New Enterprise Development EF317

Dr Eric Clinton

Team 34 - Grá Bia

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Idea Description

A ‘smart’ food container that analyses moisture content, temperature and bacteria of the meat within.

Introduction

Our New Enterprise Development Project idea is Grá Bia, a food container with integrated technology that lets users track the freshness of the food being stored through a smartphone app. Our team comprises of five students across a variety of business specialisations, which helped us with the various formational aspects of our business idea.

Our Product and its Innovative Qualities

Our product's goal is to lessen the amount of food waste that occurs in households across the nation. According to a required report produced in 2022 in accordance with EU legislation, the Environmental Protection Agency (EPA) predicts that there will be 753,000 metric tonnes of food waste in Ireland in 2021. In 2021, families created the greatest amount of food waste (221,000 metric tonnes), making up 29% of the total. The production of food and beverages was the second-largest producer of food waste, accounting for 215,000 metric tonnes of it.

Figure 2. Estimated Food Waste Generated in Ireland in 2021 (percentage per food supply chain stage)

Source EPA

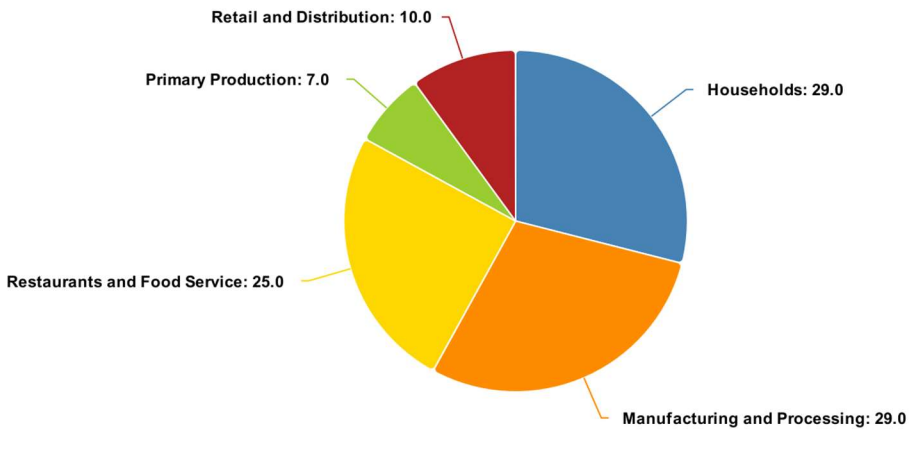


Diagram sourced from Environmental Protection Agency, 2022

Stage of Food Supply Chain	Tonnes of Food Waste Generated (reference year 2020)	Percentage of Total Food Waste
Primary Production	53,000	7%
Manufacturing and Processing	215,000	29%
Retail and Distribution	75,000	10%
Restaurants and Food Service	189,000	25%
Households	221,000	29%
Total	753,000	100%

After learning about these statistics, we decided to create an idea of how we could reduce some of these drastic numbers. We decided to focus on meat with our product, as we felt it was an avenue where we could make an effective piece of equipment to help reduce meat waste. Per the same EPA report, around 66% of food wasted in restaurants and food services is avoidable, i.e., edible foods. Hotels account for around 8% of the meat wasted in this sector. Therefore, we want to target our product towards households, restaurants, and food services to try and help them maintain their meat consumption and cut down on their waste.

We came to the conclusion that the best approach to address this was to develop a Tupperware-esque container with technology built into the top that would analyse the moisture level, temperature, and bacteria of the meat inside the container to predict when the meat would perish. A push notice would be sent at various intervals, such as a week, four days, two days, etc., before the meat starts to change, thanks to an NFC sensor tag that is connected to an app.

