had already produced, I was able to generate ideas of what sort of products would complement their existing product range. I found that they had three types of products, which are Nut bars, Baked bars, and Nut/fruit mixes. Compared to their competitors the main types of snacks on the market are Nut or baked bars. These are very common as they are convenient, and can be easily modified to create a new variation of the original 'muesli bar'. Bars such as Griffins 'Hundreds and Thousands muesli bar' are a great example of a new, eye catching version of a typical snack bar. Whilst researching Tasti's competitors and what was already on the market, I could clearly identify that snack bags aren't as common. From this I was able to minimise the risk of designing a product that was very similar to what is already out there. I was then able to narrow down the brief we were given, and generate ideas that were more like snack bags, or stay away from bars.

What's Already Out there?			
Tasti Products	Plus	Minus	Interesting
	Tasti has many different bars under the "nut bar" category including nut bars, meganut bars, snack logs, delicious bars and protein bars. They come in many different styles and flavours catering to many different target markets.	The bars aren't very big which means they won't be a great go to snack compared to other more filling products. They are all quite bulky and have quite plain packaging.	They all have either almonds or peanuts in them which seems to be now a running trend throughout the nut bar, possibly because they are the cheapest in price.
	These are an eye catching idea as they are sweet yet still a snack and they don't seem unhealthy like a chocolate bar but they are still like a treat as cake.	These bars are quite small and won't be very filling. They can get squashed easily causing the filling to come out.	These are a very interesting but simple idea to create a snack that is not just a bar but not quite a slice, it nicely imbetween.
	These are very convenient and have a range of flavours including berry burst, handful of nuts, and scroggin to cater for many different people.	These bags are quite small and only come in one size which means some people may want more than one and makes it a bit of an inconvenience.	These are a spin off of homemade scroggin but in a small little bag. They are eye catching as they can be used as a light snack in any situation including walks, school, work etc.

Thinking and Talking- Stakeholder Feedback:

This Technological modelling was very important to the development of our product, as it was the main way I could get information and opinions from my stakeholders and mentor. In our first meeting with (mentor), she described our brief to us and set out what she was wanting us to do this year. From the information I had gathered from my mentor, I found that our brief was very broad and had many possibilities. The product had to be a lunchbox snack, with a nutritional claim, aimed at teenagers. After our meeting with we were able to discuss this as a group, what ideas we had and what type of snack path we wanted to follow. After discussing our ideas we got opinions for stakeholders such as and (teacher), before trialling them. Through the trial process we got teenage members of our class to trial our product, and give us verbal feedback. Talking to members of our target market really helped us with risk management, as we were able to have an informal evaluation of our product for our own reference. This gave us the opportunity to fix small problems before getting teenagers to test the product and give us a formal, written feedback. Personally this type of technological modelling really

helped me identify issues and possible risks earlier on, before they became a big problem. With this I was able to more confidently make decisions with my team about our product and what we wanted the outcome to be.

Initial Ideas Generation

PRODUCT	Plus	Minus	Important/Interesting	Stakeholder thoughts
Rocky Road Slice	-Innovative idea -rustic look -eye catching -easy to make	-high in sugar -hard to make healthy or match our guideline	-fits unique / in between a slice & bar which isn't around much.	-quite sweet -good idea but not good as a liquid snack (too heavy)
Flapjack Slice/ Munchkin Slice	-nice flavour -like a slice & bar	-didn't hold together -too crumbly -hard to eat -not efficient	-these were good as a slice & had a great snack boost flavour	-good flavour but too crumbly -hard to hold and eat
Bliss Balls	-healthy -good boost of energy	-falls apart -hard to eat -not sweet at all -too many seeds	-this would be great as a multi flavour but won't hold as a bar.	* hard to eat * falls apart * too many seeds
Popcorn Clusters	-easy to eat -easy 'chip' like packaging -sweet & savoury -added protein -healthy option	-take longer than usms to make with all the stages of mixing, cooking, chilling, and breaking	-interesting flavour -not much competition -easily can create a new flavour infusion	* good synergy Syrup to popcorn & seed ration * great flavour * easy to eat, stick away and portable

Initial trials and ideas:

