SĒBU

セーブ (Sēbu) is Japanese for 'save'

A project to reduce global food waste by **Group 18**:

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1. Table of contents

2. Abstract

Each year, approximately one-third of all produced food goes to waste [**1**]. Not only is this morally unacceptable, it also represents an environmental danger as well as extensive costs to both government and individuals [**2**]. Sēbu attempts to tackle this growing issue by offering a low-cost device - adaptable to any fridge – that monitors its content and facilitates the process of waste reduction for the average household. Instead of simply warning the individual of the near expiry of a product, Sēbu engages with its users by providing both personal and social incentives to reduce wastage. Using the generated inventory, software embedded in the device processes the data such as to monitor consumption of food and provide advice to increase the user's well-being. From direct contact with local charities to a point-based reward system, we provide our users with the opportunity to give back to their community. This report will develop on the most important elements of the PDS from our Interim Report, with further technical discussion as well as sketches, figures and feasibility estimations on these key concepts. We will discuss the way our databases are interfaced as well as how the user interacts with the device. We also bring further reflection on our device's hardware.

3. Introduction

Food is a vital resource that every individual should have access to. Unfortunately, its distribution is limited by both our poor agricultural techniques and our limited ability to manage this resource. In order to feed a quickly growing population, we will need to improve our methods and change our consuming habits – that includes reducing food waste [3]. As we will show in this report, food waste is a problem that affects us all from an environmental and economical standpoint. Consequently, we decided as a team that we would tackle this issue by designing an innovative device that will empower households to stop wasting. Our interim report detailed the various concepts we invented and gave an overview of our decision-making process. This final report presents our latest solution, the ways in which it answers the problem as well as plans for the future.

4. Food waste: An overlooked problem

4.1 A wide scale environmental and economical issue

Each year, approximately one third of all the food we produce goes to waste [1]. Not only is this morally unacceptable, it also represents an environmental danger. The carbon footprint associated with the production, transportation and processing of wasted food is estimated to be 3.3 billion tonnes of greenhouse gases [2]; this is equivalent to a country that would be the third most polluting, after the United States and China. Furthermore, producing this unused food requires almost 30% of the world's total agricultural land [4].

Economically, food waste represents an annual loss of about $750 billion [2]. On the scale of a household, this represents on average $1600 of food wasted per family each year [3] (study conducted in the United States only). As resources keep getting scarcer and the global population grows, we cannot condone wasting.

4.2 The role households play

The question now is: what role do we, as consumers, play in this disaster? According to the Food & Agriculture Organisation of the United Nations (FAO) [2], the responsibility for wastage is almost *equally* shared between consumers and producers. However, a study by the International Journal on Food System Dynamics [5] has showed that in the United States in 2009, consumers caused the majority of *avoidable* food waste (See Figure 1).
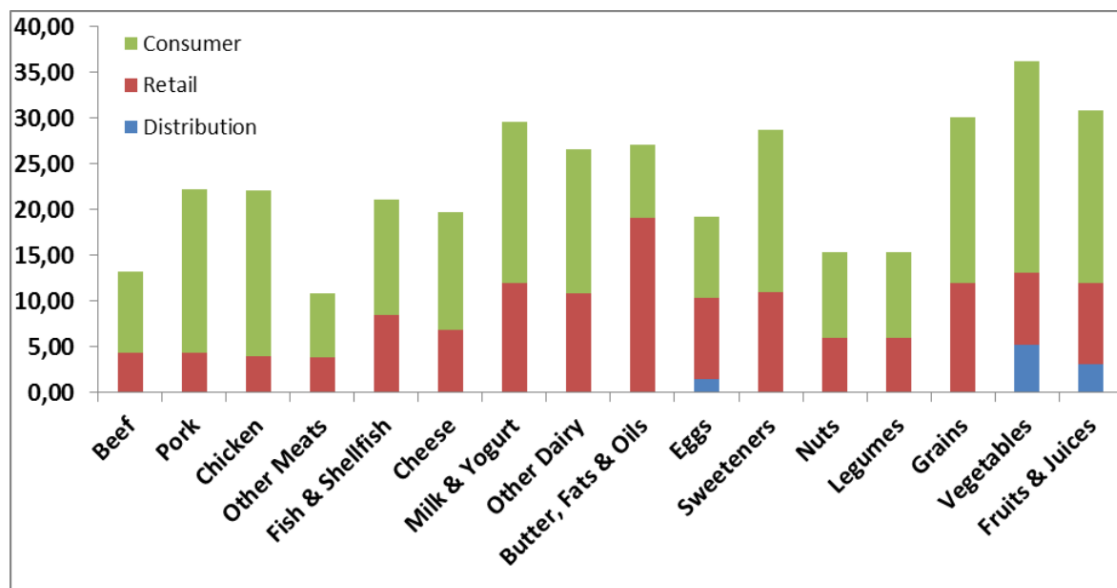

Figure 1: US avoidable food waste in 2009 as a percentage of production [5]

3

What is striking about the above figure is not only the proportion of total wastage that consumers represent but also the fact that this waste is categorised as being avoidable. In 2012, the Waste and Resources Action Programme (WRAP) led some research to categorise the total household food and drink waste into three classes: "avoidable", "possibly avoidable" and "unavoidable". Shockingly, it resulted that out of the 7 million tonnes that were wasted, only 1.6 million tonnes were unavoidable [6] – all the rest could potentially have been saved.

In the same study, survey results showed that more than three quarters of the food wasted at home was due to products being "not used in time" or being used in quantities greater than what was eaten. Many other studies and articles [7] [8] further explore these reasons and all come to the conclusion that there is a general confusion around food labelling and expiry dates. While some studies show that people understand the different types of labels, others show that very few consumers have the right attitudes towards the displayed dates [9].

This clear identification of households as one of food waste's main contributors allowed us to establish our most important design criteria: households exhibit a need for better management of their fridge's content as well as advice regarding the quantities that should be prepared, cooked and served.