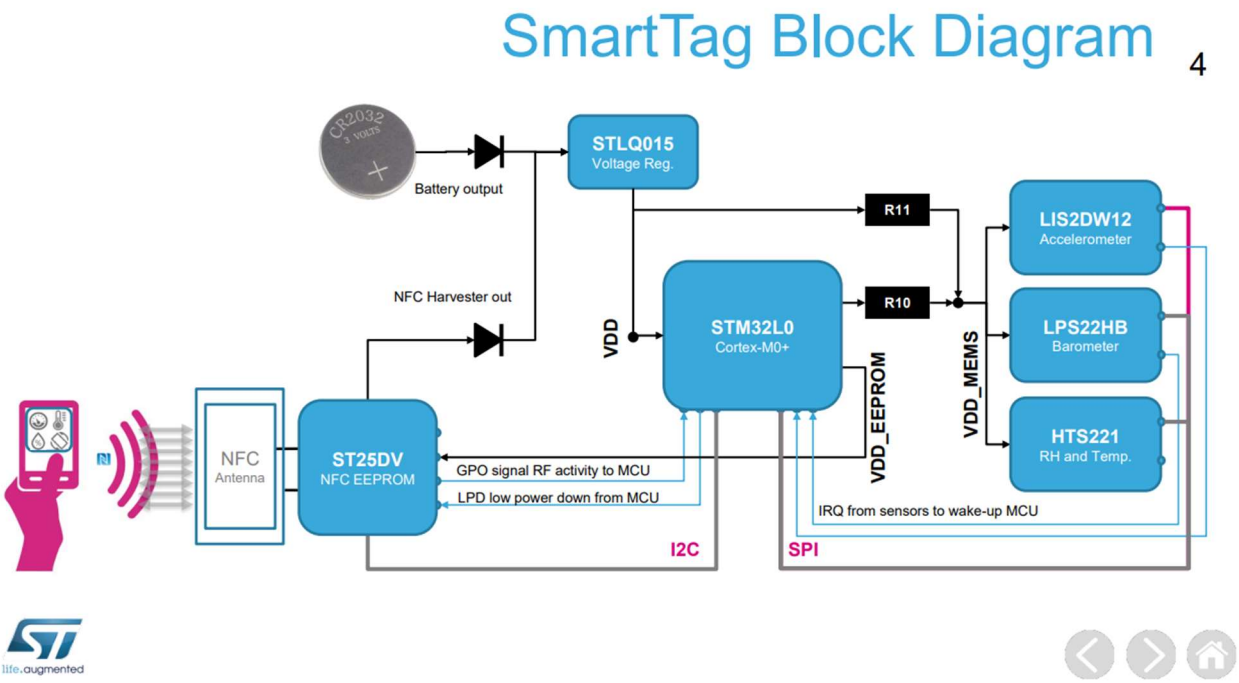


Diagram sourced from STMicroelectrics, 2020

We discussed the different possible scenarios where we could innovate the product for different scenarios, like meat sizes or capacity, and decided that we could use scaling to provide a range of sizes of the product. For example, having small containers for families that may have smaller amounts of meat to preserve and larger containers for hotels and restaurants that would need more storage space to even freezer-sized containers for butchers to know which meats they need to prioritise when facing off is a retail term for putting fresher foods at the back so that older stock is sold first.

As well as reducing food waste, our product can also help to prevent food poisoning from when expired food is cooked. According to the WHO, an alarming 420,000 people worldwide die annually from food poisoning after consuming expired or contaminated food. The most common causes of food poisoning are bacterial-based issues that our product would aim to assist in detecting bacteria in the meats. The NFC chip will be able to detect bacteria in the meat that will inform the customer whether the meat is contaminated and thus unsafe to consume.

Ideation Process

Preparation:

Following the lecturer's advice, each member of the group generated five suggestions. As a result, when we got together as a group, we had a total of 25 proposals. Each group member contributed solutions to problems they saw in the world as well as concerns in their own personal lives.

It was very helpful to gather pertinent information about each issue because it made it easier to understand the context and current solutions for the issue and to determine which solution was the most workable. Additionally, discussing our ideas and sharing different perspectives allowed us to refine and improve upon each other's concepts. This collaborative approach ensured that we considered various angles and potential challenges before selecting the most promising idea to pursue further.

