

Acronym: Cordon Gris
Name: Making sense of data to promote
effortless healthy eating habits and
autonomy for older people
Call: AAL Call 2015
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D2.3 State of the art report

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Partners involved (leader in bold): **RNS**, FhP, CC, SONAE

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¹ L = Legal agreement, O = Other, P = Plan, PR = Prototype, R = Report, U = User scenario

² PU = Public, PP = Restricted to other programme participants (including the Commission Services), RE = Restricted to a group specified by the consortium (including the Commission Services), CO = Confidential, only for members of the consortium (including the Commission Services)

Partner list

Nr.	Partner name	Short name	Org. type	Country
1	Fraunhofer AICOS (coordinator)	FhP	R&D	Portugal
2	Santa Casa da Misericórdia de Lisboa	SCML	End-user	Portugal
3	SONAE (Modelo.com – Vendas por correspondência, S.A.)	SONAE	IND	Portugal
4	Red Ninja Studios	RNS	SME	United Kingdom
5	Can Cook	CC	SME, End-user	United Kingdom
6	Unie KBO	UNIEKBO	End-user	Netherlands

Revision history

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1. Introduction

The Cordon Gris project aims to assist elderly people to maintain a healthy and independent life on a budget by providing meal recommendations, health track and grocery shopping assistance. Being unable to follow a healthy diet will most likely lead elderly people into a vicious cycle, where malnutrition and functional decline feed one another. Malnutrition can have serious consequences on one's health and independence. Today it is known that on the one hand, malnutrition may cause depression and on the other hand, studies also show that malnutrition is associated with cognitive function and dependence on others. Therefore, fighting malnutrition is one of the major steps towards promoting independent living and quality of life amongst community dwelling elderly people. In order to achieve this goal, we as the Cordon Gris consortium will build a central intelligent system that can generate recommendations. These range from meals to physical activity or other healthy behaviours, prompt people to adopt a healthier lifestyle against malnutrition and help them manage their budget without compromising the quality of their diet. The support to decisions, provided by the system will allow its users to live an independent life for longer and improve wellbeing by helping to prevent malnutrition and its associated problems.

The consortium aims at developing a solution that makes use of existing devices and standards to provide automatic meal and activity recommendations, as well as shopping assistance and nutritional education, through a flat-rate model. This benefits food production, retail and consumption, by using an intelligent system that harmonises supply and demand, reduces waste and increases profit, while offering a convenient system to end-users. In order to achieve this goal, the technology used for the development of Cordon Gris will be chosen, taking into account existing open standards.

The state of the art on products, services and models is a document that lists existing solutions related to Cordon Gris available in the market as well as research projects that relate to Cordon Gris. The document describes a number of aspects of products and services related to food and malnutrition with the goal to showcase different solutions. Solutions that target the same users Cordon Gris addresses are taken into consideration. In the research we feature some of the most recent services available in the market in the countries where this project is conducted (Portugal, United Kingdom, Netherlands) as well as solutions available worldwide. The goal of equipping the service users with technology is not just to help them track what they eat, but to provide tools and services that empower them to gain control over every aspect of their diet.

In the following chapter we will outline the methodology that served our analysis. The report is further separated into two chapters. The first one is about existing solutions: it outlines different products and services that are included in a framework where we list the name of the solution, the company that realised it, an accurate description of the service, and the relationship to Cordon Gris. All of the existing solutions are grouped in different categories. We provided an introduction and conclusion to each category. The second chapter focuses on research projects, specifically those related to the "Ambient Assisted Living (AAL)" programme. We described the relationship of each one to Cordon Gris and provided a generic conclusion at the end of the chapter.

2. Overview and methodology

In order to achieve the goals of Cordon Gris project, the technology for the development of Cordon Gris needs to be chosen. By means of the methodology and analysis, we identified existing solutions, barriers and opportunities related to Cordon Gris.

The state of the art report is a document that follows a "case study" approach. It has been organised into two main sections: existing solutions and research projects. This approach helped us to identify success factors of current developed solutions that tackle real life problems, which relate to similar problems and activities that will be tackled in Cordon Gris.

We first looked at solutions that already exist in the marketplace and then we focused on solutions that have been recently developed within the AAL programme.

The partners who were involved in the state of the art have conducted a desk research on the existing solutions that address similar problems that Cordon Gris aims to solve. Thus, services that tackle meal planning, meal recommendations, activity recommendations, budget management, health tracking, grocery shopping assistance and food waste have all been taken into account.

Partners were asked to identify and analyse at least five possible solutions and indicate how those relate to the Cordon Gris project. Every partner was in charge of finding solutions in a country they were familiar with: this approach is defined as local-knowledge cases. Thereby, we made use of the rich knowledge of a consortium between three countries, where every partner can contribute with their familiarities, skills and in-depth knowledge. In addition to that, every partner in charge was asked to identify worldwide solutions as well. Each solution transcribed in this document consists of a summary description of the solution, service or application, accompanied by a critical analysis of the solution in terms of features, business model and economic value, also in relation to the outlined goals of Cordon Gris. Other characteristics of each solution were also analysed when available: geographical market where each solution is available and popularity. In an ongoing analysis, all cases were analysed in an equal way and equal attention was given to each solution. In the following phase, cases that were discussed more than once have been aligned and according to the type of solution they have been merged into different topics:

1. Grocery delivery
2. Ready meals delivery
3. Food tracking
4. Activity tracking
5. Food stock management
6. Others

In the analysis, one partner was in charge to review the analysis of one, two or three topics respectively. The respective partners included an introduction in each topic that specifically relates to the goal of Cordon Gris. Based on the analysis, a summary evaluation of each topic was outlined, relative to the identified sub-topic.

