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Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 2 Technology 2024

91358 Demonstrate understanding of how technological modelling supports risk management

EXEMPLAR

Merit

TOTAL 06

[redacted]

Introduction

Technological modelling is important during the process of developing a new food product. It helps ensure correct analysis of all information gathered to help make decisions. This risk management assignment summarises 4 risks I encountered during my conceptual design development and prototyping standard when creating a product. I encountered risks during my practical techniques trial, materials investigation, portion size comparison, and prototyping in situ. Parts of this research included functional modelling, initial trials, product disassembly, and stakeholder feedback questions such as 'Could it happen' and 'Should it happen', which helped me in the decision-making process, and affected my final product outcome. If technological modelling is carried out in each stage of development, it minimises the risk factors to ensure the product is safe to use.

The first step in technological modelling is called functional modelling. Basically, it's all about brainstorming product ideas, running some tests, and getting feedback from people. This helps figure out if the ideas are actually doable and if they make sense. So, functional modelling is like a research process that helps me see if my product is technically possible and fit for purpose. By analysing the probability and severity of these risks, I could reduce the likelihood of my final product having them, helping it be fit for purpose. While engaging in functional modelling, I also examine the validity and reliability of my findings, which contributes to the development of a better product.

The next step in tech modelling is prototyping. This stage involves running tests to identify and address specific risks related to the product's success. I use feedback from my stakeholders to help manage these risks effectively. Prototyping also includes designing the product, and when combined with functional modelling, it allows me to create a product that will do what it is designed to do and has any risks properly managed.

Stakeholder:

When beginning my project I decided I wanted to work in food waste to help make a product that will prevent the wastage of food. So my initial stakeholder was [redacted] I was also supported by additional stakeholders with Food Technology expertise.

[redacted]

[redacted] is a food recovery organisation based in Wellington. They collect surplus food from various sources, like supermarkets, and distribute it to organisations such as [redacted] and local soup kitchens. [redacted]s mission is to achieve "zero food poverty and zero food waste," and they actively educate the Wellington community about the issue of food waste. I chose [redacted] as a stakeholder because they were the organisation my school initially connected me with for this project. I wanted to make a product that [redacted] could give out to people who needed food, and a recipe they could use in their kitchen.

Additional stakeholders:

My other stakeholder was [redacted], the Food Technology teacher at my school. She provided me with valuable advice throughout my project. There are two kitchens and four Food Technology teachers at [redacted]. She has worked on Food Technology projects in the past and on food waste projects, making her a reliable source. Another stakeholder I had was students trialling my product and recipe. This was a reliable source because the students would be the end users of my recipe and product.

Initial idea development:

Originally I was working with [redacted] to create a recipe they could use and make the product to give away to people in need. I interviewed my stakeholder, [redacted], to work out what foods are commonly wasted and what kind of recipe [redacted] would like me to develop. After some research, I worked out that Kaibosh didn't want a recipe that I could make because they usually give away the food to other organisations such as [redacted], where they go and make their own products. However I decided I still wanted to maintain the idea of reducing food wastage and, during this time, I came across a problem within the [redacted] food rooms. Many classes come through and use this space every day and lots of food is wasted either from vegetables and old foods going off, or students disliking their food and throwing it out. So, I decided to use [redacted] idea of zero food wasted and come up with a recipe the [redacted] students could use.
After interviewing [redacted] she became my new stakeholder for this project. My aim was to create a product that students can eat when they are hungry e.g. forgotten their lunch and in need of some food. This meant it needed to be filling- as it is for lunch, reasonably simple- so people like it, and quite diverse- so anyone with allergies or dietary requirements could eat it e.g. vegan or allergic to nuts. The recipe I came up with would also need to be used by itself, so the junior food technology classes could use it. This meant it had to be simple to follow and have clear instructions.