4.3 Existing solutions

One of the proposed solutions is the so-called "smart refrigerator" produced by companies such as Samsung [10] and LG Electronics [11]. These are based on regular refrigerators with the addition of a Wi-Fi enabled touch interface (see Figure 2: Samsung 4-Door Refrigerator with 8" Wi-Fi Enabled LCD). Features usually range from finding recipes using the fridge's content to displaying weather forecast, listening to the radio or mirroring a phone screen [12]. While these options may be helpful, smartphones and tablets can provide most of them without the need to buy an expensive new fridge. Interestingly, since we have first written our product design specification, the LG refrigerator we cited as competition has now been discontinued.

Figure 2: Samsung 4-Door Refrigerator with 8" Wi-Fi Enabled LCD [10]

Mobile applications represent another type of competition. These take advantage of a smartphone's connectivity and its camera to create an inventory of the fridge's content. Figure 3 below shows the interface of one of these applications: Fridge Pal [**13**]. However, most of the time, they require manual input of the product and its expiry date [**14**], which can quickly become a burden when one has just bought groceries for the coming week. Furthermore, these applications often have very little interaction with the user apart from displaying information and fail to create real incentive.
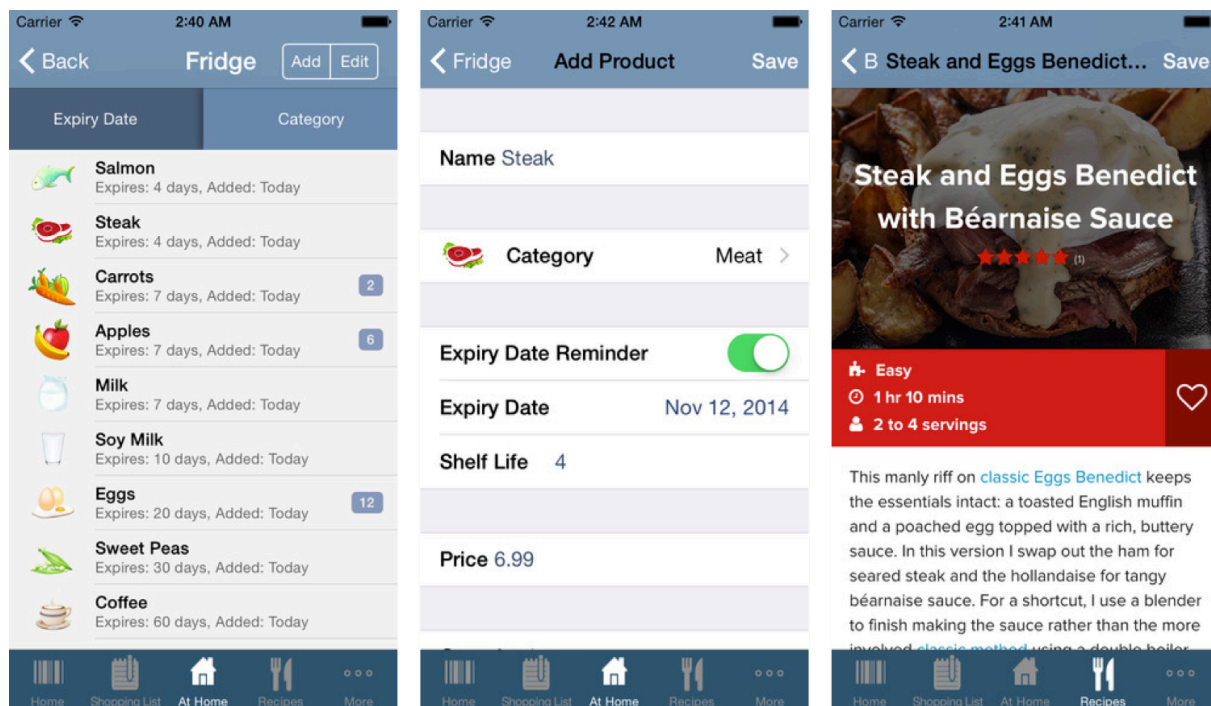

Figure 3: Screenshots from "Fridge Pal" [14]

5. Our Solution

5.1 Design criteria

This thorough analysis of the problem combined with our study of the competition allowed us to extract our most important design criteria. To further understand the user's needs, we also conducted a survey[1] [**15**].

5.1.1   Require minimal input from the user

The main reason why people do not inventory their refrigerator's content, or use an application to do so is because the process is time-consuming. The first way in which we can make our device attractive is by making it user-friendly and finding an input method that will require minimal effort. As shown by our survey, although very few people have completely dismissed the idea of Sēbu (2%), more than a third (37%) are concerned by how much time such a device would require. The results relevant to this question of the survey are shown in Figure 4.

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[1] Results were collected over a period of one month (December 2014 to January 2015) with a total of 90 responses. These may however be biased by the context of the survey as well as the sample population that answered it.

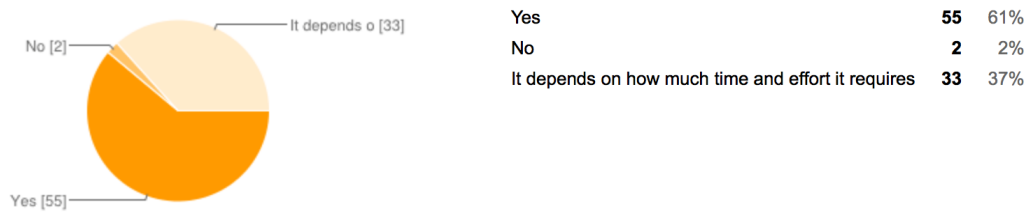**Would you be interested in using a device that would help you reduce food waste?**

Yes	**55**	61%
No	**2**	2%
It depends on how much time and effort it requires	**33**	37%

Figure 4: Extract from our survey

5.1.2 Create incentive to reduce food waste

If Sēbu is to be successful, it will be by achieving what our competitors have not yet accomplished: to be able truly engage with the user. Our survey shows that people are generally conscious that food waste is a problem if not concerned by it. Rather than just informing the user that certain items will soon perish, our task lies in helping these people to take action and facilitating any process that will save food.