Divergent thinking

The above-discussed brainstorming method was employed. Each group member shared their thoughts, and everyone listened without passing judgement. We believe it was the finest course of action since it gave us the freedom to have a wide range of ideas.

Convergent thinking

Idea Evaluation: At this point, we evaluated the concepts we came up with using predetermined standards, such as price. We were only allowed €300,000 for our project; therefore, some ideas would not have been feasible. We also talked about the potential impact and financial potential of some of the ideas.

Idea Selection: We reduced our list of ideas to two at this point in the procedure. These two concepts, in our opinion, had the most promise and the most information and data available.

Both proposals addressed the societal issue of waste management, which our group determined to be a significant issue in Ireland at the moment. Several of the group's participants work in retail and observe these problems firsthand; therefore, we wanted to produce a product or service that would help solve this issue.

Iteration:

Feedback: During our tutorial slot, we shared both of our concepts. When our major proposal was first made, it was dismissed on the grounds that it would not bring in enough money and that we would have to undercut rivals to turn a profit. This was an intriguing realisation for us since it

demonstrated that even if we had a great idea, the market must also be taken into account during the ideation phase which is a crucial step. This criticism helped us appreciate the value of performing market research and comprehending client wants prior to deciding on our business concept. It emphasised the necessity of matching our concepts with market requirements and creating a competitive edge to assure long-term success.

*Refinement:*We also gave our professor another, more receptive suggestion. Our proposal was deemed to be promising and to have good potential, but it needed to be improved upon to make it more workable and efficient. The technological component of our plan was the key area that required modification. To make sure our idea could be built, given that we needed to employ certain technologies to accomplish it, we were instructed to consult with engineering students on campus. We were all quite pleased with this response and were confident in the quality of our Tupperware product. We set up meetings with engineering students to go over the specifics of our concept and get their opinions. In order to better grasp the market's demand for our Tupperware product and find any prospective rivals, we also made the decision to do market research.

Implementation:

Action Plan: To make sure that everyone in the group had a task to do, we created a thorough strategy for putting our Tupperware idea into practice. Using our particular strengths as a guide, we distributed the tasks among ourselves. While two group members had specialisations in two distinct fields, some group members were experts in the same field. This was quite helpful because these students were allocated the financial components of our project because they knew the most about them. We worked together to attempt and make contacts and gather information because none of the group members had any prior expertise or understanding of the technical aspect. This was done to make sure that our product could be developed. For the purpose of successfully implementing our product, our action plan also includes deadlines and resources.

Execution: Since we are still in the early stages of developing our product, nothing has been put into practice yet, but we are aware that changes may be required soon. As a result, we will keep track of our development during this period to ensure that we don't repeat the same errors and that we develop as a team.

Though we are cognizant that ideation is not a linear process and that we may need to alternate between divergent and convergent thinking stages, for the time being, we feel as though we have developed a workable and original solution to food waste. In order to validate our approach, we will aggressively seek input from stakeholders and industry professionals as we move forward.

How will it work:

To ensure food safety, Smart Tupperware blends technology and pragmatism. The Tupperware would include three sensors: CO2, humidity, and temperature. The primary causes of meat spoilage are these factors. The meat must be kept at a safe temperature to prevent bacterial growth and rotting, therefore the temperature sensor would keep track of the temperature inside the tuba. The tupperware's moisture content would be monitored by the humidity sensor. This is essential because it would show us whether the meat was drying out or getting too wet. Both of these elements increase the risk of spoiling.

The CO2 sensor is crucial because it can detect the presence of microorganisms like bacteria, which emit CO2 when they expand. Therefore, if there is evidence of increased CO2 levels, it may indicate rotting. The tupperware lid would include an embedded NFC tag. This would enable the user to scan an NFC tag with their mobile smartphone and communicate the sensor data to the device app.