I interviewed my stakeholder, [redacted], to determine what ingredients are commonly wasted in the [redacted] food rooms. She told me vegetables, bread and milk are often wasted as they need to be used quickly. So I initially came up with 5 different ideas of what to make. These ideas had to include using items that are often thrown out in the food rooms. I wanted a product that I thought would be realistically useable and helpful. I researched what food recipes would be suitable for my intended environment. A website I found useful for this was Love Food Hate Waste, where I researched appropriate recipes. My 5 ideas were Banana Peel Muffins, Old Bread Bliss Balls, Vegetable Soup, Vegan Samosa, and Vegetable Stock.

I presented the bliss balls and banana peel muffins at the WHS open evening and got people's opinions. Most people liked the bliss balls and were surprised by the fact they were made up of

old bread. The results were very similar to the banana peel muffins. The people trying my product have a valuable opinion because they are potential stakeholders for my product, as they might be coming to [redacted] and joining the Food Technology program meaning they could be using my recipe and developing that product.
However, after initially trialling this product, I determined that the bliss balls and muffins would not be fit for purpose. This is because I needed to make a product that students could eat at lunchtime and would sustain them throughout the day, as well as a simple recipe junior students could use at any time, and the bliss balls and muffins would not fill students up for lunch, and bread and bananas are not always leftover in the food rooms, so it would not be a reliable recipe for the juniors to use.
However I still wanted to use food waste, so I decided to try other recipes that use old vegetables. I wanted my recipes to be flexible in terms of what vegetables they require, this is because the leftover vegetables in the food rooms vary from each week.
After trialling the vegetable soup, I realised it didn't have much flavour and it wasn't fit for purpose. This is because I would need to freeze it in singular portions and it must be easy and quick to reheat, since soup doesn't fit under those specifications I decided to go with the samosa. I also found that since the soup didn't have much flavour, it wouldn't work in its intended environment. This is because it would be given to students who are hungry at lunchtime, but they might not like the soup, and therefore it would not work.

Overview of the product I focused on: Vegan Samosa

The [redacted] food rooms buy and use a lot of vegetables throughout the week. Vegetables only last a short amount of time, and only a few can be frozen e.g. peas and beans, not carrots or cabbage. My solution to this problem was vegan samosas. Vegan samosas mostly contain vegetables and some spices, which are all combined and simmered to make a soft mixture. This means I could use any leftover vegetables that might not look nice, and need to be used quickly because it doesn't make a difference to the product visually.

Overview of how I assessed risk:

One of the risks I encountered was when I was trialling my samosas during the prototyping stage. In my ingredient trial, after doing some research I came up with some ingredients I could substitute. I could change potatoes to kūmara, or pumpkin as both have a similar consistency. I could change carrot to zucchini, parsnip or beetroot. I could change frozen peas to green beans, lentils, asparagus or broccoli. These substitutions were important for my recipe because I wanted the recipe to be flexible. I chose to do a materials investigation to see which ingredients I could change and whether my product would still work the same. I trialled changing from potato to kūmara and since both vegetables have a similar consistency and buildup, the substitution worked well and the samosa was still functional in its intended situ. However, a risk I encountered was with the water content and texture of some vegetables as opposed to others. For example, pumpkin has a higher water content than kūmara or potato, so if I had substituted my samosa filling with pumpkin instead of potato, it would have been too liquid and wouldn't hold its shape. This would mean the final samosa, whilst being cooked, might leak or not hold its shape, making it unfit for purpose. I anticipated some vegetables might not work as well as others, so I made sure to do some research and trialling.

Technological modelling, aimed at minimising risk, can take various forms and is carried out at different stages during product development. Functional modelling, which includes initial trials and determining the most socially acceptable product, is primarily completed before prototyping begins. This is important because, later on, many risks that could have been addressed through functional modelling become difficult or impossible to manage. Therefore, any sort of functional modeling like surveys, brainstorming sessions, market research, and early trials must be finished before moving on to prototyping. This approach helps prevent the creation of a non-functional product.
Once functional modelling is complete, the prototyping phase starts, where several prototypes of the product and its recipe are developed, followed by sensory testing. Prototyping helps manage risk by ensuring that the final product meets its requirements and functions properly in its intended environment.

Risk management involves evaluating the likelihood and impact of potential risks, and it is carried out in various ways during technological modelling.