5.1.3 Cost efficiency

Although people do not consistently use mobile applications to inventory their food, the fact they are aware these applications exist will restrain them from spending large amounts of money on a piece of appliance that has similar functions. This explains why "smart fridges" are so hard to sell. Our device will have to be quite cheap and exhibit great functionality to appear as sound competition to a £1 - £2 application.

5.2 Sēbu, an innovative solution

Our proposed solution finds its place halfway between the full "smart fridge" option and the minimalistic mobile application. Indeed, the idea that first defined our project was to design a product that will turn any refrigerator into a smarter piece of appliance. Our device consists of a connected, tablet-like touch interface that can be fixed to a refrigerator's door, or placed anywhere in the kitchen (see Figure 5). Contrarily to a smartphone with a mobile application installed, the purpose of our device is, firstly, to inventory the refrigerator's content, secondly, to create incentives to stop wasting. We also envision a companion smartphone application that would make our device even more personal, acting as a shopping list for example.
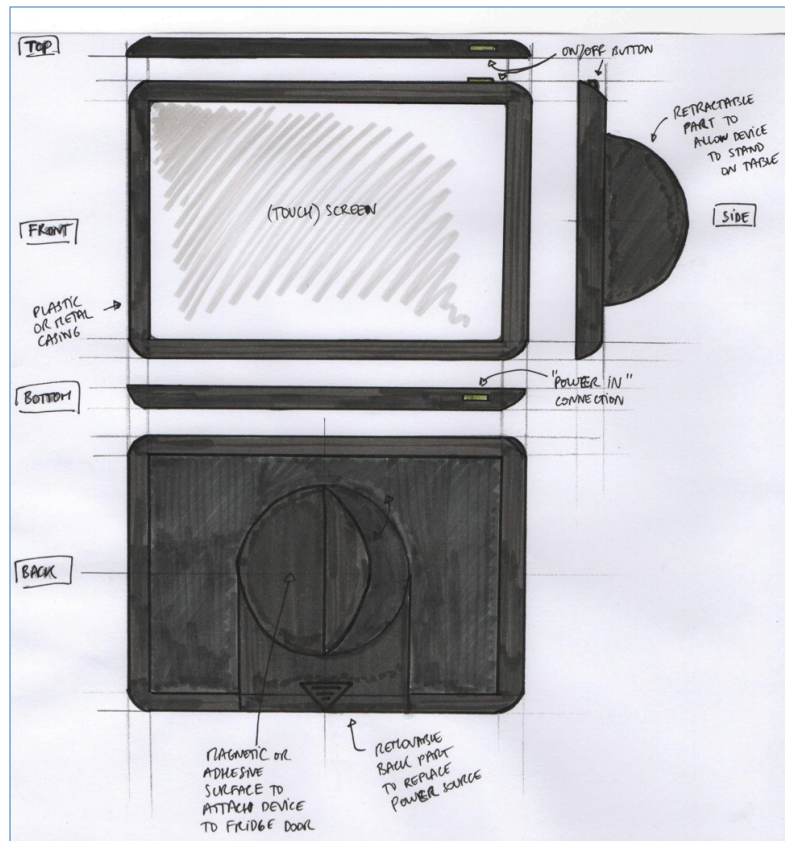
Figure 5: A sketch of a Sēbu unit

5.3 How Sēbu tackles food waste

5.3.1 Keeping track of expiry dates

To inventory a fridge's content without requiring user input, we will take advantage of the fact that a supermarket employee scans each item individually at the time of purchase. We plan on partnering with various stores to integrate our software to their existing system. Our simple add-on will only need to send a list of barcodes or item names through existing communications protocols (for example by e-mail) to a Sēbu device, which will then carry out the data processing we require (see section 6.1 "Seamlessly building an inventory and processing data" for further details on data processing). However, a similar method has already been described in a patent application [**16**]. We will therefore need to do more legal research and receive professional advice before we can actually implement this feature.

Of course not all items are bought in a supermarket or have barcodes. To deal with these items, Sēbu will provide the option to input an item manually. Furthermore, if items were bought at a supermarket that does not support our system, we plan on connecting to a smartphone to use its camera to capture a picture of the shopping receipt. Its content will then be extracted through Optical Character Recognition (OCR) [**17**] and added directly to the database. If there is a high demand by users who do not own smartphones, we consider creating a second version of our device, which will have an integrated digital camera.

Sēbu determines expiry dates are determined based on a product's average lifetime; quantities are then associated with each item and displayed on the screen. The displayed list will be ordered in ascending order of expiry date such as to make it easier for the user to plan ahead. The general confusion behind the use of the terms "use by" and "best before" [**9**] that leads to avoidable wastage

will also be tackled as only one date of same type will be set for all products. In this way, our simplistic design requires minimal effort and time input by its user, thus answering our first design criteria.

5.3.2   Creating incentives

Instead of simply warning the individual, Sēbu engages with the users by providing incentives at multiple levels. When the device identifies that an item will soon expire, it will give a notification to the user suggesting various uses for the food. Sēbu will search online resources[2] for recipes containing the soon-to-expire food and other ingredients from the inventory. If none of these suit the user, Sēbu will put him or her in direct contact with local charities and food banks to make sure that the food will be re-used rather than thrown away. We also wish to establish a point-based reward system to encourage people to take part in our project: the more people avoid waste, the more rewards they receive. These could be vouchers in our partner supermarket or restaurants for example. Integrating the community to create a movement of people willing to reduce food waste makes Sēbu not simply a device, but a complete solution to a growing problem.