Initially as a group we came up with 4-5 ideas to trial, and from there we could evaluate which would be best for us to develop more. These ideas included Rocky Road Slice (bite sized), FlapJack slice, Munchkin slice, Bliss balls, and popcorn clusters. After trialing each idea, I made a PMI chart to evaluate each potential product. I also got stakeholder feedback on each product to get an idea of what our target market (teenagers), were looking for in a lunchbox snack. The Rocky Road slice bites, were a fun and innovative idea but seemed to be too sweet for the teenagers who trialled it and it would be hard to add a nutritional claim to it. Both Flapjack slice and Munchkin slice, were very crumbly and were described as 'hard to eat by teenagers' and 'not very eye catching', which was a

problem we as a team believed we couldn't get past. Bliss balls seemed to be very popular with teenagers and aren't very complicated to make. They were really trending at the moment, which meant many companies would be releasing their own version of Bliss balls in the near future. The idea of a popcorn cluster was very popular with the teenagers who tried it, and it was described to be very appealing, and convenient, also a 'healthier and more creative version of a chip snack. Similarly to researching, this stage of technological modelling helped with risk management, as it reduced the risk of creating a product that didn't meet our brief, e.g wasn't appealing to teenagers, or didn't have a nutritional claim.

Mood boards:

Technological modelling including idea and potential outcome generation can be shown through mood boards. Throughout the whole project I completed 3 different mood boards, to see my ideas I wanted for our outcome and how they developed over time. The first Mood board was made after my group decided to go with a popcorn cluster idea. The moodboard showed clusters and bars with popcorn as a main ingredient, and I also included seeds that are protein filled, as we decided as a group to go with protein for our nutritional claim. This gave me ideas of how to incorporate these seeds into



the popcorn, to minimise the risk of not meeting the brief. My next mood board was more detailed, with the main ingredients of the cluster, which showed the deconstructed recipe, and also the main flavour ideas that we had narrowed down to. The flavours chosen were from our personal opinions, as everyone in my group is part of our target market, teenagers. The last mood board I made, was about packaging, and clearly stated the packaging options we had access to and would possibly use. All of these mood boards helped me identify my main ideas and how I want the intended outcome to look like, which is part of minimising the risk of not meeting the brief.

Product Disassemblies:

As a group we completed many product disassemblies to further our research of what is already out on the market. We tested products that had popcorn as a featured ingredient, so we could get an understanding of how it is already incorporated into the existing market.

One of the disassemblies we did was the Nature Valley Popcorn bar. We trialed two different flavours (peanut, and cranberry), which gave a small variety to the consumers.

The serving size was 20g, which was quite small, and isn't very filling. The texture was crunchy but chewy, which is very appealing to teenagers. The smell of the bars seemed quite artificial which is what we don't want for our product. This information really help us reduce the risk of creating a product that smelt or tasted artificial, which would be very unappealing to our target market.



Another product disassembly we did was the 'Seriously Popcorn', Vanilla and Coconut. This was a flavoured popcorn, in a potato chip-like bag. The serving size was yet again 20g but there were 5 servings in each bag, therefore making it a share bag. This size would not be ideal for a teenagers lunch box but would better suit a picnic or shared lunch. The smell of the popcorn was a good intensity but the flavour lacked intensity, as I got a burst of flavour in the first bite, but then the popcorn became very bland. Working with flavours, my team and I would need to get the right concentration so it was not overpowering but still had a good flavour.



Product disassemblies helped me through the process of risk management, as I was able to identify problems that were already out there on the market. This gave me the opportunity to avoid the risk of making the same mistakes in regards to factors such as flavour and serving sizes.

Snack Survey

If we could, we would love to take just a moment of your time to answer a few questions on different snack products. If you respond you may be in with a chance to be part of one of our focus groups for Year 12 Food Technology - THIS MEANS FREE FOOD!!! Thank you for your feedback and just to measure you - all results and feedback will be kept confidential.

Your username (2059@carnel.school.nz) will be recorded when you submit this form. Not 2059?

[Sign out](#)

* Required

1. What is your age? *

Mark only one oval.

☐ 11
☐ 12
☐ 13
☐ 14
☐ 15
☐ 16
☐ 17
☐ 18

2. What snack products do you have in your lunch box? *

Check all that apply.

☐ Chips
☐ Muesli Bars
☐ Cookies
☐ Popcorn
☐ Bliss Balls
☐ Crackers
☐ Other: _____

3. On a scale of 0-5, how important is it to you to eat healthy snacks at school? *

Mark only one oval.