In the second section, partners were asked to research for projects within the context of the AAL programme. Four projects have been analysed, as they aim to realise services targeted to the same market Cordon Gris is addressing. We searched for scientific articles, project's descriptions, news and references in the official AAL website and through major search engines using keywords such as "food" and/or "nutrition". Afterwards, we outlined the research purpose and functionalities in relation to Cordon Gris. In an ongoing study, all cases were analysed in an equal way and equal attention was given to each solution. Lastly, one partner was in charge to align the four AAL projects in a generic summary, outline major existing services within food and nutrition related AAL projects and set out opportunities for the Cordon Gris solution.

3. Existing solutions

3.1 Grocery delivery

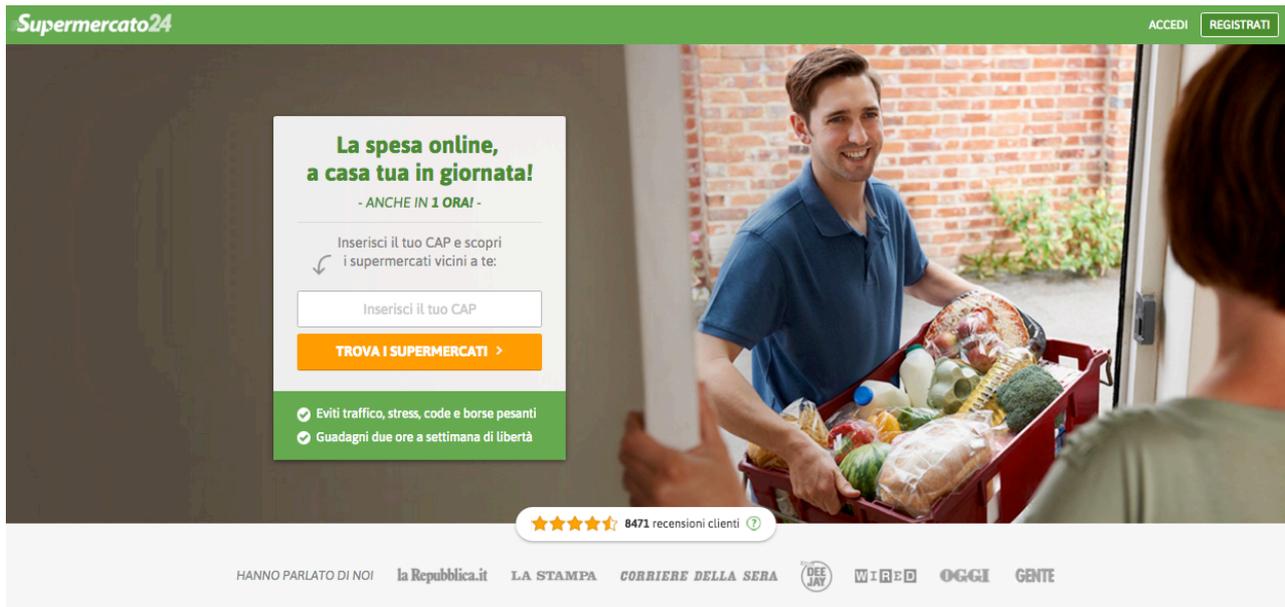
The grocery delivery category comprises nine web services that focus on delivering food items (groceries and measured ingredients). Grocery delivery is a service that is rapidly growing. In fact, more than a third of online shoppers expect to buy their groceries online in 2016, according to an AlphaWise survey from Morgan Stanley Research (Here comes online grocery, 2016). Beside the convenient aspect of buying food from the comfort of your home, it is a service that can be considered "green": some researchers at University of Washington (Wygonik et al., 2012) have found out that using a grocery delivery service can cut carbon dioxide emissions by at least half when compared with individual household trips to the store.

3.1.1 Supermercato24

Market: Italy

Website: www.supermercato24.it

Popularity: In less than two years, Supermercato24 has reached 40,000 customers and 250,000 registered users, with an average of 500 deliveries per day in more than 300 municipalities where the service is active.