- Low to medium-severity risks are more common when prototyping, they are not a big threat to a product. A low-severity risk I encountered when making my product was the portion size comparisons. I wasn't sure what size to make the samosas so I trialled different sizes in their intended environment. I got Stakeholder advice on which size was best, and after a few trials, I was able to resolve this risk. This wasn't a very high risk because the specification of the product was to be served as a lunch product so it needed to fill someone up, this meant I could do lots of little samosas, one big one or a couple of medium ones and it wouldn't make much of a difference. This didn't affect the recipe in its intended environment much either because as long as I am clear on how to fold and fill the samosa in the recipe, the juniors following the recipe can choose which size they would like their samosas to be.
- A medium-severity risk I encountered while making my product was the prototyping in situ. This is where I got a junior class to trial my recipe, which is its intended environment. A risk from this would be the recipe not being easy to follow because the instructions are unclear, so the recipe would not be fit for purpose and the students could not make the product. This was reasonably easy to solve because I made the steps simple, and added photos in on how to fold the samosa to make it clear. However, if the recipe was still too hard to follow it would mean the product is not fit for purpose. It was not as simple to overcome as my low-severity risk, but was less so than a high-severity risk would be.
- A high severity risk is something that could lead to an extremely poor outcome e.g. the product does not function properly. A high-severity risk that I came across was my practical technique trial. I decided to change the method of deep frying to oven baking. A risk I encountered was the product taking a long time to cook. This meant I would have to cook the samosas over 2 days, which was not very practical for a junior class. This was not too big of a problem and I could solve it by setting up all my

equipment/ingredients before starting and leaving the samosas in the fridge overnight, but it would be easier to only take one double to cook them for the junior classes. Another risk I encountered was the samosa leaking/losing shape whilst cooking. The samosas when being baked would often leak liquid out of the edges of the samosa, where it would burn on the bottom of the tray and change the taste of the samosas. This was a problem because it meant the product did not function properly. The samosa does not satisfy as a samosa if it is the incorrect shape and taste so this was a high risk. I remedied this by trialling baking the samosa a few times to work out how it might work practically but then switched back to deep frying for the final product as it created a product that was more fit for purpose.

Probability risk is the likelihood of a risk occurring, for example, the risk my product was not appealing due to it being vegan was of a low probability due to the fact samosas are often vegetarian and veganism is not much of a step further. By understanding risk management, and being able to assess the severity and probability of a risk, I was able to manage and minimise risks throughout my technological modelling.

Detailed discussion of my process

Investigating potential products based on stakeholder needs

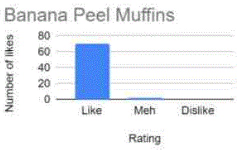
The first section of research I did was a brainstorm of potential food waste products I could make. I did this by analysing the ingredients that often need to be used up quickly in the WHS food technology rooms, and recipes that were needed to use them up without any wastage creatively. The main ingredients I noticed were a lot of old/less fresh and bright vegetables, and also vegetables that have been half-used. There was also often leftover milk and bread, which both go bad quickly and need to be used, although they can be frozen they need to be used still and aren't at their best when frozen.

The teachers try to get the junior classes to cook with the older vegetables so they can get used up before they have gone past their best before time. I know when there are old bananas they will get the students to cook banana bread or muffins to use them up, as well as when there is extra milk cooking things such as cakes and cookies to use it up helps. Often there is food that is still wasted. Bread and some of the vegetables can be frozen, such as celery but some are not ideal for freezing such as potatoes or onions. After some research, I found some of the common recipes that are used are curries or soups which contain lots of vegetables but might not appeal to junior classes. I wanted to create a product that the students actively want to make and eat so no food is wasted. Identifying this helped me reduce the risk of creating a product that students might not like and therefore throw out creating more food waste within the school.

Stakeholder feedback

I went through multiple stages of this form of technological modelling, and stakeholder feedback. Stakeholder feedback is important because it allows me to assess and manage the risks of social acceptability and technical feasibility.