0 1 2 3 4 5

Not important ☐ ☐ ☐ ☐ ☐ ☐ Very important

Surveys:

Surveys are an important stage of Technological modelling, as they gave me a perspective of the views of my target market. As a group we formulated a survey to send out to all teenagers in . We asked questions that would help us improve what we had already achieved, and if what our target market wanted would work with our brief. We asked about what teenagers already had in their lunch boxes, and what their ideal snack would be. From this I was able to identify what a lot of teenagers were missing from their diets. Most snacks that teenagers liked had a high sugar content, and didn't have a 'healthy' appearance. We also asked how important they believe a nutritional claim is, and their opinions were on a high protein claim. The results came back very positive as the teenagers wanted a product that was delicious but also good for them. A product that is delicious and nutritious for

teenagers is very appealing to parents as their child will be eating well, and will want to eat the product. Surveys help in the process of risk management as they give me a more detailed idea of how my target market wants. Without doing a survey the risk of the product not being popular with teenagers was definitely possible to happen.

Trials and Evaluations:

Through the trial stage of technological modelling, I evaluated in depth what needed to be done to make the next trial better. During this process we were able to test many different flavours and find the concentration which was right for our product. We also had the time to modify our recipe to make it meet the brief and be shelf stable. At the beginning of our trials we found that the product looked 'too healthy', which brought us to reducing the number of seeds and increasing the amount of popcorn. After trialling a few different syrups (maple and rice malt syrup), we were provided with a recipe by our mentor for a syrup that wasn't too thin but also want too heavy. After we had a base recipe, we could test different types of flavourings and identify which would be the best for our product. We finalised our three main flavours which were Sweet and Salty, Caramel, and BBQ. With all flavours, especially Caramel, we had to do multiple trials to get the right amount of flavour, and the right style of flavour. As Sweet and Salty was our 'original' flavour, we firstly tried adding both salt and sugar, but then found that the syrup was sweet enough, to be the sweet element. The first Barbecue flavouring we used was very spicy and strong, so from there we realised we



Trial 6:

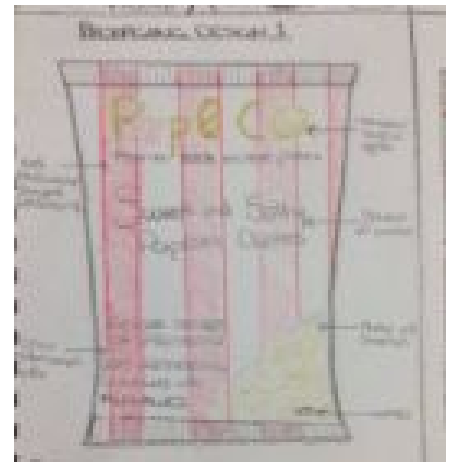
This was the first trial that we used the syrup that (our mentor), helped make in her time with Tasti Foods the week before. This trial was also our first time working with flavourings. We used the salted caramel flavour that Juliet gave us from Tasti products. We split one batch of clusters into 3 separate sets, each with a different quantity of Salted Caramel flavouring. We planned to use 1 gram, 3 grams and then 5 grams for each batch. We thought that this would be a good indication on quantity sizes that we should be using. During the trial we decided that we would put in less because the salted caramel flavour smelt very strong and we didn't want the flavour to be too overpowering. After we baked the clusters, we found that the flavour was hardly noticeable despite the strong smell it had given off. We have learnt that smells can be deceiving and next time to stick with the amount of flavour that we had planned to do. We also found that the popcorn didn't stick together very well.

needed a smokey home barbecue flavouring. We were provided with a powdered flavour which work very well. We struggled a lot with Caramel as all the flavourings we tested had a strange sharpness, or artificial taste to them, even though they were all natural flavourings. With talking and discussing this obstacle with

, we decided to use condensed milk in our syrup to have a more caramelised flavour. Through all of our trials and evaluations, I found that I was able to easily identify any risks or hazards in the recipe and the production of the cluster.