The user interface of the mobile app would be straightforward but welcoming, a location where the user may see the data instantly. If the data went over certain limits, the software would be able to provide alerts. This software would also offer recommendations for these problems, such as reducing the temperature or informing the user not to consume this meal while in this state, for instance, if the temperature is too high. The user would also be able to review historical sensor data to follow the evolution of the meat conditions.

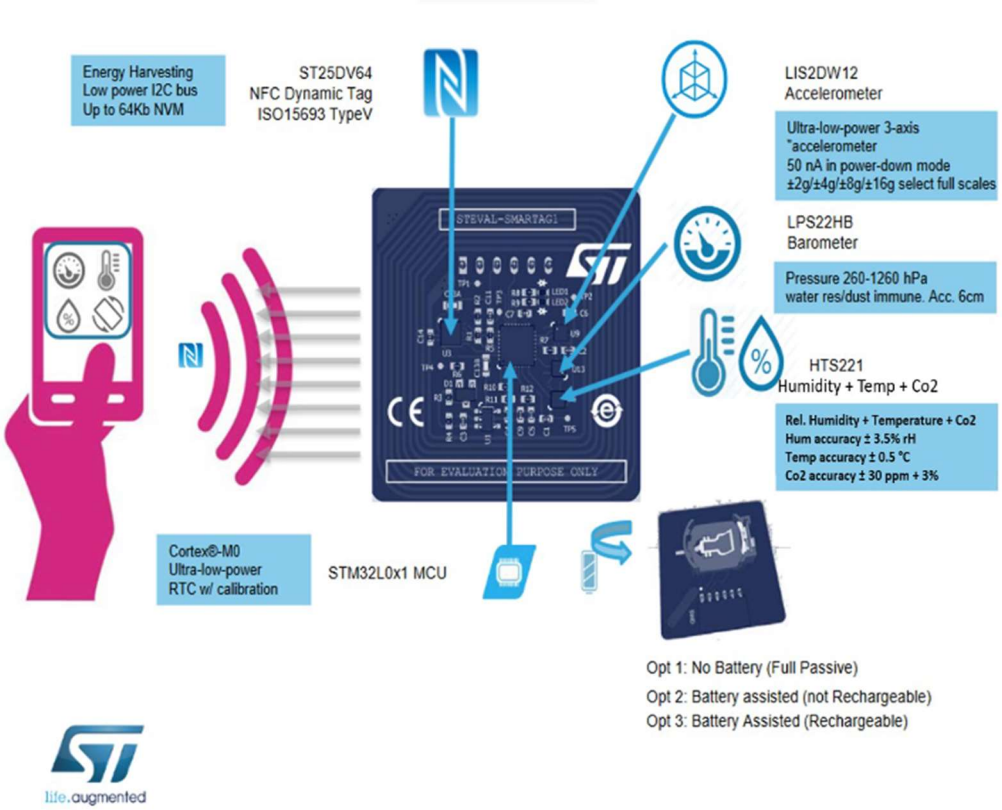
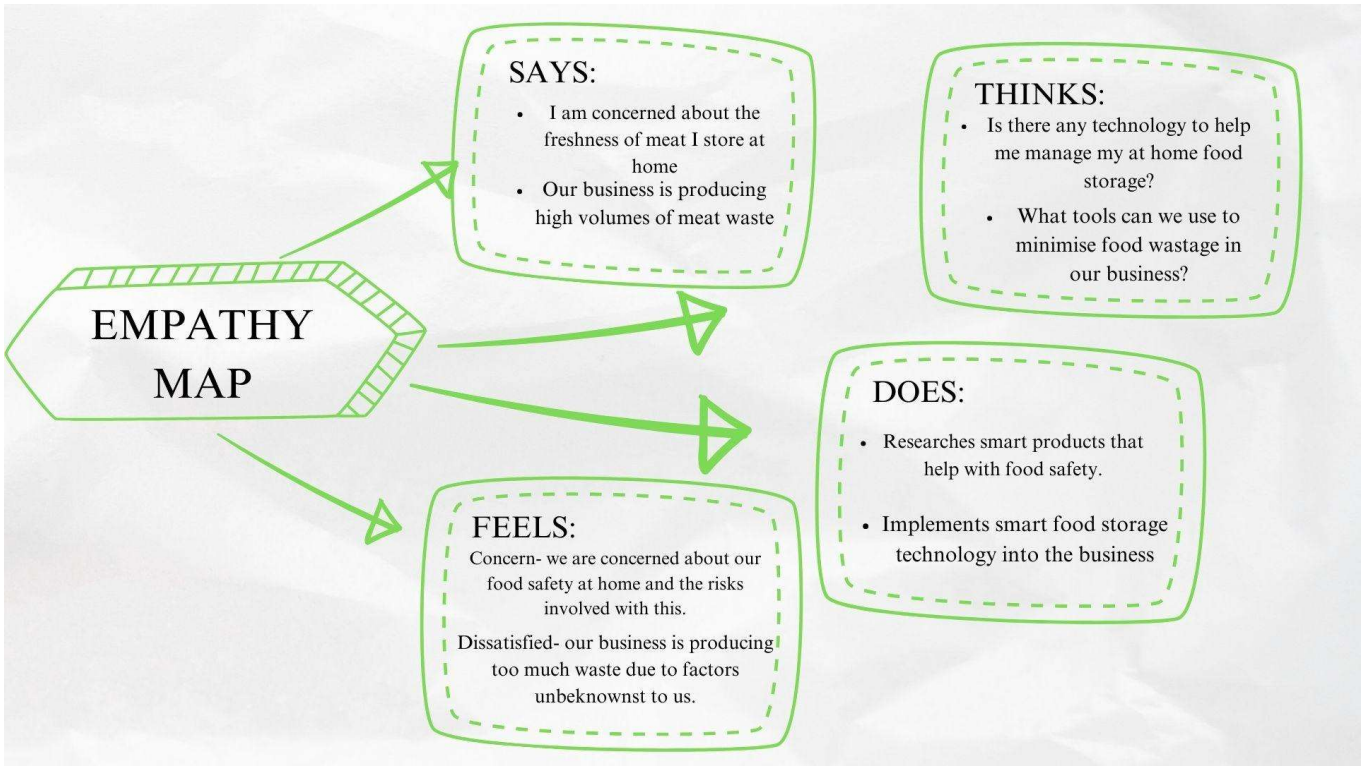