5.4 An unexpected social impact

By making the customers active members of our design, we brought a social dimension to Sēbu that we had not envisioned at first. This creates new benefits, beyond the scope of simply reducing food waste.
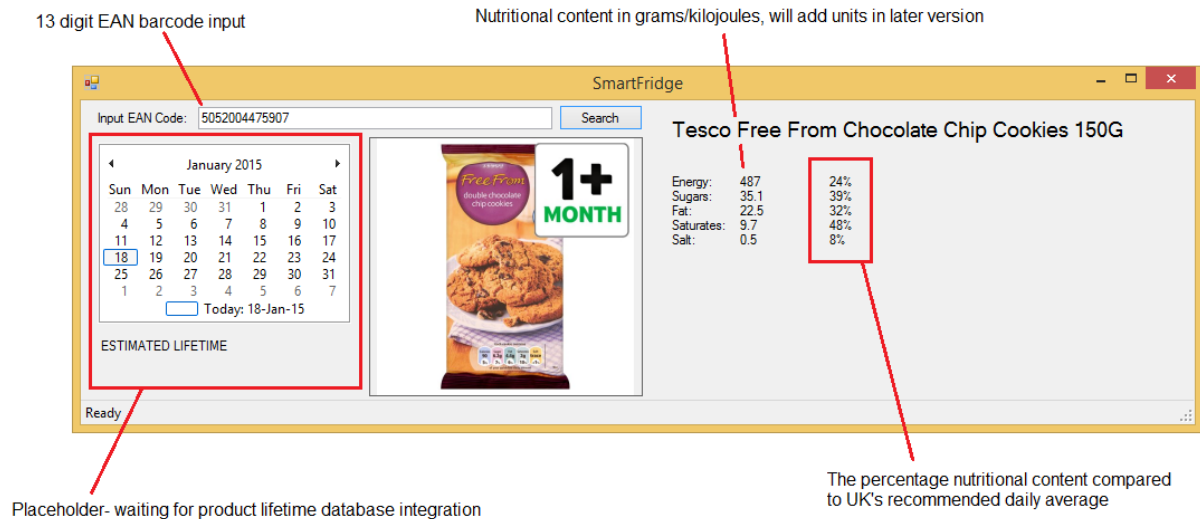
5.4.1   Improving lifestyle

Having access to the content of one's fridge puts us in a position to monitor the nutritional intake of our users, under their consent, and immediately suggest ways to improve their lifestyle. In fact, this opportunity arises in a time when the average western consumer's diet is in much need of repair. According to the National Diet and Nutrition Survey [18], added sugar and saturated fat averages consumed per day were significantly higher than the recommended value across all age groups. At the same time oily fish, vitamin D, iron and other essential mineral intakes remained below the recommended average. Moreover, obesity costs the NHS approximately £5.1 billion per year and could rise to as much as £60 billion in 2050 [19], placing serious pressure on government funds. Finally, the average household wastes approximately £60 of food per month [20], capital that could be used elsewhere to improve one's financial situation.

Sēbu has the means to answer these concerns by retrieving the nutritional content of each item in the database from a third party[3] and, based on the user's daily consumption, monitor his or her intake. This will enable Sēbu to warn the individual if he or she does not have a balanced diet. Additionally, by looking at the contents of the fridge and searching for recipes online that include soon to be expired products, the device will propose a diverse set of meals in the appropriate quantities. In the case where an ingredient is missing for a particular recipe, Sēbu could connect the user directly to a local grocery shop, stimulating local commerce. Immediately, we see that Sēbu has the potential to increase the overall welfare of its users and their surroundings.

The following figure shows our first prototype for Sēbu's interface, in which a product has been identified using only its 13-digits barcode number. The information acquired online were an image of the product, its name and nutritional contents.

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[2] Online resources include Supercook [33] or Allrecipes [34] which both allow to search by key ingredients
[3] The Food Standards Agency (FSA) nutrition guide (revised in 2007) [32] could be used for the nutritional intake values. The FSA is a well-respected UK body and has used reputable medical sources and surveys for information.

13 digit EAN barcode input

Nutritional content in grams/kilojoules, will add units in later version

Placeholder- waiting for product lifetime database integration

The percentage nutritional content compared to UK's recommended daily average

Program is only a prototype, and is not representative of the visuals or functionality of the final release

Figure 6: First prototype for Sēbu interface.

5.4.2   Food for charity

Sēbu gives the opportunity for its customers to give back to the community by contacting local charities and food banks directly. In the UK alone, 13 million people live under the official poverty line; that is roughly 1 in 5 individuals [21]. Users who cannot finish all their groceries before it expires will be able to select a nearby food bank they want to support from the device interface. By facilitating the process of giving, Sēbu increases awareness while making a strong social impact.

However, the feasibility of this endeavour is questionable. By contacting various food banks such as the Trussell Trust [22] and the Tower Hamlets Foodbank [23], we discovered that the majority do not take in perishable goods. Moreover, while approaching Fareshare [24], a company tackling food waste that does accept perishable goods, we were told that they only deal with bulk quantities, directly from large suppliers like Tesco and Sainsbury's. As a result, there is a niche market where nobody operates at the moment for liability reasons. Once an individual gives away a perishable good, he (and intrinsically Sēbu) is responsible for the quality of the product and the effect it can have on the new user [25] [26]. A possible solution to get around this issue is by monitoring the condition under which the food is kept and by asking our customer a few trivial questions on the handling of the product itself. Furthermore, European countries such as France and Belgium have recently made legal efforts to simply the food donation process [27].

5.4.3   Rewards based on food reduction

Building upon the social aspect, our objective is to create a movement of people willing to reduce their food waste within their community. A reward-based system is envisioned, whereby an individual would receive points in exchange for giving out food that would otherwise have gone to waste or by improving his or her diet. The user could then redeem the points through discounts in various restaurants, shops or supermarkets nearby. These points could be attributed by the charities themselves based on the weight of food given away. Alternatively, a smart algorithm embedded in the device could determine whether a user has improved their lifestyle or managed to reduce their food waste.