The first stakeholder feedback session I had was a survey at school. I surveyed potential students and parents attending [redacted] and joining the Food Technology department. This survey was done during an open day at the school, and both children and parents voted for whether they liked, didn't mind or disliked the food product. The two products I trialled were Old Bread Bliss Balls and Banana Peel Muffins. The votes I received were: most people positively liked the Banana Peel Muffins, and nobody disliked them, and very similar results from my Bliss Ball trial. This modelling allowed me to manage the risk of social acceptability for my food product. By surveying a suitably large group of people, I was able to get reliable and valid information. The market that I was able to reach with this survey was relevant because those at the school open evening are people who are likely or could be likely to attend [redacted] and do Food Technology in Years 9 or 10.



The next stakeholder feedback I received was in response to my refined choices for what could be made. I went to my main stakeholder, [redacted] following the main values of Kaibosh another one of my stakeholders, with my 5 proposed products. My proposed products were Bliss balls, Muffins, Soup, Samosas, and Stock. I was told all my recipes were doable and great ideas, and they would each use up something that would otherwise be going to waste. This modelling was useful, as it showed me that my product was technically feasible and could be done in the Food Technology rooms, and it showed me that the product was socially acceptable. This modelling allowed me to manage risk by allowing me to see that my products could be technically and socially feasible because I was receiving feedback from a professional Food Technology person, which was reliable and useful.

Once I was nearing the end of the second stage of my technological modelling and prototyping, I got my product to be trialled in situ. Some of the feedback about the samosa recipe I was given was that the teachers who teach Year 10 Food Technology already have a samosa recipe, but are looking for one that links into the work that they do with [redacted] so that they can talk about Food waste and sustainability in a way that's relevant to the community. [redacted] is a part of the wider community. And so this is when I got my samosa recipe to be trialled by a junior class. The students in the class were vegan, so they couldn't make the original recipe the rest of the class was making, so they tried my vegan samosa recipe instead. They gave me valuable stakeholder feedback as that is my recipe's intended situ, which meant their feedback was valuable and reliable. They found the recipe easy to follow and had good results. One student was unsure of what the texture of the dough was supposed to be like. Two other students were impressed that it was a food waste recipe and found it easy to substitute ingredients and still get a good product.

The main risk from prototyping in situ was that the product might not work properly. I wanted a recipe that used food waste, was easy to substitute ingredients in and out of, and was simple to follow. I chose to do prototyping in situ as a form of modelling to see if my samosa actually worked in its intended situation. I did this after my final recipe was made so the juniors could trial the recipe and also the samosa to see if it was good. The risk of prototyping in situ was high, because if the samosa recipe is not easy to follow and juniors can't make the samosas then it is a very high risk because my product does not work at all. The product would not work in its intended environment. It is important the juniors can follow the recipe so that the samosa can actually be made and eaten. The risk is not very likely to happen. This is because I will/have made the recipe very clear to follow so that they can make it. The likeliness of the product not working at all in its intended situ is not likely because I made sure all the prototyping led me to create an easy recipe to make and follow. The junior stakeholder student's feedback was valuable because I knew what to change about my recipe/product. From the feedback, I know I can add pictures for clearer instructions and describe some of the steps better.

Initial trials - functional modelling

Initially, I came up with many ideas during brainstorming and refined those down to 5 ideas (bliss balls, muffins, soup, samosas, and stock) which I would perform initial trials on. These initial trials, which were part of my functional modelling process, were done so I could assess the technical feasibility and social acceptability of each product. Doing so would allow me to decide which product was worth continuing to develop, and eventually to prototype.

After deciding on samosas as the product I wanted to continue to prototype I decided to do some practical technique trials. I chose to try changing the technique of deep frying to oven-baking the samosas. This was for health reasons and also practicality. I knew that baking would mean the samosas have fewer calories and therefore be healthier than oven baking. However I also knew that baking takes longer than deep frying and depending on how long the recipe takes to make, it could be easier to deep fry them especially if it is in its intended situ, where juniors will be making them and they may not have enough time to bake.