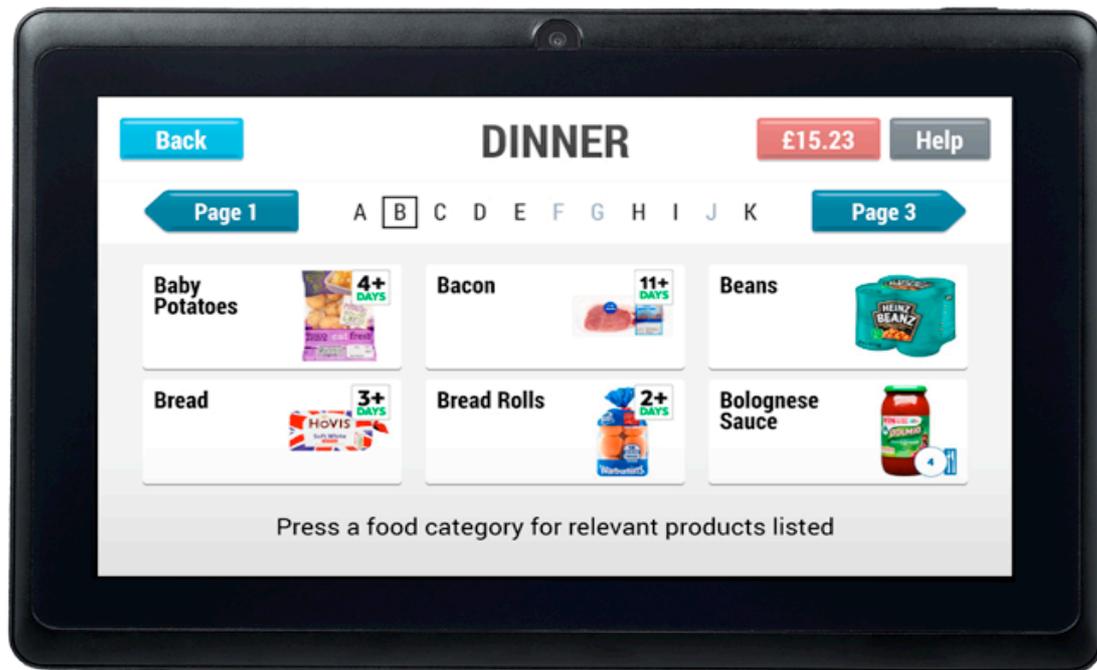


Supermercato24 is an online delivery service transforming the way people buy groceries and home essentials. It is a platform dedicated to users that want to buy grocery items from their local supermarket, using their own devices and having them delivered to their home by a delivery man. The platform manages the crowdsourcing of the delivery men, their geo-localisation and, thanks to an algorithm, decides which delivery man will do the shopping and deliver it within one hour. Thanks to an extensive network of 1800 couriers present in Italy's largest cities and provinces, many orders are delivered the same day in under an hour. For the families with children, business professionals, and millions of other people that have limited time, Supermercato24 provides a simple, stress-free way to grocery shop. Supermercato24 is an online shopping platform that allows the user to shop from a specific supermarket chain and branch. This solution is useful whenever elderly want to shop from a specific store because they like the quality of the items and/or the price. They would also be able to buy specific items in different stores within the same platform: in this case the user would have to initiate and complete separate transactions, as the supermarket needs to be selected in the first step of the process.

3.1.2 Helping Hand

Market: UK

Website: <http://www.redninja.co.uk/design-technology-work/age-friendly-technology/>



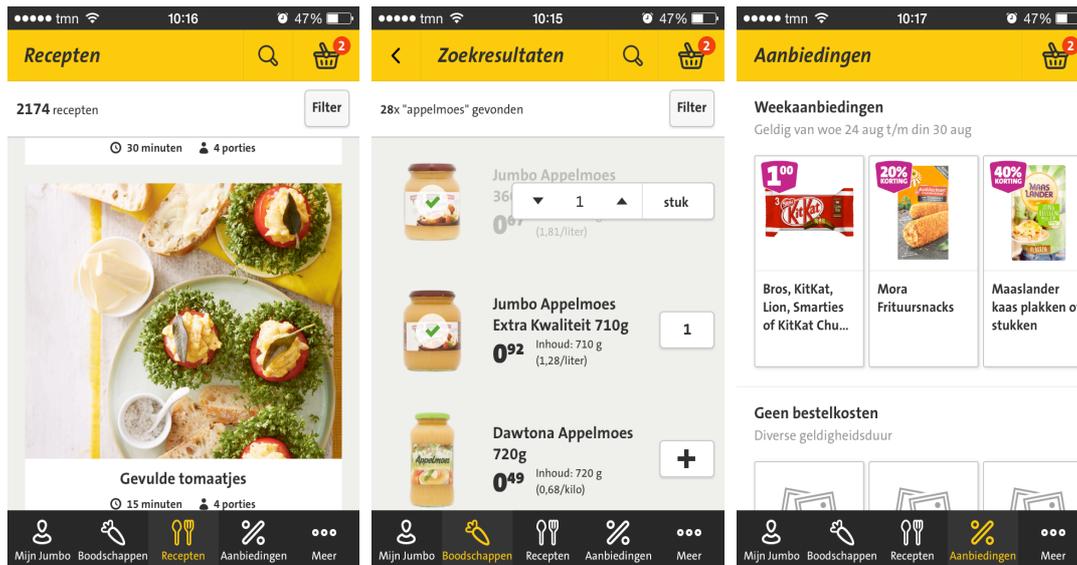
Red Ninja gathered ideas from over 350 elderly people to co-create Helping Hand, an age-friendly shopping app that is easy-to-use. The users told Red Ninja they were interested in shopping online. Because of health and mobility issues they sometimes find it difficult to get out and to carry heavy shopping. Home delivery would be good for them when the weather is bad and staying at home is more appealing than a trip to the supermarket. However, Red Ninja learned that most of this group had never shopped online. Users were concerned about privacy and security, and about their own ability to use the technology. They were afraid of signing up to something that would eventually cost money, and many did not have a computer or an internet connection. There was a general fear about not knowing what to do. Users asked Red Ninja to keep things simple and as the project developed their confidence grew. Because they loved bargains, the app that has been developed includes all the features of the retailer's online service, including the ability to search for deals. This application has been positively received by the service users and is a good example of what can be achieved when you co-create a solution with the end-users, as we are doing with Cordon Gris. The user interface of Helping Hand has been designed iteratively: Red Ninja held workshops about colour theory, typography, language and user experience. The designers shared examples of other websites, discussing what the group liked and did not. The service users loved this process and really got into the technology. They made design choices for a large font, big buttons, highly visible colour contrasts and clear instructions.