Our survey [15] has shown that potential users would be interested in such a system. However, this will be rather difficult to implement in the short-term. Firstly because the idea relies on the users' fair-play; secondly because we need to provide a business plan to describe where the rewards will come from. Nevertheless, such a smart system would tie Sēbu's social benefits together into something that links a community together.

6. Our Technical Implementation

6.1 Seamlessly building an inventory and processing data

Building an inventory can be done in two ways: either we are granted access to supermarket databases or we will have to create our own. In the first case, these databases already contain the product name, probably a type, a shelf lifetime and an expiry date. Our program will simply have to interface between these databases and our own. This type of interfacing simply consists of highlighting the relevant information in one database and rewriting it in a format that suits us. From a technical standpoint, we will need to understand these third-party data structures as well as the coding language they are written in. We have contacted retailers such as Waitrose and Ocado, but until this date we have not received relevant information[4].

In the case where we input a product based solely on its 13-digit barcode number, multiple options are available. The first one is to use an online search engine [**28**]. Barcode numbers - properly named international or European article numbers (EAN) - are regulated by European law [**29**] and can therefore be read by anyone. The engine we used gives as a result a link to an online retail store where the product can be bought. Our program then extracts the relevant information from the retailer's website by scraping the HTML content of the page. The second option is to enter products manually into our database: we scan a barcode to create a new entry and manually enter its name and type. Based on the product's type, we obtain an average lifetime. As one might guess, this is not a solution when it comes to being able to recognise any product, but it will be enough to create a functioning demonstrator. A flowchart describing our program can be found in Appendix A.

6.2 Working with databases

Creating inventories is mainly a question of working with databases. For each Sēbu device, we need two databases: a dictionnary that will contain all possible products and a database for the contents of the refrigerator. Because the dictionary is always the same and will be a rather big data structure, we will choose to store it onlin,e on our own servers ; the Contents database will be stored on each individual device. Both are coded in the MySQL language. The Dictionary contains the following information: the product's EAN, name, type, category, default quantity and average lifetime. The « type » field allows us to associate an image with each entry while « category » allows us to group products on the user's screen. The Contents database is very similar but has an exact quantity column rather than default and a record of the date each product was added as well as an expiry date, which is just the sum of the date added with the average lifetime. Figures 7 & 8 show these databases with all the fields described above.

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[4] See Appendix B for our correspondence with Waitrose.Ocado is yet to answer.

SQL result

Host: pierreazywmod1.mysql.db
Database: pierreazywmod1
Generation Time: Mar 14, 2015 at 05:46 PM
Generated by: phpMyAdmin 4.1.9 / MySQL 5.1.73-2+squeeze+build1+1-log
SQL query: SELECT * FROM `product_database` LIMIT 0, 30 ;
Rows: 9

EAN	name	type	category	default_quantity	average_lifetime in days
5022313562711	Tropicana Orange Juice	juice	DRINKS	1	5
5000169030967	Waitrose Lemons	lemons	FRUIT	6	7
5000169128534	Waitrose Smoked Salmon	fish	SEAFOOD	1	10
5000169034132	Waitrose Duchy Organic Carrots	carrots	VEGETABLES	1	7
3228023910107	President Grated Emmental	cheese	DAIRY	1	6
5000169135549	Waitrose Grated Parmigiano Reggiano	cheese	DAIRY	1	30
3045320094008	Bonne Maman Strawberry Conserve	jam	OTHER	1	600
5000169205426	Waitrose Spanish Red Wine	wine	DRINKS	1	20
5000169002742	Waitrose British Apples	apples	FRUIT	4	7

Figure 7: Printable version of a temporary dictionary database

SQL result

Host: pierreazywmod1.mysql.db
Database: pierreazywmod1
Generation Time: Mar 14, 2015 at 05:48 PM
Generated by: phpMyAdmin 4.1.9 / MySQL 5.1.73-2+squeeze+build1+1-log
SQL query: SELECT * FROM `fridge_content` LIMIT 0, 30 ;
Rows: 11

EAN	name	type	category	quantity	date_added	expiry_date
5000169030967	Waitrose Lemons	lemons	FRUIT	9	2015-02-14	2015-02-21
3228023910107	President Grated Emmental	cheese	DAIRY	1	2015-02-20	2015-02-26
5000169030967	Waitrose Lemons	lemons	FRUIT	6	2015-03-08	2015-03-15
5000169034132	Waitrose Duchy Organic Carrots	carrots	VEGETABLES	4	2015-02-14	2015-02-21
5000169002742	Waitrose British Apples	apples	FRUIT	7	2015-02-14	2015-02-21
3228023910107	President Grated Emmental	cheese	DAIRY	1	2015-02-17	2015-02-23
5000169128534	Waitrose Smoked Salmon	fish	SEAFOOD	2	2015-02-17	2015-02-27
5022313562711	Tropicana Orange Juice	juice	DRINKS	7	2015-02-17	2015-02-22
5000169034132	Waitrose Duchy Organic Carrots	carrots	VEGETABLES	2	2015-02-17	2015-02-24
5000169002742	Waitrose British Apples	apples	FRUIT	3	2015-02-17	2015-02-24
5000169135549	Waitrose Grated Parmigiano Reggiano	cheese	DAIRY	2	2015-03-06	2015-04-05