Diagram sourced from STMicroelectrics, 2020

Analysing the Market:

This product is intended for businesses and customers who may not be well-versed in food storage and food safety in general. 821 respondents from a poll with a total of 1069 respondents from all 27 Republic of Ireland counties took part in this study. The average degree of knowledge of 29 food safety procedures among Irish people was shown by 28 findings (67.0% passing rate). They demonstrated an average level of competence in maintaining and using the kitchen (59.0% passing rate), storing food (52.8% passing rate), and maintaining personal hygiene (61.0% passing rate). On the other hand, their level 32 comprehension of proper food handling (passing rate: 10.8%) and food poisoning (passing rate: 20.1%) was worrisomely lacking. Moreb and co., 2002 These results give a clear indication of where consumers' food storage and food safety knowledge stand.

Through this information, we developed an empathy map to gain a deeper insight into what our target market may be looking for in a new potential food safety product.

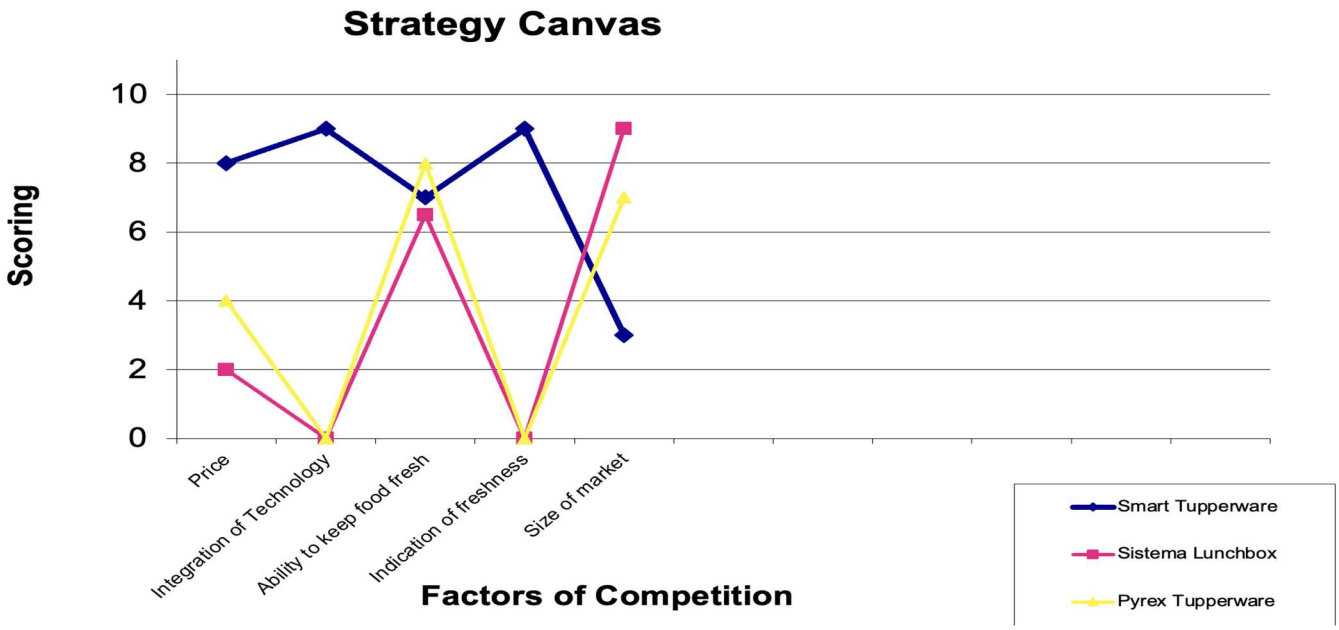


We were able to create a product that is specifically tailored to the demands of our target market by creating an empathy map. We are able to provide our consumers with a quick and simple approach to determining whether the stored uncooked meat products are suitable for sale or consumption, thanks to our technology. We have focused on their requirements for integrating smart technology into a meat storage product they would routinely use, whether it be at home or in a commercial context.

Consumers and businesses can find advice on food storage on the website of the Food Safety Authority of Ireland, but there is no way to keep track of temperature or CO2 changes in this advice.

Our competitors:

We are joining the well-established market for food storage solutions by creating this product. The company Pyrex, which has long controlled the market for cookware and food storage, is our biggest rival. Four 1.5-litre Pyrex glass containers cost about €60 each. Pyrex takes pride in its hygienic and adaptable cooking and food storage glass goods. Despite producing high-quality goods, Pyrex does not have any integrated technology for food safety.



We are considering partnering with Sistema, a well-known company with significant sales in the plastic tupperware sector. In order to compare how our product is positioned in the market to how the other two companies are positioning their products in the same market, we, therefore, chose to incorporate this into our strategy canvas.

According to the strategy canvas, it is evident that the price of our product places us in a more specialised market, but this premium price covers the technology integration that the other two firms lack. While the ability of the three companies to keep meat fresh is relatively comparable, our product rises on the graph when it comes to the ability to communicate this freshness to the consumer. In contrast to the other two businesses, which have been well-established for many years in their respective industries, our product is positioned in a niche market, which obviously reduces the size of our market.

Our product stands out from the competition because you can get all the information you need about the contents of the container directly from the chip to your phone using smart NFC technology instead of using a probe.

