Level 3 Technology 2024

91612 Demonstrate understanding of how technological modelling supports technological development and implementation

EXEMPLAR

Merit TOTAL **06**

Achievement Standard 91612 - Demonstrate understanding of how technological modelling supports technological development and implementation

Introduction
In food technology this year, we had to research different types of desserts and meet a specific dietary requirement with specifications of what the dessert needed to have. This report will cover my understanding of how technological modelling supports technological development and implementation.

Technological modelling
Technological modelling is made up of two parts, functional modelling and prototyping. Functional modelling is made up of ongoing testing and concept designs to see if they meet the intended purpose. Prototyping is the realisation of a fully functional model using real materials. These two together make up Technological modelling, which provides two different perspectives of thinking. Functional thinking is, how is it happening? How to make it happen? And practical thinking is, should we make this happen? Will this work? Both functional modelling and prototyping were a crucial part of helping me create my dessert. I needed to do functional thinking when thinking about what dessert I was going to make, and whether it would meet the specifications and requirements and I needed practical thinking when thinking if it was realistic and achievable to make sure I had the equipment and time to be able to complete a dessert to the best of my ability.

The Project - The Brief
The need was that an opportunity arose for students to design a dessert item that caters to a deity requirement/needs to be a part of a dessert degustation menu. The expectation is that the dessert can be carried from the classroom and taken home, so if 'customers' wanted to take something away they could. My stakeholders were a group of teachers from school, one was celiac and they would be around middle-aged. My dietary issue is for my dessert to be completely gluten-free. It is extremely important to cater for coeliac and gluten intolerant people because it can take a very small amount of gluten to make those people sick and gluten intolerant people should be able to eat yummy desserts because there are ways of changing recipes to make food gluten-free. My target market is adults, particularly older adults. The attributes of my dessert were, a square shape with a natural colour plate and the desired texture of my cake is soft and moist. The dessert had to meet the specifications of having a base, filling and processed topping, and it had to have a fruit component. I got categorised into the gluten-free group, so I trailed two different desserts. I trailed a brownie that had raspberries throughout the base and vanilla butter cream icing topped with freeze-dried raspberries. Likewise, I also trailed a lemon cake with lemon butter cream as the filling and butter cream on top of the cake as the decoration. Through evaluating stakeholder feedback and considering my competing and constable factors, my stakeholders and I concluded that I would continue developing and trailing the lemon cake as this is what they preferred.

Competing and Contestable factors
Introduction Paragraph:
Competing and contestable factors are comparing two important factors and choosing what will be better for your dish. Eg. For

fresh/seasonal vs frozen/preserved produce, in my case, I considered all the factors like price quality and stakeholders and I ended up deciding on using fresh produce in my dessert. To briefly explain what competing and contestable factors are, Competing factors are challenges and trade-offs that have to be considered when developing new technological products. Contestable factors are when there is room for improvement and innovation.

My competing factors were:
Food safety vs Consequence of lack of knowledge
When talking about food safety, the consumer needs to be able to trust that you will provide them with food that is tasty and safe to eat. It's important to have food safety knowledge so that when you're dealing with things such as high-risk ingredients, you are not going to make the customer sick and give them food poisoning. If a customer were to get sick from the food you were serving them, they could leave a bad review, which could affect your business and potentially get your place shut down because there would not be health and safety in your kitchen. Therefore, it is important to follow through with food safety practices to ensure no negative consequences.

Above is my original stance when it first came to making my dessert now after all the trials I still completely agree with what I have said. I feel as though having good food safety knowledge can eliminate so many risks of someone potentially getting sick, whereas lacking knowledge in food safety can create so many more risks and problems.

Fresh/seasonal vs frozen/preserved produce
Fresh/seasonal produce are typically ingredients that have been brought in the season and are readily available. Frozen/preserved produce are ingredients that are available year-round. I must take into consideration both types of produce because my stakeholders may prefer a fruit that was out of season, or they may want to use fresh fruits. From my stakeholder analysis, a majority of votes didn't have a preference when it came to fruit in the desert. Also, from my stakeholder feedback, I had more people who were learning towards fresh fruit in a dessert. Therefore, I will use fresh fruit in my dessert because I think that it will produce a more fresh dessert flavour.