Figure 8: Printable version of a contents database

6.3 Creating a user interface

Sēbu's interface is one of our main concerns considering that creating a user-friendly device is our most important design criteria. In order to make it accessible online, we decided to code the interface as a blend of HTML, CSS and PHP. The first two languages create the skeleton as well as the graphics of our user interface while PHP is responsible for everything that is functional. Figure 9 shows a few screen captures from this interface. Each item can be clicked on: this displays the options to add or remove items, specifying whether the product was used or wasted.
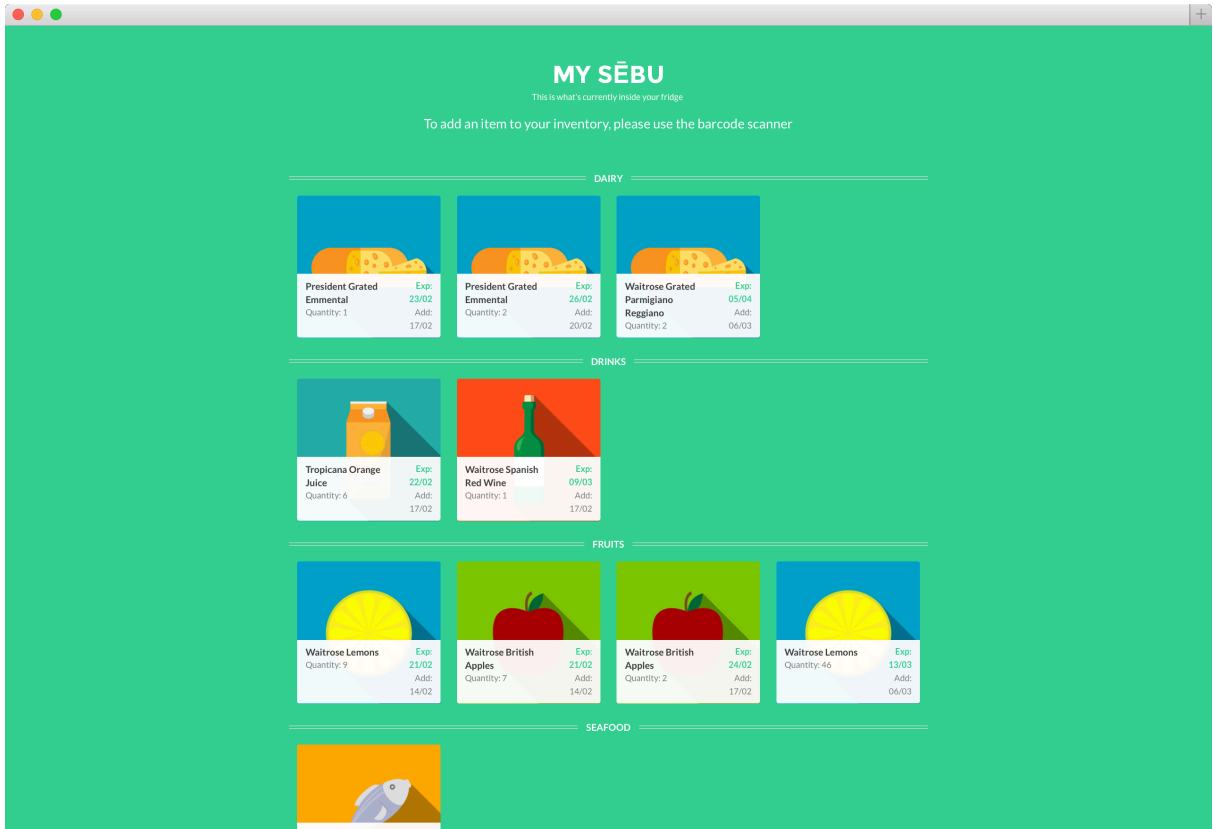

Figure 9: Screenshot of Sēbu's interface

6.4 Demonstrator

In the scope of our 2nd year group project, we created an online demonstrator [**30**] in which users can add products with a simple scan from a laser barcode reader. This inputs an EAN number that is automatically checked against our dictionary. If the product is recognised, it is added with the corresponding image under the right category with the date it was added as well as its expiry date. If a product is added twice on the same date, an additional entry is created, but the quantity is increased. If however the same product is added at another date, a new entry with a different expiry date will be created. Finally, if the product is not recognised, we would like to use our previous program to search it online. Unfortunately, integrating this to our interface is still work in progress. At the moment, when an unrecognised product is entered, the user is prompted to add it manually.