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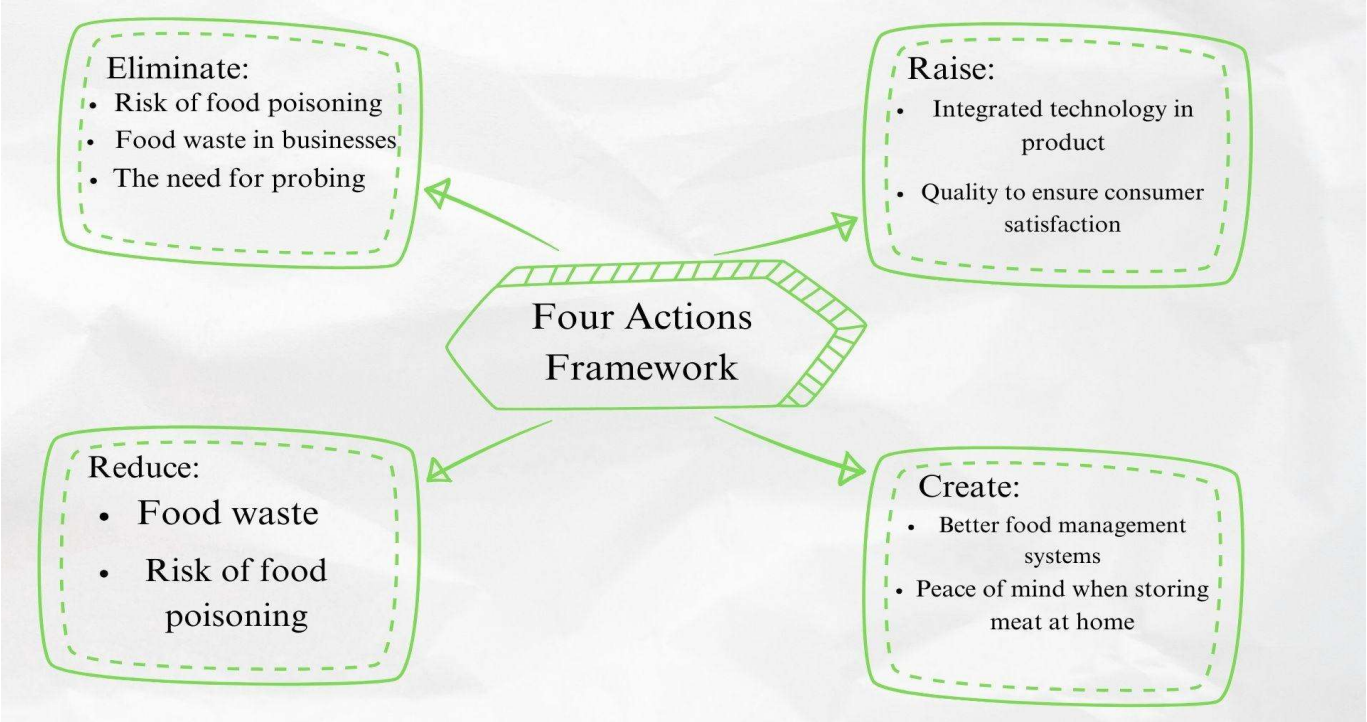
Our Strategy:



Eliminate:
Creating our product allows the consumer to have better insight into the temperature and CO2 changes their stored meats have gone through. This can help reduce the risk of food poisoning and also food waste as no meat has to be thrown away.

Raise:
The USP of our product is our smart technology allowing you to view all this information through the NFC chip. This unique aspect raises our product well above industry standards and by ensuring a quality product we create an attractive product for consumer purchase.

Reduce:
The reduction of food waste and food poisoning comes as a result of easy access to food freshness information through our NFC chip.

Create:
Businesses can utilise our product to ensure a more efficient food management system is in place. By doing this they can ensure that the products they are selling are fresh and fit for human consumption, whilst also being able to identify areas where reductions are needed to sell certain products quickly. At home, consumers can be sure that any meat stored in our product at home is fresh and ready to eat.