3.1.3 Jumbo

Market: The Netherlands

Website: <https://www.jumbo.com/content/jumbo-app>

Popularity: 100.000 – 500.000 downloads



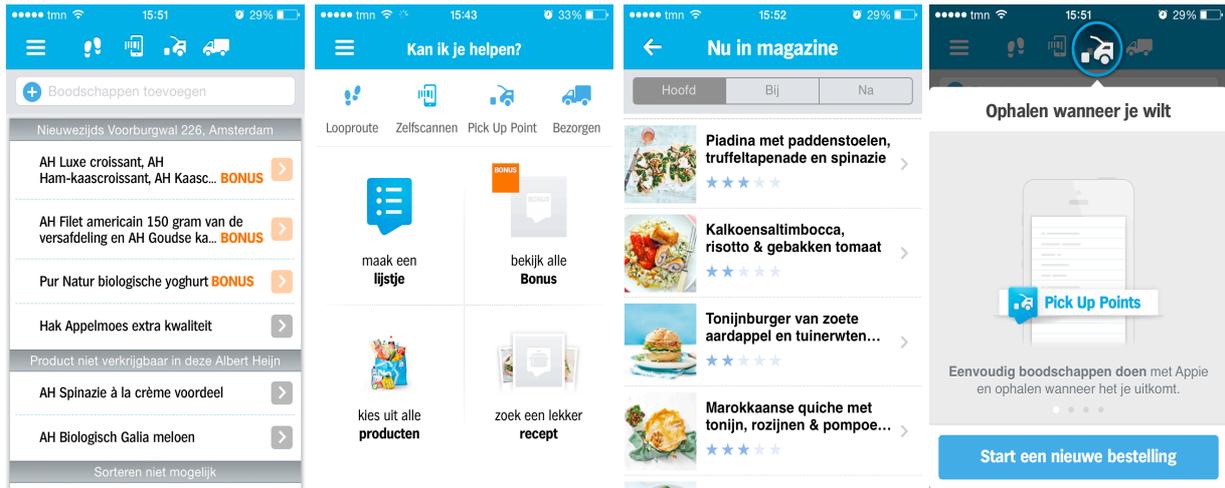
The Jumbo app offers online groceries shopping and delivery. Products are organised in different categories. The main function of the app is the shopping list, the user can continuously update. By means of the function to find recipes, users can add missing ingredients of recipes to their personal shopping list. Besides that, the app shows current promotions and presents a price overview to the user. Groceries can be delivered at home or the user can choose to pick them up at the supermarket. The Dutch supermarket chain Jumbo already participated in one of the workshop sessions held by the Cordon Gris consortium in the Netherlands. The app shows what type of service already exists in the Netherlands in terms of delivery service, shopping list, recipes, product database and it offers some suggestions of how the Cordon Gris solution could be built.

3.1.4 Appie

Market: The Netherlands

Website: <http://www.ah.nl/over-ah/services/mobiele-apps>

Popularity: 1.000.000 – 5.000.000 downloads



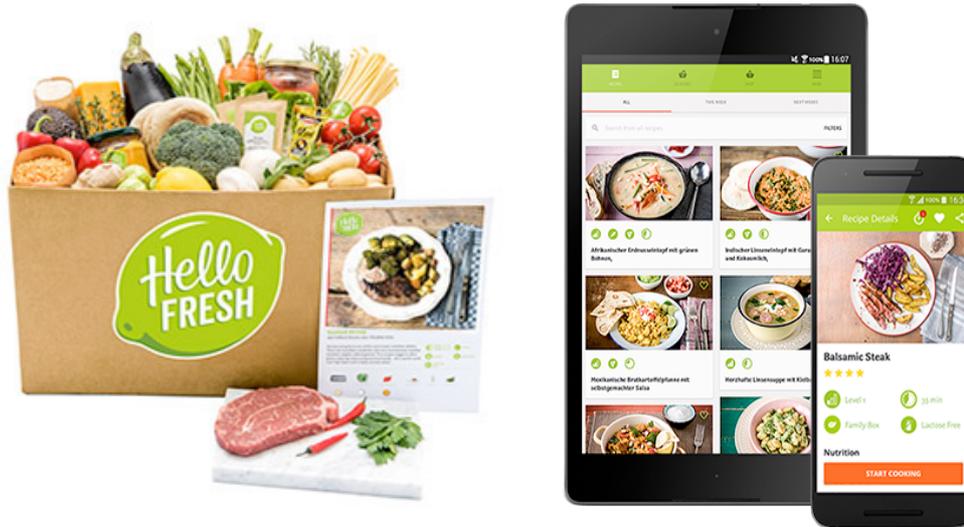
Appie is an app of the Dutch supermarket chain Albert Heijn. It allows users to organise grocery shopping and to shop online. The app includes a product and recipe database. Products are ordered according to the user's shopping history. Products can also be found via a product finder, a barcode scanner and a voice recognition function. The shopping list can be organised based on the physical layout of the selected supermarket. Also, a "self-scan" function is included, which can be used in the supermarket to scan the groceries and pay easily. Groceries can be delivered at home, as well as be picked up at the supermarket. This app shows an interesting way on how to "walk-through" the users at the supermarket (following a shopping list and location logic of the supermarket). Cordon Gris can build upon and adapt to this logic.