Packaging sketching:

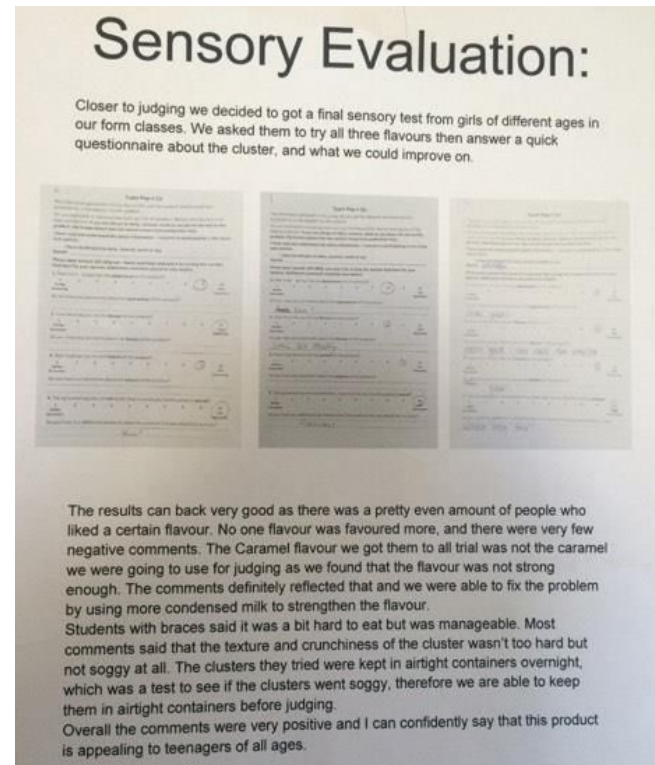
Sketching was an essential part of this product as, I was able to visualise the exact way I wanted the packaging and product to look like. Amongst our group we had a few different ideas for packaging, which were presented in sketches inspired by previous moodboards. One of our designs was a cone, which was cinema themed, emphasising that the popcorn cluster was just as good as classic popcorn. Another design was similar to a chip bag, where it was made out of foil and had a cinema/carnival design on the front and back. After evaluating both packaging ideas, and asking ourselves if it was 'fit for purpose', I found that the cone packaging would have a innovative, eye catching look, but would be an impractical shape for storage (in stores, homes, and lunchboxes). With the 'chip bag' design, I found that the design and theme could still be interpreted into it, but it will be easier to store and create prototypes for. From this type of technological modelling, I was able to minimise the risk of creating a prototype which is not up to the standard I need it to be. I was able to make a mock up design of the prototype itself, which made the prototyping stage a lot easier.



Sensory testing:

This part of technological modelling was done just before our final prototypes, to get the opinion of our target market on our final product. As a group we decided to use each of our form classes to do a sensory test with, as there are a range of different aged teenagers, to give us the different perspectives. To eliminate the hazard and potentially severe risk of students with allergies, before trying the products they were given a

information sheet and had to sign that they had no allergies to certain ingredients. Those students who were under the age of 16 needed signed parental consent, to eliminate any risk of parents being unhappy with their child testing our product. The students were given three forms to fill out (one for each flavour), and they were not told which flavour was which. We asked them to comment on the texture, flavour, appearance, and give an overall rating out of ten. The results were very positive and we found that there wasn't much they didn't like about the product. Considering that there are three flavours, there wasn't one flavour that was preferred over the others. This shows that the flavourings we chose were a good range and we were able to cater for all tastebuds in our target market. This stage helped in the risk management process as it gave us a clear and formal initiation of and problems, if they were to occur. We would then have time to fix them before creating our final prototypes for the judges of CREST to try.

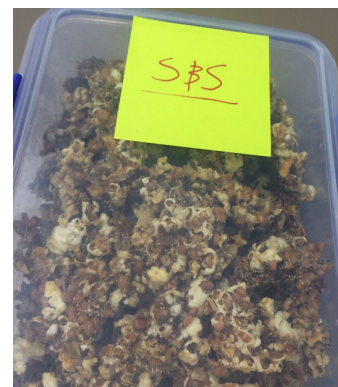


Prototyping (packaging and product):

This was the final stage during technological modelling process. From all the information we gathered from mood boards, sketching and sensory testing, we could finalise the intended product. Before the competition, we stayed after school to create the products, the way we wanted them to be. We made one batch of each flavour and made them with care to ensure we had correctly measured ingredients and carried out the method strictly. As the prototypes were made the night before judging we kept them in airtight containers overnight to keep them from going stale. We carefully cut and heat sealed the



packaging prototypes to ensure they were the right size, to fit our serving in (80g). Prototyping is extremely important in risk management as it was the final test of a product before it goes on supermarket shelves. All food industry companies have to do many prototypes before they get a final prototype. The final prototype goes through a lot of testing, to minimise any risks or possible hazards in the product before consumers buy it.