Technically, our demonstrator is built on the interface previously described. We use Python scripts to access, write and read our databases. Figure 10 shows an explanatory diagram of our program.
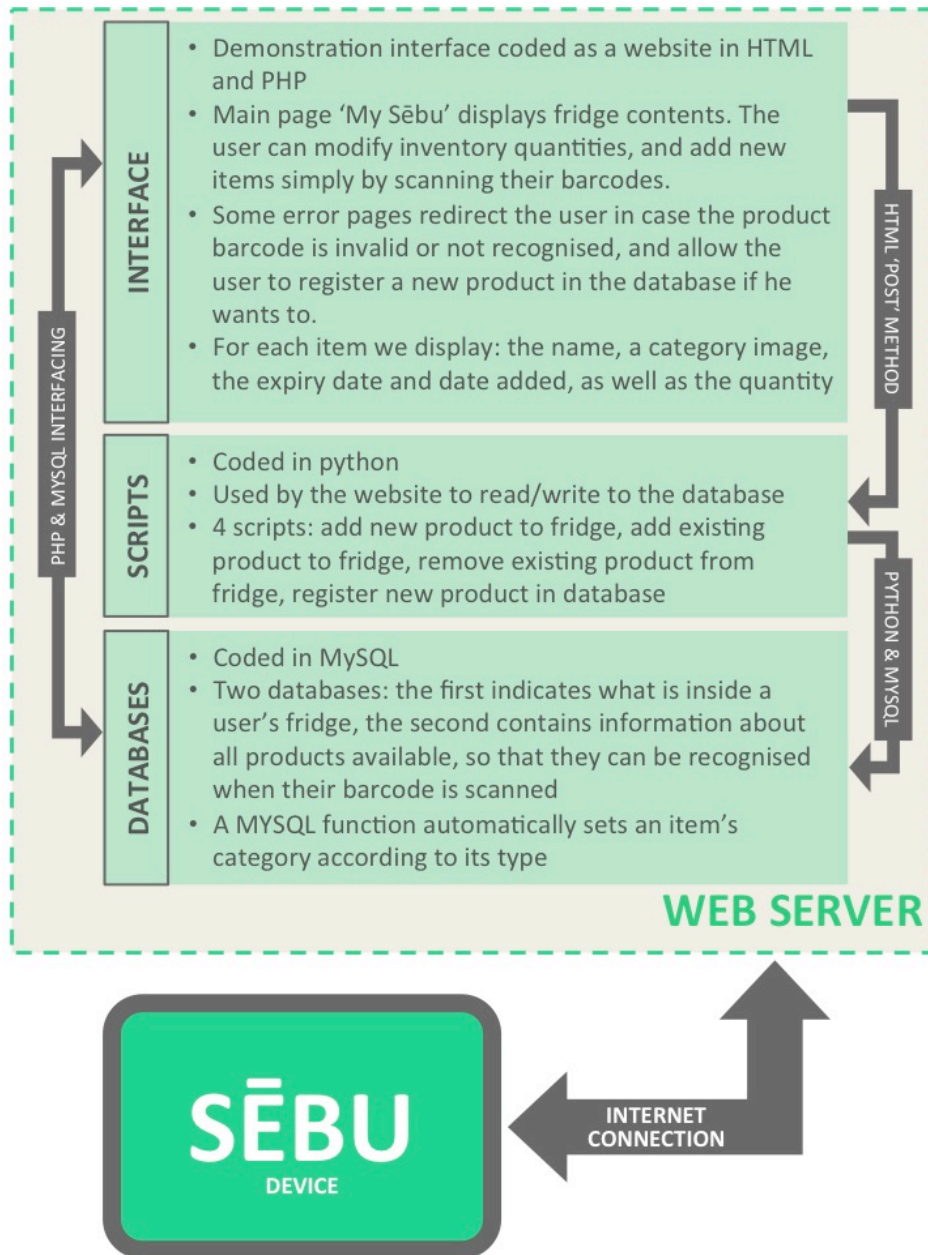

INTERFACE
- Demonstration interface coded as a website in HTML and PHP
- Main page 'My Sēbu' displays fridge contents. The user can modify inventory quantities, and add new items simply by scanning their barcodes.
- Some error pages redirect the user in case the product barcode is invalid or not recognised, and allow the user to register a new product in the database if he wants to.
- For each item we display: the name, a category image, the expiry date and date added, as well as the quantity

SCRIPTS
- Coded in python
- Used by the website to read/write to the database
- 4 scripts: add new product to fridge, add existing product to fridge, remove existing product from fridge, register new product in database

DATABASES
- Coded in MySQL
- Two databases: the first indicates what is inside a user's fridge, the second contains information about all products available, so that they can be recognised when their barcode is scanned
- A MYSQL function automatically sets an item's category according to its type

PHP & MYSQL INTERFACING

HTML 'POST' METHOD

PYTHON & MYSQL

WEB SERVER

SĒBU DEVICE

INTERNET CONNECTION

Figure 10: Explanatory diagram of the demonstrator

6.5 Hardware considerations

We intend Sēbu to be a kitchen appliance. The specificity of this environment has strong implications concerning our hardware. In terms of power, our device will have to be able to stay in standby mode when no one is in the kitchen but will have to power up quickly when it is needed. Lithium-ion batteries such as those already in use in mobile devices fit this specification easily [**31**]. To make charging easier, we suggest doing so by induction. In this way, the user can simply place his device on a provided inductive surface to charge it while it is in use. Sēbu will also have to be dirt and water-resistant as users may manipulate the device in presence of liquids or powders. A glass screen and a plastic or aluminium body are enough to create a tight enclosure. Any input or output port can be protected with plastic sealing tabs.

7. Conclusion and Future Works

So far, we have managed to pinpoint the design specifications that can make our device a success, and develop the software behind Sēbu. In the near future, it is integral for the progression of our project that we secure partnerships with retailers. Our next milestone is to transform our precise idea into a functioning prototype.

Having access to one's fridge content opens many possibilities for Sēbu, beyond the scope of simply reducing food waste. As we have seen, Sēbu also offers many social benefits including the improvement our customer's lifestyle and supporting the growth and development of communities. In the future, we plan to take further advantage of these new opportunities.

Firstly, we would like to develop the nutritional aspect of Sēbu. We envision to integrate an algorithm within our device that will help our users plan their meals ahead based on their nutritive objectives. Sēbu would then propose various recipes based on the contents of the fridge, meeting our user's expectations. To develop this, we could partner with a dietary expert.

Secondly, putting our users in direct contact with local charities and food banks brings important social benefits for the community. We currently face issues relative to the liability of our customers when they give away their food. In order to minimize risk in the future, Sēbu could connect with neighbouring smart devices as to monitor the conditions under which products were kept. The device can then highlight which products are suitable to be given away. On top of that, a partnership with a molecular sensor device company, such as Scio, could enable us to have more accurate information on the quality of the products that are given away. Doing so would give us the sufficient information to reduce liability risks.

Throughout the project, we have focused on understanding the issue of food waste and determining how Sēbu can be best shaped in order to answer our potential user's needs and wants. We soon came to the conclusion that a simple device would not suffice to motivate people to reduce food waste effectively. Following this we added an extra, unforeseen social and philanthropic dimension to our product. This now has additional benefits for the user and for their surrounding community. Sēbu has effectively transformed from a simple technical device into an innovative, complete solution to the growing problem of food wastage.