After trialling baking vs deep frying and gaining stakeholders opinions I concluded that deep frying was more practical for my product. The risk I came across when trialling this was the samosa not cooking evenly, not holding its shape as well as deep frying does, and leaking out of edges and then burning on the bottom of the tray changing the flavour of the product. These were high risks because when these happen it means my product is not working. This is because when the samosas don't cook evenly it might not be safe to eat, therefore defeating the purpose of creating less food waste as it would not be safe to eat due to the uncooked flour and filling. If the product leaks and doesn't hold its shape, it is not functioning as a product and, therefore does not work. These are high risks but aren't probable to happen because I controlled them by trialling, prototyping and gaining feedback. This meant that when I came to finalising my recipe it was not an issue because the recipe says to deep fry the samosas. Another issue I came across with baking instead of deep frying was the amount of time it took to cook. It usually took about 30 minutes after doing multiple trials, which was not practical for my recipe because it took me 3 classes to complete. When the product is put in situ it is not easy for the juniors to refrigerate or freeze their mixture/samosas before baking the next day. However, after more prototyping and feedback I found that reheating the samosas after being frozen in the oven worked well. My stakeholder's feedback was that my product was a good, technically feasible product and had no major risks when they had been controlled. I decided on keeping deep frying as my practical technique because it made a product that was fit for purpose, kept to the specifications, and my stakeholders agreed with my decision.

Comparing my idea for samosa with other products on the market:

During my technological modelling process, I conducted one product disassembly to enhance my understanding of the practices used by technologists in existing market products. A product disassembly is the process of researching a product, to better inform my modelling, and to understand proper technologist practice. Doing so allowed me to manage and reduce the risk of practical techniques and portion size in my prototypes and final product.

For my product disassembly, I focused on empanadas and conducted my research online. I explored various resources to understand the ingredients, preparation methods, and cultural significance of empanadas. This research provided me with insights into the practical techniques involved in creating this popular dish.

Empanadas are often deep fried as well and they can change in portion sizes, so disassembling these helped me make key decisions on my practical technique and portion size. I learned about the significance of testing different portion sizes to find the right balance for my prototypes. This aspect is important for ensuring that the final product is both practical to prepare and fit for purpose. Through my research, I made my key decisions on deep frying my samosas and decided on a medium samosa.

Trials and Evaluations

Throughout my technological modelling, I performed many trials, both during functional modelling and prototyping. Trials and the evaluations that come from them are one of the most valuable parts of technological modelling. The process of trialling and evaluating your result allows a product to be developed and refined to remove risk. It also allows for proof of concept for stakeholders. It was through the process of trialling and evaluating that I created my initial models, and was then able to evaluate the practical techniques and technical feasibility of each of them. Later on, when I was in the prototyping phase, making small adjustments to improve the practical techniques and technical feasibility, I used the same process of trialling and evaluating to create a quality finished product.

When I wanted to trial practical techniques, a process I wanted to change was the cutting of the vegetables. I decided I wanted to trial grating the vegetables in the samosa filling rather than chop them into small chunks. I knew there was a high risk of the product not working, because of the filling being too soft and not holding its shape in the samosa. I wanted to trial this because I thought it might make the overall texture of the samosa better. At first, I trialled just grating the carrot and not the rest of the vegetables, from trialling this I ran the risk of the textures not working together and the overall samosa not having the correct texture. This would run the risk of the product not working properly due to an undesirable texture. After trialling I decided I liked the grated carrot because it made the texture softer and binded the ingredients together more, combining the flavours. So I decided to trial grating the potato as well. After this trial and after analysing the results I decided grated vegetables worked better in the samosa, therefore creating a better product for its intended environment. I discussed this with my stakeholder and we concluded that it is also best for juniors to use a grater to help practice kitchen skills, which is where my recipe will be made, so it works better for its intended situ. Prototyping and trialling my practical technique changes led me to create a product that is a better fit for its purpose.