Crest Judging:

During CREST judging we meet many different people who work in the food industry and looked excited to see what we have been working on this whole year. We had two rounds of judging, where they would ask us questions about our product and the technological modelling we went through to product our product. They were able to trial all three of the clusters and evaluate them themselves. We had our logbook and information on Technological modelling for them to read about, in detail, the decisions we went through. We also had a poster and report available to everyone there, which is what the judges had seen before they talked to use about the product. As a team we equally shared the talking time, and explanation of certain aspects of the product, as we all had a detailed understanding of the product itself. Whilst there we were able to see what

Team/Project	Pop & Co
Supervising teacher	
Students	
Mentor	
Sponsor	
Result	Highly commended, 1 st prize
Judges' comments:	The team gave a good presentation to the judges regarding the approach taken to develop their product. They exhibited good technical knowledge of the product, and had solved the problems they experienced in a professional manner. Their work was well presented in a detailed log book of activities. In particular, they undertook excellent sensory analysis of prototypes and of the final product.

other groups and schools and created, the technological processes they went through to get their products. After creating a product that fit our brief, and proving our understanding/ practicality of using Technological modelling, we were awarded first place in the CREST Challenge.

Evaluation:

Through this whole year, my team and I have achieved great understanding and knowledge of the different types technological modelling, how it supports risk management, and why they are used at different times. In the beginning stages, technological modelling such as Research, talking and thinking, Initial trials, moodboards, Stakeholder feedback, and mood boards, are used to minimise risks that could happen later on in the prototyping stage. All of these are part of functional modelling, and they constantly make me ask myself, 'could it happen' and 'should it happen'. This is analysing the reasons we make certain decisions and identifying the possibilities of it working, and creating no major risks along the way. During the middle stages, where trialing and evaluations are used, I was able to use my knowledge and put that into a physical product. This was constantly identifying possible risks or hazards, then fixing them as efficiently as possible. The prototyping stage is very

important to risk management, as it is the final stages and tests of the products before it goes out into supermarket shelves. All companies that produce not only food products but other products, use all of these stages in technological modelling, to ensure the best outcome possible, with minimal risk/hazard or none.

Exemplar of Merit.

AS91358 – Demonstrate understanding of how technological modelling supports risk management. Merit Requirements

Demonstrating in-depth understanding of how technological modelling supports risk management involves:

Explaining how modelling enabled the identification of the type, severity and probability of risk during technological practice

Explaining why different forms of modelling were selected at different stages of technological practice to inform what 'should' and 'could' be done.

Commentary

This report is for Food Technology with the student discussing their product development for a CREST challenge. The report covers the sequential development of the food outcome with a variety of functional modelling techniques. Each has had any associated risks identified and evaluated, according to the impact the particular risk will have on the outcome ie given a status, in regard to the probability of said risk occurring.

Main points for Merit:

- Report has a clear introduction explaining the importance of functional modelling, prototyping and how this assists with risk identification
- Student explains why different modelling methods were used to communicate key design decisions with certain stakeholders
- Explains why the resulting decisions assisted the ongoing development of the outcome
- Shows links between 'could' and 'should' in the introduction; however, it is not explained until further into the report when discussing aspects of technical modelling.
- Identifies links between modelling and decisions made that assisted with the success of the outcome
- Student discusses the importance of identifying risks early in the outcomes development so that they can be given a status according to whether the risk can be minimised or eliminated with decisions made from further modelling.
- At different stages throughout report, risks are identified and evaluated as 'big', 'reduced' or "low severity".
- The probability of a risk occurring during modelling is implied throughout the report, with the student explaining what can be done to stop risks, what they did to prevent risks, or procedures followed to prevent risk.
- Different aspects of 'could' related to modelling are discussed and explained throughout, connections to flavour, colour, sensory, packaging etc.
- Explains what 'could', technically feasible, at different stages and how the identified risk was resolved and/or provided options for technical improvements.
- 'Should' aspects, those with a future or broader context, were identified throughout the report. Student is aware of the product's need to be fit for purpose in the broadest sense i.e. harm to consumers, allergies, competition for the product, meeting brief, the requirements to be successful in the challenge.