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9 Appendices

9.1 Appendix A: Program Flowchart

Fridge Project

Program Flowchart

v1.0

Pierre Azalbert
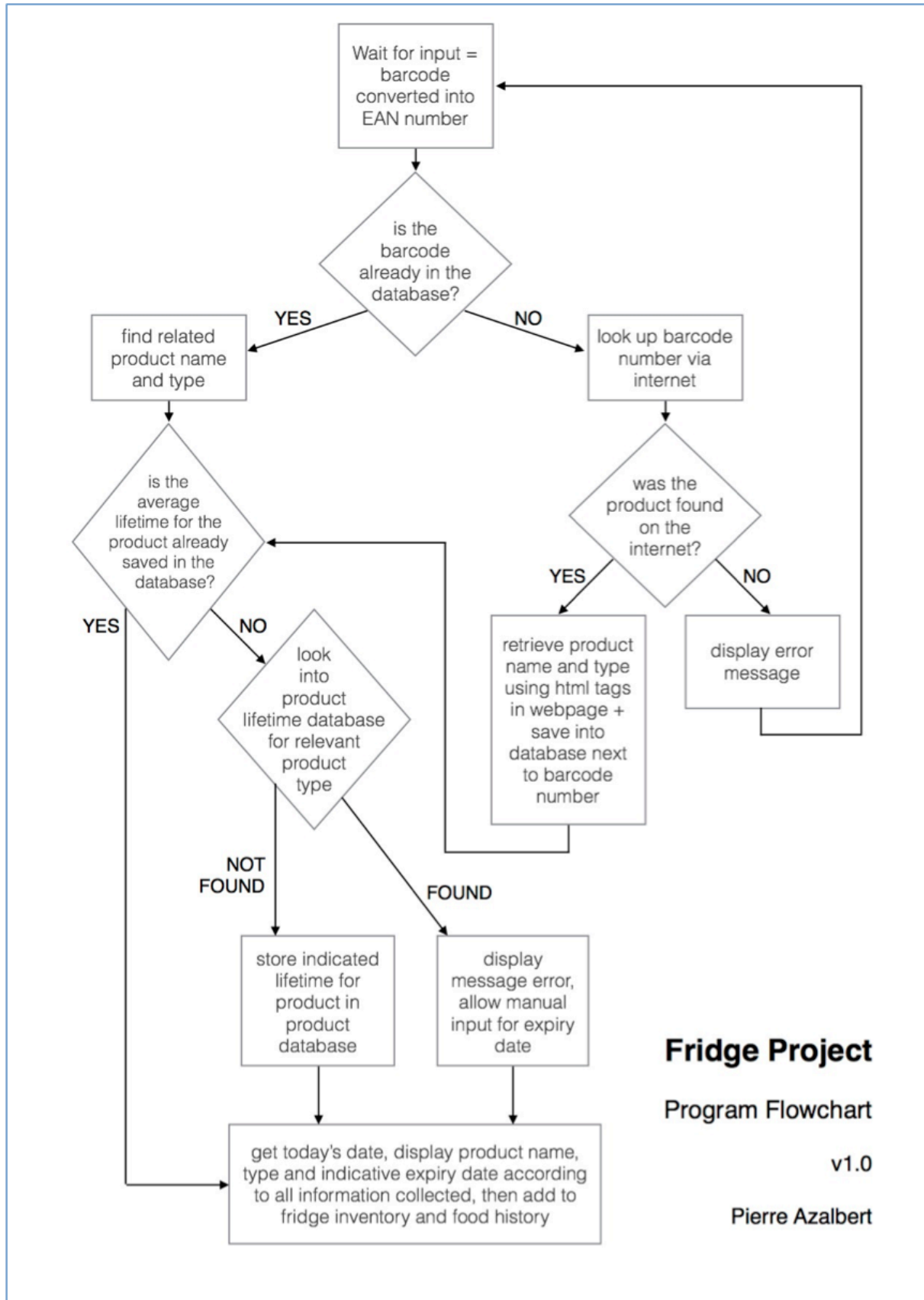
9.2 Appendix B: Correspondence with Waitrose

Expéditeur: Waitrose Customer Service <customerserviceteam@waitrose.co.uk>
Date: 14 mars 2015 14:03:45 UTC
Destinataire: "michael.moses13@imperial.ac.uk" <michael.moses13@imperial.ac.uk>
Objet: Rép : Household food waste reduction project feasibility   [ref:_00D20Iaeb._50020irdHo:ref]

Dear Mr Moses

Thank you for your email and for expressing your interest in partnering with Waitrose.

Unfortunately I'm afraid from previous experience, projects which require customers to provide consent for their inclusion are not often undertaken. However if you wish to pursue this idea further, the best course of action would be to write to us at head office with your proposal in detail so that it can be fully considered.

The address to write to is:
Waitrose
Taylor House
Doncastle Road
Southern Industrial Area
Bracknell
RG12 8YA

Thank again for expressing your interest in Waitrose.

Kind regards

Michael Lloyd
Waitrose Customer Service
Case Reference: 00318646

We'd love to hear your thoughts on your contact with us. If you'd like to take a couple of minutes to fill in our survey you could win £500 of vouchers - www.waitrose-cs.com

--------------- Original Message ---------------
From: Moses, Michael D [michael.moses13@imperial.ac.uk]
Sent: 03/03/2015 01:01
To: customersupport@waitrose.co.uk
Subject: Household food waste reduction project feasibility

Dear Madam, Dear Sir,

I am a second year Electrical and Electronic Engineering student at Imperial College London and am currently working on a project to reduce household food waste.

We are planning to monitor the content of our users fridge and based on the expiry date suggest ways to avoid wastage. Instead of requesting our users to build an inventory by manually inputing every single product, we were thinking of partnering with various shopping services. After payment and with customer agreement, the shopping list would directly be sent to our system which would then generate a database of fridge content.

18

We are at an early stage in our project and would like to know if such **a system could easily be implemented**. If so, we would like to know if along with every shopping receipt, the **expiry date of each item is stored**.
Moreover, have similar partnerships already been made in the past, whereby **shopping list information is shared to third parties with customer consent**?

If you require any further information, feel free to let me know.

Thank you in advance.

Sincerely yours,

Michael Moses
+447775444990