3.1.5 HelloFresh

Markets: USA, UK, Germany, Austria, Australia, Belgium and the Netherlands

Website: <http://www.hellofresh.com>

Popularity: By the end of Q1'2016 HelloFresh had over 787.000 regular subscribers across the world.

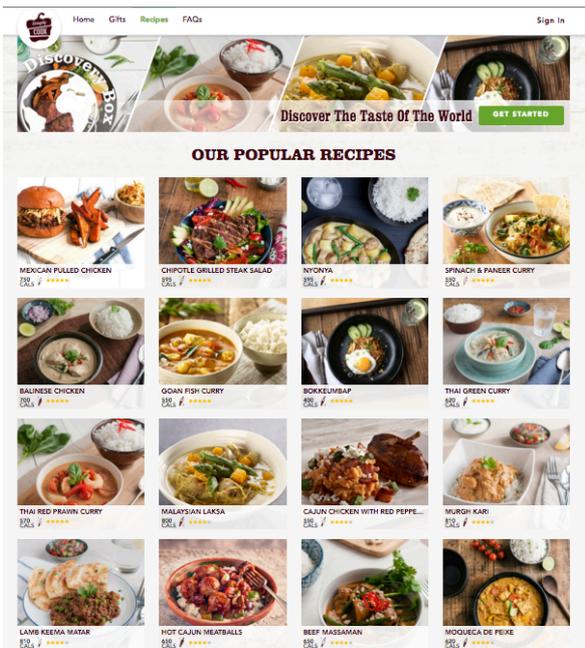


HelloFresh is the global leading provider of fresh-food at home. HelloFresh aims to provide each and every household in its seven markets with the opportunity to enjoy wholesome home-cooked meals with no planning, no shopping and no hassle required. Everything required for weeknight meals, carefully planned, locally sourced and delivered to your door at the most convenient time for each subscriber. Behind the scenes, a huge data driven technology platform puts us in the prime position for disrupting the food supply chain and for fundamentally changing the way consumers shop for food. The soft subscription model business enables HelloFresh to leverage their weekly subscriber touch points to consistently manage supply chains and demand, and to optimise the customer experience, as well as our business economics. Their recipe cards even tell the difficulty to prepare the dish, in case you are still very much on the “How do you sauté?” end of the cooking spectrum. Not only does HelloFresh deliver nationally, across the USA, they deliver internationally too—to the UK, Germany, Austria, Australia, Belgium, and the Netherlands. Place your order by midnight on Wednesday to receive your box the following week (and there are daily shipping options). Boxes start at \$59 for a Veggie Box and \$69 for the Classic Box, with three meals for two people. The Family Box starts at \$79.95 for two meals for four people. It is a subscription service, but you can change your box from week-to-week. Shipping is included. This solution is a good example of how delivering measured ingredients together with detailed recipes, reduces the amount of planning, preparation time and also waste. Furthermore, this service allows users to personalise their diet, get the right ingredients based on their needs (e.g. more proteins rather than carbohydrates) or limitations (e.g. allergies, intolerances). Presuming that everything the users eat will be limited to the box, it will be easy to track their diet, without to manually keep a journal updated.

3.1.6 Simply Cook

Market: UK

Website: <https://www.simplycook.com>



Simply Cook aims to encourage people to cook by themselves and through the use of fresh produce and recipes cards, to take ownership and empowering them to learn how to cook. The service acts as a step between the ready meals and "cook it at home". The product itself is a series of recipes cards and ingredient kits – such as spices, oils and rubs for meats. The customer has to buy the fresh ingredients in order to use this product. The kit is small enough to mail through the door so the customer does not have to be at home to receive it. Marketing is supported by encouraging people to give this product as a gift (by signing friends up for three, six or nine months for example): this would offer a defined and interesting route to gain a customer base. Whilst the service might not be ideal for the 60+ age group, there are elements of the model that could be easily incorporated into a mixed model approach of:

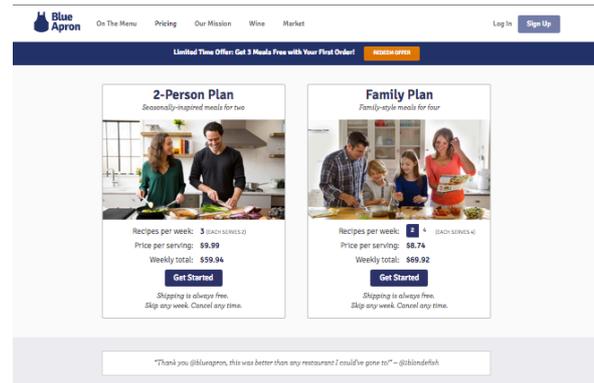
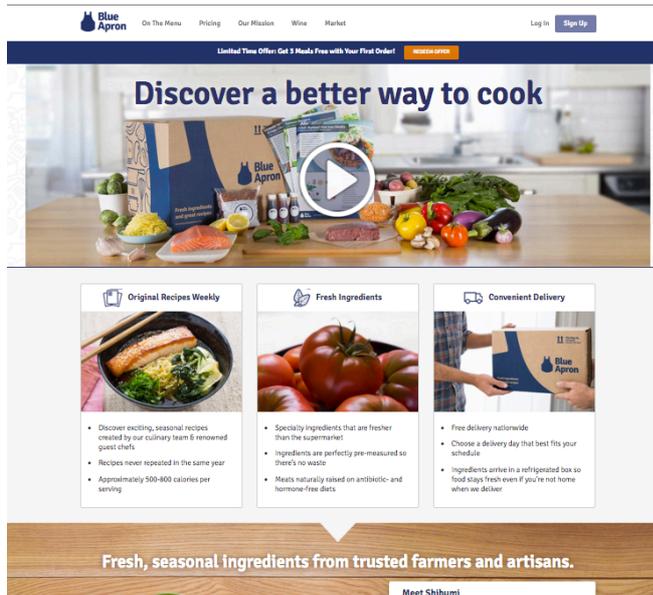
- 1) Fresh chilled meals ready to cook;
- 2) Cook at home meals that have an easy 4 stage cooking process.

We believe this approach has a strong market proposition.

3.1.7 Blue Apron

Market: USA

Website: <https://www.blueapron.com>



Common Questions

Do you accommodate specific diets or allergies?
We accommodate a variety of dietary preferences - e.g. vegetarians, pescatarians, or if you don't eat red meat, fish, shellfish, pork, or lamb - and personalize your menu each week based on your preferences. All of our boxes are assembled in the same processing facility, so we don't recommend ordering Blue Apron if you have a serious food allergy.

Where do you source your ingredients?
The quality and freshness of our ingredients are incredibly important to us, so we work directly with [artisan purveyors and hundreds of family-run farms](#) that support sustainable practices.

Can I skip my delivery for a particular week?
Yes, you can skip any delivery before the weekly cutoff (8 days before your next delivery). Visit your account to manage your delivery schedule.

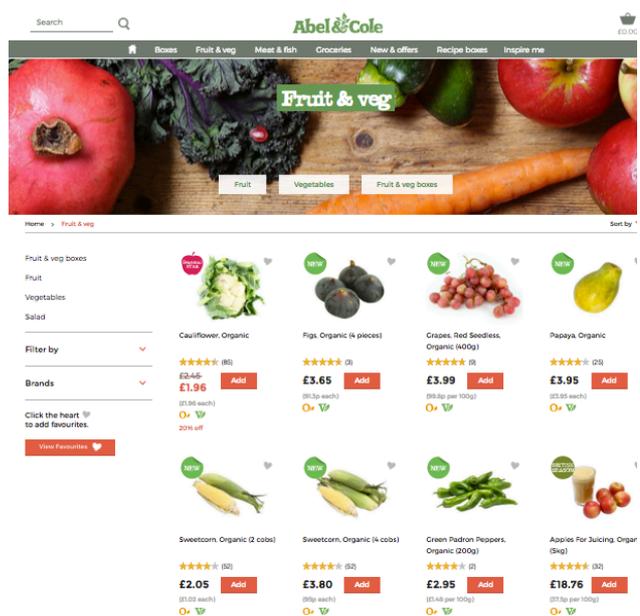
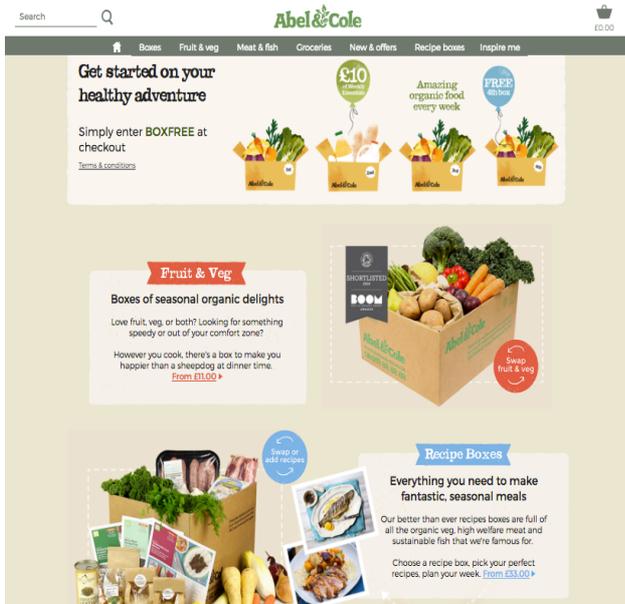
When do you deliver?