The Technology:

The technology we would use would mainly be basic and with the help of Life.Augmented we would be able to manufacture these chips for a relatively low price.

STMicroelectrics, 2020

The usage of thermistors or digital temperature sensors is a widely utilised technology for temperature sensing. These are ideal for the tupperware because they can deliver precise readings and are relatively compact. The humidity is measured using a capacitive humidity sensor. These sensors function by identifying modifications in electrical capacitance brought on by moisture.

CO2 concentrations are frequently measured with non-dispersive infrared sensors. They operate by examining how CO2 molecules absorb particular infrared light wavelengths.

The user's phone and the NFC tag can communicate wirelessly for a brief period of time. To communicate with the tag, the user would first need to download the smartphone app.

The Life.Augmented app would have a straightforward user interface and be available for download on both iOS and Android smartphones.

Diagram sourced from STMicroelectrics, 2020

For the power supply of this device, we would be using a coin cell battery as the sensors will have low power consumption.

Manufacturing Process and Design:

We would look to partner with Life.Augmented and Sistema.

The semiconductor solutions expert Life.Augmented would be able to provide us with these sensor chips. Depending on how we designed the container, we could collaborate with them to modify the chips so they would be perfectly integrated.

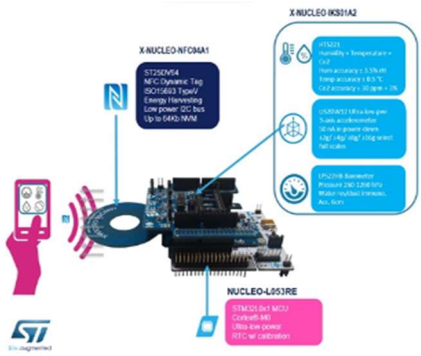


Diagram sourced from STMicroelectrics, 2020

Investment & Returns:

For about $18 per piece, Life.Augmented presently manufactures and markets the sensor chips necessary for our product. Ideally, we would try to negotiate a price reduction with them that would bring the cost down to roughly $15 per unit, or about €14.50.

One of the biggest manufacturers of plastic food containers, Sistema offers a wide range of goods and has experience in plastic manufacturing. Depending on the size of the tub, their food containers range in price from €6 to €8. We believe they would be the perfect business partner for cost-cutting and design guidance.

sistema® (iDt Group, 2014)

In terms of raw plastic material costs, a 3.5L food container made of Polypropylene from Sistema weighs 315.6g. In 2022, the price of polypropylene was around $1,133 per 1,000kg (Statista, no date), meaning 315.6g would cost about €0.35 per unit. Using an online calculator as an estimation tool for a 6in x 6in x 6.8in container, the production of 1,000 units would have a cost breakdown as follows;

- Materials - €11,000
- Production - €2,300
- Tooling - €20,000

Total - €33,000 (€33 per unit)

The setup costs for the machinery, product mold designs, manufacturing/labor costs, and shipping prices are additional expenses to take into account. Plastic injection moulds cost between €1,000 and

€10,000 depending on the complexity of the design and are reasonably simple to design and build with an experienced manufacturer. We can estimate the cost at around €4,000 because our device will need a specific enclosure for the electronics.

Below is an example of a 3-year forecast for costs and revenue assuming we sell our product at a unit price of €60;

	Year 1 **1,000 Units** **Cost**	**Year 2** **5,000 Units** **Cost**	**Year 3** **10,000 Units** **Cost**
Materials (Plastic)	€15,500	€78,000	€141,000
Materials (Electronics)	€14,500	€72,500	€145,000
Production (Labour etc.)	€2,050	€7,900	€15,000
Tooling (Machinery and moulds)	€20,000	-	-
Total	€52,050	€158,400	€301,000
Unit Cost	€52	€32	€30
Revenue	€60,000	€300,000	€600,000
Profit	€7,950	€141,600	€299,000
Profit per Unit	€8	€28	€30

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