To conclude this I did end up using a fresh fruit in my desert trail, I ended up using lemons which were luckily in season. This one is controversial to me because if my stakeholders wanted fresh raspberries in the middle of winter it would be very expensive and not economical at all. So it depends on the circumstances and depends on if the fresh fruit was in season, although in saying this I do believe the fresh fruit tastes better than frozen even in deserts and my stakeholders did agree they wanted fresh fruit. I still do agree that fresh fruit is better than frozen and preserved fruits.

Time vs quality
Time is when you use your time efficiently and get everything done, it may not look the prettiest, but it is completed. Quality is when you may not finish your dessert fully but from what you have done it is constructed to a very high standard. I think both are important when creating the dessert to get the best possible outcome, but I'd rather have a fully made dessert to feed my stakeholders. I think time is slightly more

important because at least, even if it doesn't look pretty, I'll have something to feed my stakeholders so they can taste it and at least give feedback on the taste. Therefore, I will focus the majority on time management to ensure my stakeholders have a completed dessert to eat.

To conclude this, I still agree with everything said above. The reason I do this is that sometimes at the end of my trials, I didn't give my stakeholders the most pretty dessert, but I was at least happy that I had finished so that they could give me feedback. I think time is a really important quality and being able to give a completed dessert is better than giving something that looks amazing and tastes amazing but is only a ¼ finished. This especially factors into the real world because if I were to go to a restaurant and order a dessert, and it came out to me ¼ finished, I would be extremely disappointed rather than having something that is completed.

My contestable factors were:
Taste vs Appearance
Taste is a vital part of making any food enjoyable, but appearance is also important. For my dessert, I think that the taste is overall more important because, you want to please the stakeholder trying the dessert, and it is more important because once you start eating the dessert the appearance matters less than how it tastes. In saying this, the aspect of food being appealing is also very important because when food looks appealing to eat, it can change people's perspectives on how it tastes. Although considering that, I think it's important for me to reiterate that I will mainly focus on the taste.

Once again, I still agree with what I have said. This is because I truly think taste is more important than how something looks. If I were to give my stakeholders a dessert that looked good but tasted awful they would be very sceptical to try my dessert again, but if I were to do the opposite and give my stakeholders a dessert that didn't look the best but tasted amazing they would definitely want to try it again.

Stakeholder vs Personal Preference
For my dessert, I think that stakeholder feedback is more important than my preference. This is because they are all able to offer different opinions and come up with solutions I may face when making my dessert that could hinder the best possible outcome. When having different opinions, it can help to make a dessert that pleases everyone. In saying this, although I value the feedback of my stakeholders very much I get to make the final decision, so what I mean by this is my stakeholders may have different views on how to improve my dessert, and I'll get to choose how to improve it. As well as giving me diverse opinions, they also give me feedback and improvement to work on things. My stakeholders can ensure that they will help me get to the intended outcome I want.

For this, it was crucial to me throughout making my dessert that I followed my stakeholder's wishes because I wanted to make sure all of them were happy with the outcome of my dessert. So I still agree with what I have said above. I think I value others' opinions, especially since they're only trying to help improve my dessert and make it better. So my stance on this stayed the same.

Cost vs sustainability

Cost and sustainability are both important qualities to consider while making this dessert. I want to keep the cost down as much as possible, but I also want to ensure I'm using good quality ingredients that won't be bad for the environment or cause damage to the environment. I will do this by looking at the ingredients I buy considering the price and the sustainability of the product, and ultimately deciding what is better value. For me, I think that although both are very important, keeping the cost down as much as possible is important to make this dessert as economically friendly as I can. As talked about above, stakeholder opinions/ideas are extremely important because those are the people I want to please. I think it's also important that I make something that is achievable for me to make and something I will enjoy making, so that's why personal preference is also important. Ultimately, I think that it's more important to please my stakeholders because they are the ones eating it and giving feedback. To me cost is most important because buying fresh fruits can be very expensive and uneconomical to this process, so although both cost and sustainability are two very important factors, cost will be my priority.

To summarise this, again both cost and sustainability are important aspects to incorporate whilst making a dessert. In saying this, I did want to keep the cost of my dessert down as much as possible, so I'm glad that I was able to, and I do still stand by this. The reason I was able to keep my cost down is because I was able to buy fruit that was in season and so it was a lot cheaper and ultimately a lot better for the environment as well.