Blue Apron lets you choose from the above plans, choose which day of the week your box will arrive and choose your recipes for each week. For the smaller plan, you have six meals to choose from each week. For the family plan (for which you choose to receive either two or four meals), you have only four meals to choose from. This is a subscription service, meaning a box is set to come every week. However, you can skip a week or cancel at any time. Blue Apron is a subscription based model which features fresh food and adapted portion sizes. It enables the consumers to retain their cooking autonomy and engages with them through its recipes. This business model is very likely to be used by us. The only twist, if we choose to develop a subscription model, is that our focus, instead of fresh food, could be scientifically built to fulfil consumers' basic needs.

3.1.8 Abel&Cole

Market: UK

Website: <https://www.abelandcole.co.uk/>

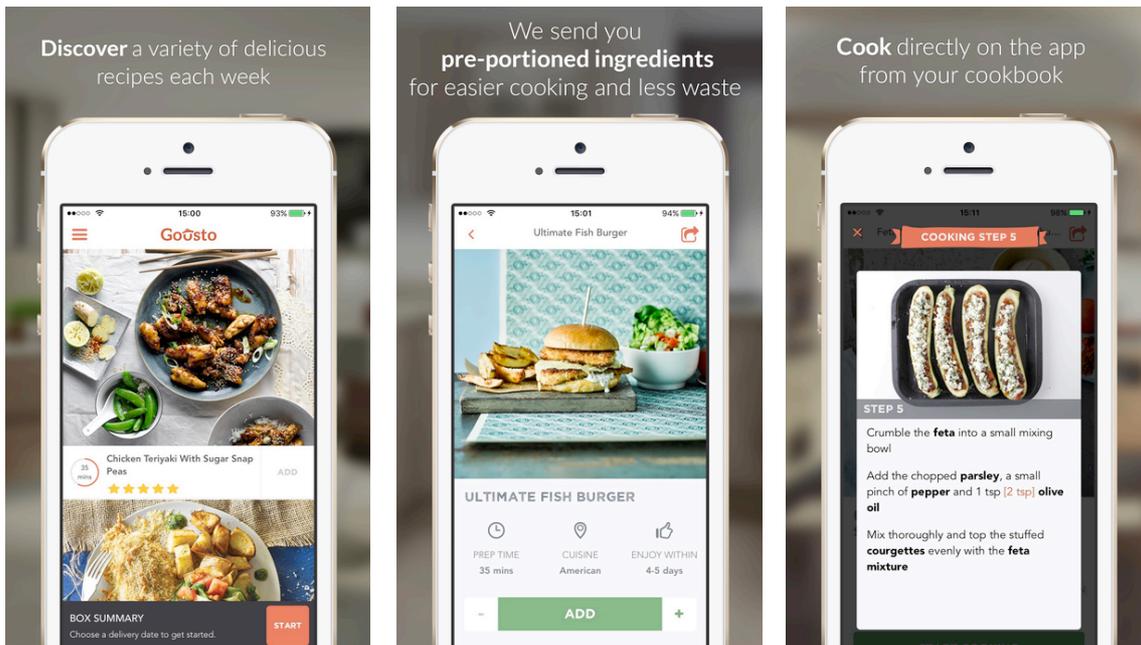


Abel and Cole is a subscription service of organic ingredients. This service allows users to choose the perfect weekly organic fruit & vegetable box that can be customized with additional items including fish, meat or snacks. Abel and Cole features a similar service to Blue Apron (3.1.7). The main difference between them is that Abel and Cole maximises its value proposition by adding themed-based boxes and meal type boxes. The company offers a complete eating service, rather than just dinner and lunch. This approach relates to Cordon Gris, besides being a subscription model, by offering a complete eating routine to its customers based on their needs.

3.1.9. Gousto

Market: UK

Website: <https://www.gousto.co.uk/>



Gousto offers recipe kit boxes, which include fresh ingredients and step-by-step, chef-designed recipes. It has been voted best recipe kit service by the Independent, the Guardian, the Metro and Time Out London. Gousto is a recipe kit box subscription service. It allows users to choose up to 12 recipes per week and the company pre-doses the orders and delivers the ingredients. It is a service which is booming across the UK market, but the brand attempts to differentiate itself by promoting the freshness of its ingredients and their source. It relates to Cordon Gris because it shows how customers' confidence on the ingredients source and freshness can differentiate similar services.

3.1 Ready meals delivery

The solutions highlighted in this section cover the following categories:

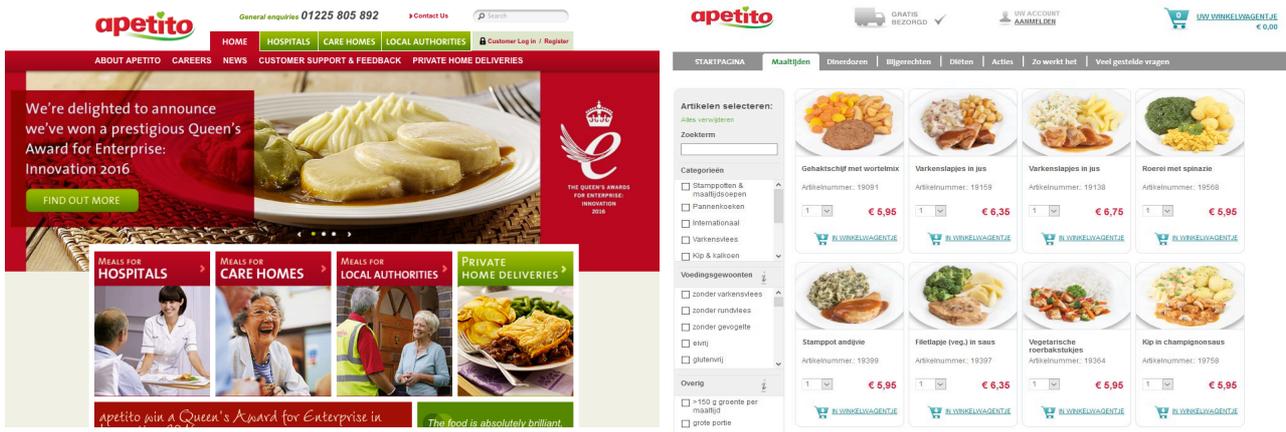
- Frozen meals, home delivery (Wiltshire, Apetito, Oakhouse and TLC)
- Chilled home delivery (Healthy chef)
- Restaurant home delivery (Uber)