Modelling

Designing a recipe was a necessity for my product, due to the nature of the Food Technology kitchens my product is to be placed in, a readable and simple but adaptable recipe is imperative. I very quickly settled on an idea for what my recipe would look like, inspired by recipes seen and used in the food kitchen already. Due to the simplicity of my product, I felt that an over complicated recipe would be unnecessary extra information that could confuse the student using it. I decided that I would create a recipe that was simple to follow so that junior chefs could make it. I added a photo of how to fold the samosas for clarity. After discussing what helps juniors follow recipes with some stakeholders (students who trialled my recipe) I found out that it is much easier for them to follow with the image in. After having another discussion with my main stakeholder [redacted] I made sure that the image that showed how to fold the samosas also had a picture of the final result, because often students don't know what the product they are making is by name, so by having a picture in it makes it more clear for them. After trialling my recipe in its intended situ, my stakeholders told me the final recipe was clear, easy to use, and well designed.

Final Prototyping

Once I had completed all my functional modelling, and my prototypes to manage risk had been completed, I had to make a final prototype. This final prototype was done to a set of specifications to make an ideal final product that had all its risks managed, could be taken to my stakeholders as proof of concept, be socially acceptable, and technically feasible. I made 10 samosas, using all the information I had gathered in my trials to manage all potential risks possible. I froze the samosas in their packaging in the [redacted] foods freezer. This was the intended environment of the made samosas. The next day I reheated the samosas and gave both my recipe and the product to my main stakeholder. The product was received extremely well. The leftover samosas were kept in the freezer so that students who need lunch can use them. A sample of the samosa was given to some students, who would be likely to eat my product outside of making it in class. They gave me valuable feedback and enjoyed the product's taste and flexibility. The recipe was printed so that junior classes could now have a vegan samosa option in their class. The process of making a final prototype to present to my stakeholders is a process often done in the industry after many prototypes have been made, which allows assurance of risk management.

Final evaluation

This project in Food Technology allowed me to learn about technological modelling by exploring product options through functional modelling and later prototyping.

It increased my knowledge of technological modelling, and how to properly manage risk. If I had not implemented proper risk management procedures I would have created a product that did not properly meet the requirements of my stakeholders ([redacted] from the [redacted] food department), and that was not socially acceptable for its environment. As a result of this project, I can be confident my samosa recipe will be used, where otherwise it likely would not have been. Looking back at this process I have been able to see how important a proper modelling phase is, as I have come up with a recipe that will be used, which I never would have done otherwise.

Through this project, I learned to ask not only if my product could be made, but also if it should be made in the first place. The use of could and should questions to assess the technological feasibility and the social acceptability has made me better able to contribute to the development of recipes in the real world, including in a school environment.

Through the model practical technique trials, I learnt that by changing different stages and assessing the risks involved, I can create a better, unique product. By trialling and prototyping material investigation and portion size comparisons, I was able to check my product still worked by assessing the risks. And also creating a product that was best fit for its intended purpose rather than a generic product bought or made in a different setting. Prototyping in situ meant I learnt to take on the valuable advice of stakeholders and use it to better enhance my product.

One of the most important things I learnt was the risk management process to assess whether a product is worth making, and in particular, the importance of many stages of prototyping when making a product, where I may have previously made one to two prototypes. I learnt to evaluate the severity and probability of risks, so I could properly manage them. Although my initial trial produced an acceptable product, the use of modelling and prototyping allowed me to further refine my product and to make it technically feasible (able to be adapted and used in the food rooms).

The lessons I will take from this for future recipe development are to make sure I assess and manage risks before finalising my product. I will do this by asking stakeholders (such as [redacted]) for expert advice on methods as I know it will be valid and reliable. I will also seek a wide range of opinions on flavour and texture throughout development and before making a final batch of a product.

Merit

Subject: Technology

Standard: 91358

Total score: 06

Q	Grade score	Marker commentary
One	M6	This report is based on the context of food wastage. The context itself provides opportunities for the candidate to reference broader factors in their decision making. At the beginning of the report the candidate introduces several stakeholders including an authentic client. They then go onto reference these specific stakeholders throughout the report and what feedback they provided.