Functional modelling that I used:

Initial Stakeholder Consultation

It's really important to get stakeholder feedback opinions, ideas and preferences throughout this process because with feedback I'm able to get lots of different opinions and that way I can try and please as many people as possible through modifications and different ideas. Through the feedback received from the form, there were aspects of desserts that the majority of people liked. The 9 responders thought it was really important to cater to gluten-free customers, from what they wrote the reason for this is so that everyone can be catered for and not feel left out. I agree with this, from having a celiac friend, it's important to me that we can go out to a restaurant to eat and both be able to enjoy our food, we even had one responder who was gluten-free. People's desired texture for a dish was a wide variety, but the majority said they weren't sure, now to look at this from a positive side this means it leaves me and my group more of an option to do a dish with any texture. Talking about flavour again, the majority were open to whatever. With no major specifications or big requests from my stakeholders, it leaves a wide variety of options apart from being gluten-free. Both the taste and appearance need to be good, this is because you want to eat something that looks appealing, but you also want it to taste nice. My initial stakeholder consultations helped me to get a rough idea of what people thought about deserts and gluten-free food because the options were quite wide it helped me to be creative whilst creating my concept ideas, there were not many competing and contestable factors that became clear from this as my stakeholders weren't fussy.

Pre-existing Products/Market Research

I conducted a research task with desserts sold from a variety of different places that were all gluten-free and that were different shapes and flavours. I did this because I wanted to gauge some possible ideas for my desserts. It was important to do so because it helped me to try different flavours and textures, see how well the dessert held up to the overall rate and see what aspects worked well with the gluten-free dessert. This research task helped develop my design because the aspects of desserts that I liked I tried to incorporate into my concept designs and also most of them didn't taste gluten-free which I was amazed that they were able to make dessert taste so yummy when missing a huge aspect.
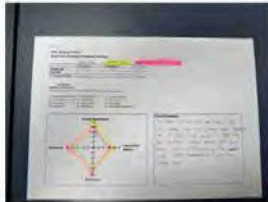
Gluten-free hazelnut cake and white chocolate ganache ($7) - This had a bit of a weird texture, it had nuts through it which I don't like that much, it wasn't very sweet, but it had a very nice presentation. I would rate this my second favourite of all that I tried.

- Orange cake made with almond and coconut flour, glazed with 54% Belgian chocolate ($6.50) - I liked the citrus aspect of this, it wasn't too sweet, it had a crumbly texture, so I think the texture could have improved slightly, maybe it could have been more moist. The bonus being it did not taste gluten-free, and it tasted like a normal dessert.

Orange and almond cake ($7.50) - This dessert was my least favourite, it was very sweet and had a lot of icing. It had a beautiful presentation and was in my opinion quite reasonably priced for only $7.50 and for the portion of it as it was the biggest desert.

Initial Brainstorming

After conducting my stakeholder research, I came up with four concept ideas that aligned with the things my stakeholders valued and with my competing and contestable factors. I chose ideas that had a wider variety of textures and flavours but also related them to my competing and constable factors to ensure I met the brief and specifications.

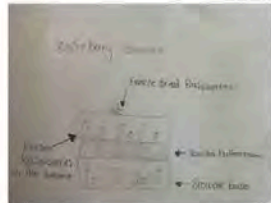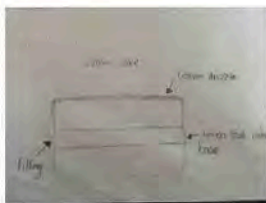### Concept Ideas
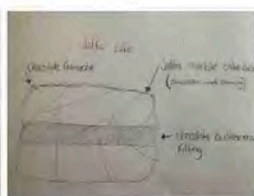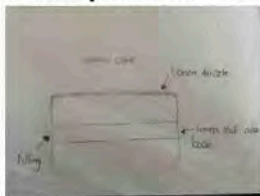
Reasoning for designs:

Design 1 (Lemon cake) - My first idea was a lemon cake which has a filling and a lemon drizzling on top. I will put a lemon buttercream frosting in the middle of the cake and a lemon drizzle on top of the cake. I have decided that I will be trailing this cake. To add to this in my Competing and Contestable Factors I said that I would rather use fresh fruit and lemons are currently in season, so this works well. I also believe this would be achievable for me to do, and I should get it finished in time.

Design 2 (Sticky date cake) - This is a sticky date cake, this is a butterscotch sauce and a sticky date base. To add to this in my competing and Contestable Factors I said I'd prefer to use fresh fruit, but in sticky date pudding the dates that they use are usually not fresh. I do think this is achievable at this time, but there is a slight problem with it not having a proper filling because the filling will soak into the date sponge. My stakeholders were concerned about the filling not being able to stay in the middle, but they thought it was a good flavour. I will not be trailing this because I think there are too many small risk factors.

Design 3 (Jaffa cake) - This is a jaffa marble cake, it would have a chocolate butter cream in the middle of the cake and a chocolate ganache on top. Talking about my competing and Contestable Factors, this would follow what I have said about using fresh fruit, and oranges are currently coming into season in New Zealand. My stakeholders thought that the presentation was better on this and that the flavours worked well together. I have decided that I will not be trailing this dessert because this was an original idea and there isn't a recipe for it, so it may be unachievable.

Design 4 (Raspberry brownie) - This is a chocolate brownie, with frozen raspberries incorporated in the brownie, vanilla butter cream as a filling, and freeze-dried raspberries as a garnish. To compare this to my competing and Contestable Factors, the raspberries I would be using in the brownie would be frozen because they are currently not in season in NZ, so this would be going against what I thought was more important, I think that this is achievable for me to make. My stakeholders liked this idea a lot and voted it as their favourite dessert. I have decided that I will be trailing this.

Concepts/initial ideas
Based on my stakeholder consultation, market research and initial brainstorming, led me to create the concept designs at the top of this page. The reason each of these concept designs was made is because they were thought out carefully and created while keeping my stakeholders, my dietary requirements and market research in mind. I have explained each aspect of the above. The reason I chose to trial specifically is because I sent these concept designs out to make stakeholders and these were the ones that got the most votes out of all four designs I had sent them.
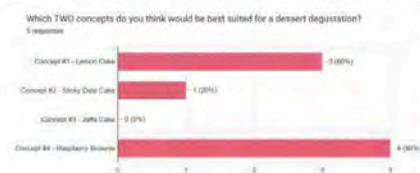
Technical feasibility: testing ingredients, techniques and processes

Initial concept trailing is extremely important to decide what the best dessert to make is. The purpose of the concept trails

was to get an idea of which desert best fit the criteria, such as time, quality, and how pleased my stakeholders were, and to ensure it was achievable. Ideally, once I figured out which desert was to be best is the one I would go on to trail as my prototype. Altermalty I wanted my stakeholders to be the most satisfied. Whilst trailing both desserts, it was important to check if they were both technically feasible, so was I able to get the desserts finished in the timeframe, was I able to construct the dessert to a high standard and was the dessert technically feasible? Having to trail initial concept ideas also helped with my decision-making as I know that although it took me longer to make the lemon cake I felt as though it was the better dessert for a variety of reasons such as getting better stakeholder feedback, as other things that helped me were that the colour and texture plate worked significantly better with the lemon cake compared to the brownie. The initial concept ideas also helped me to decide what dessert was fitter for purpose, so because of the colour and texture of the brownie the butter cream icing and brownie didn't work well together and had too many contrasting colours, so I felt this would be socially unacceptable because maybe one of my stakeholders would feel embarrassed walking around eating it. Also trailing my very first concept ideas one of the specifications I had to keep in mind such as keeping everything completely gluten-free, this comes under food safety and kitchen safety and understanding I can't use any equipment or bench space that may have come into contact with gluten as this would mean that I would be making the dessert not gluten-free.

The overall results between prototypes one and two were honestly quite similar in results. I cannot say that there was a definitive answer in which my stakeholders wanted more because there were aspects of desserts that my stakeholders liked or both. But using the results and my own experience, I chose to make the lemon cake. I felt that this was the right decision because the feedback I received for the lemon cake implied I could improve it, so my stakeholders would enjoy it more. The stakeholder feedback I received helped me to improve my prototype and also ensure I was meeting the brief and speciations because I got feedback such as improving the lemon flavour and improving the decoration which I did to ensure I was meeting those.

Prototyping

Prototyping is the process of creating a product or model to test and validate ideas. It

allows designers and developers to explore different concepts and get different feedback from a wide variety of people to improve the product or model. Some key aspects of prototyping are testing concepts, gathering stakeholder feedback, making adjustments, and visualising ideas. It was really important for me to do prototyping, and it was also important for me to conduct functional modelling of my dessert prototype before having the final product. This is for many reasons such as identifying any problems I ran into so that I can improve this or avoid any more problems, also concept validation, helped me to see if my dessert works well together and if the flavours and textures work well. It allows refinement through stakeholder feedback and my own opinion, I can refine any unnecessary steps or ingredients. Functional modelling is a key step in the process of enhancing my dessert. All these examples helped me develop my dessert so that I was happy with the end product of my dessert.

Final Trial - Lemon Cake
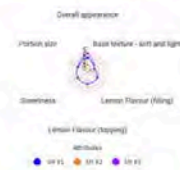
Trialling in situ

This is my final product as seen above and as well with my batch-tested photo. This was tested in a physical environment as it upheld its structure and integrity on the plate, and I saw my stakeholders eating it without it falling apart or causing a mess. As well as seeing my stakeholders eat it, I felt as though it fit the social environment as it wasn't messy so it wasn't something they were going to be embarrassed or ashamed to eat in front of someone. As well as the neutral colour palettes and positive contrasts in the texture, I felt this added to the appearance, making it look more appealing.

The competing and contestable factors also played a part in making the final decisions for the final prototype, such as having good food safety to ensure I never made my stakeholders sick or put them at risk of getting sick. Also, things such as I wanted to prioritise taste over appearance which I felt I did because my desert didn't have a super fancy appearance, and it tasted better than it looked I know this because the feedback I received on my last trial was directed more onto improving the appearance rather than the taste. As we can see on my star chart I received scores of 3s for sweetness and lemon flavour which was an improvement from the very first time I did the lemon cake with scores of 2s. To add to this, it is also things such as time vs quality because I felt that with the amount of time I had I made the most of it rather than ensuring the quality was up to its highest standard and not finishing the dessert.

Meeting the Brief

The brief and refined specifications - The original brief of this dessert was to batch produce 12 desserts completely gluten-free which contained a fruit element in the dessert, and it must contain a stable base layer, a stable processed filling and a processed topping with a suitable decoration. I have done this by making my lemon cake. My staple base layer was the lemon cake itself, and my middle was a lemon butter cream and my decoration was the same icing pip on top. My evidence to prove this is the photos. The specification I had to follow was making sure the dessert was completely gluten-free, so a frequent component I used in my dessert was gluten-free flour as a replacement for normal flour. The fruit element that was contained in my dessert was lemon. In my photos below you can see my cut test that has been done, this shows the base holding together and the icing in the middle staying in the cake, and also shows the cake staying together. If I were to make this dessert into larger scale production, I would have to make some modifications, such as perhaps working on the texture of the base as explained for many reasons above and because of my stakeholder's feedback, some giving a score of 1 for texture. I would have to produce a slightly bigger portion size so that if someone is paying money, they would expect a reasonable size. My stakeholder's comments somewhat implied that my dessert was fit for purpose. Some of the quotes I got from my stakeholders were, "fab! a bit dry but a great level of sweetness and lemon" and "lemon flavour is very obvious - might have had a bit too long in the oven. Nicely presented, lemon flavour was excellent and just the right balance of sweetness".

These comments gave flavour ratings of 3s and there was quite a mixture of ratings for the texture of the cake, such as ratings of 1 and the way up to 4, so we know my stakeholders have differing views. These comments both mentioned the texture of the cake but mentioned it being presented nicely and having a great level of sweetness.

HACCP - The only high-risk ingredient I used or needed to keep in the fridge was butter. When I came to school, I put my butter in the fridge because it needs to be below 5°C. I made sure to check the expiry dates before using it. I ensured there was no cross-contamination of gluten by following procedures such as using clean cutlery and bowls and making sure I would clean benches before I used them. Also, making sure that I didn't use anything that had a gluten product in it. Using clean bowls and utensils, they have to have been washed in hot soapy water. Other food procedures I followed to ensure the food was safe to eat were things such as, making sure no high-risk raw ingredients touched my low-risk ingredients in my dessert, e.g. the eggshell touching my icing. Also making sure I'm using the right chopping boards and hygienic things.

Before cooking, I ensured to follow the classroom's health and safety procedures, so tying my hair up and ensuring I wore a hat and apron. Sanitizing my bench and washing my hands. Also following through with washing my hands after touching things like eggs to prevent cross-contamination. The reason I followed all of these health and safety precautions is that I want to make sure all the food I am serving my stakeholders is safe to eat to ensure that no one gets sick.

Kitchen safety- It's important to follow kitchen safety so that everyone remains safe. I did this by carrying knives and pointing them downwards, making sure when opening doors and cupboards such as the oven door that no one was in the way or going to get hurt, and making sure I warned people before carrying a hot try to my bench, and use a dry folded tea towel when doing so. Making sure that I let my trays cool before putting them back, and put a wooden chopping board down on my bench before putting the hot tray straight from the oven on the bench. Make sure that kitchen mixers are not on the edge of the bench so they don't fall off or cause a hazard.

Technical feasibility - Previously I struggled with time efficiency because I had to make the dessert in two hours, so there wasn't enough time to let it cool and the butter cream icing slightly melted in the middle, now with the timetable change and having two periods reflecting I had plenty of time in my last trail because my cake was completely cooled. In saying this everything else about my dessert is achievable for me and in my last trial I will have two periods to make this dessert meaning I will be able to let my cake cool overnight and should finish with plenty of time. The reason I didn't find it too hard to make my three components is because of my prior knowledge of making cakes before, and I have a fair range of baking skills from just over the years of making all different sorts of things at home and in school. I am quite familiar with the food tech classroom as I have been cooking in the senior classroom for three years. To add to this the food kitchen I cook in has lots of different equipment and all available to use which helped me as well.

Social acceptability - I was able to meet the specification of making the dessert

gluten-free. None of my components I was cooking with had gluten in them. I was extremely careful to use clean dishes and cutlery that had been washed in hot soapy water beforehand and working away from people who were using normal flour. The colours of the cake are all-natural, and the colours match the flavour of the cake, they were appropriate sizes for my stakeholders to eat and are appropriate for the target market because they would be socially acceptable to sell at a café or bakery and look presentable, to prove this statement is true from my trailing I got higher ratings such as 4s and 5s for my appearance which is evidence to why it would be socially acceptable to sell at a café or bakery. It also meets the target market is it was a dessert that needed to be appealing to adults (middle-aged) so for example if I wanted to make it appealing to kids I would use more colours and make it look more appealing to them but since I was making this dessert for adults I used natural colours so that it is socially acceptable.

Conclusions/Final Evaluation

Throughout this report, I was required to cover my understanding of how technological modelling supports technological development and implementation. Technological modelling is broken up into two parts, functional modelling and prototyping. Technological modelling is used to help test design ideas, make good decisions to improve the outcome and to be able to understand the wider impact of the outcome. Functional modelling is the ongoing testing of things such as initial concept designs to see if they work as intended. Prototyping is making a fully functional prototype out of actual material. Following through with technological modelling has helped me to develop and make a successful desert. I used things such as competing and contestable factors, market research, initial concept ideas and prototyping, through all of these processes of technological modelling I was able to make a great final prototype. Also, the importance of trailing it in its social and physical environment to make sure the prototype meets the brief and specifications. To sum this up technological modelling was a very important part of helping me create a successful final prototype, being able to trail and test ideas and concepts and receive feedback was significantly helpful.

Bibliography/References/Footnotes
https://technology.tki.org.nz/Technology-in-the-NZC/Technological-knowledge/Technological-modelling

Merit

Subject: Technology

Standard: 91612

Total score: 06

Q	Grade score	Marker commentary
One	M6	The candidate explained in-depth the different forms of modelling used to develop and implement their technological outcome. Competing and contestable factors were correctly identified and categorised and used to justify decision making. Functional modelling and prototyping were differentiated and explained in-depth. The prototype was trialed in situ. The use of photographic evidence was appropriate and relevant to their discussions.