3.2.1. Apetito

Markets: The Netherlands, UK, Germany, Austria, Spain, Canada

Website: <https://www.apetito.com/>

Popularity: 1.3 million users per day, worldwide



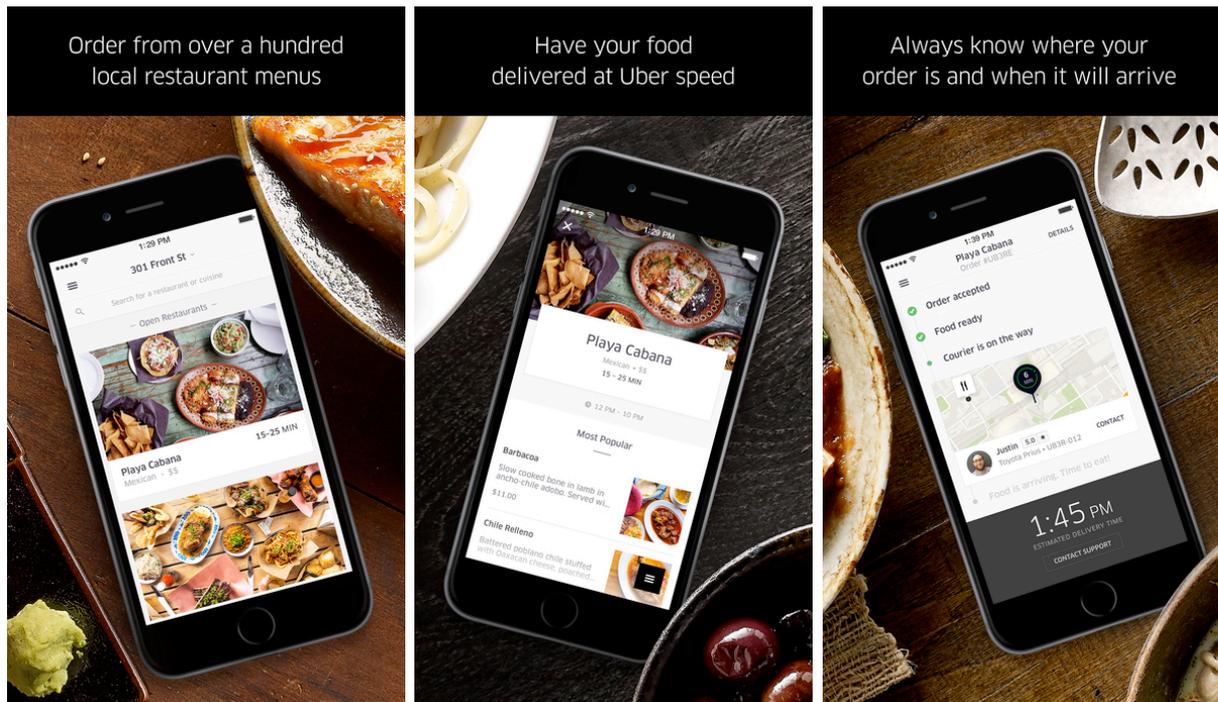
Apetito is a company, which was founded in Germany and nowadays is established in six different countries. The company delivers frozen ready made meals, cooled meals, menu components and catering concepts. The main target group are elderly people or disabled people. Apetito offers their target group an individualised nutrition advice. For example, Apetito sets out important aspects for people with dementia. Meals are provided to nurseries, schools, businesses, hospitals, retirement homes and meals on wheels. Menus can be ordered via phone or via the web shop. Clients can choose the required portion size and thereby manage their budget and food waste. Apetito is established since 50 years and it represents a success story for personalised delivery services; furthermore, it addresses the needs of elderly people. The UK's subsidiary won, in 2016, the Queen's award for the texture modified range of meals for elderly people, who experience swallowing difficulties. This is only one of the examples that shows how Apetito is addressing individual and group's needs. It is an example of how well a delivery service can be distributed and connected in different countries. Cordon Gris can build upon, in terms of relying on the delivery system and combining menu choice, nutritious meal options and fast deliveries.

3.2.2. UberEats

Markets: Some cities in Australia, Canada, UK, France and US

Website: <https://www.ubereats.com>

Popularity: 1.000.000 – 5.000.000 downloads



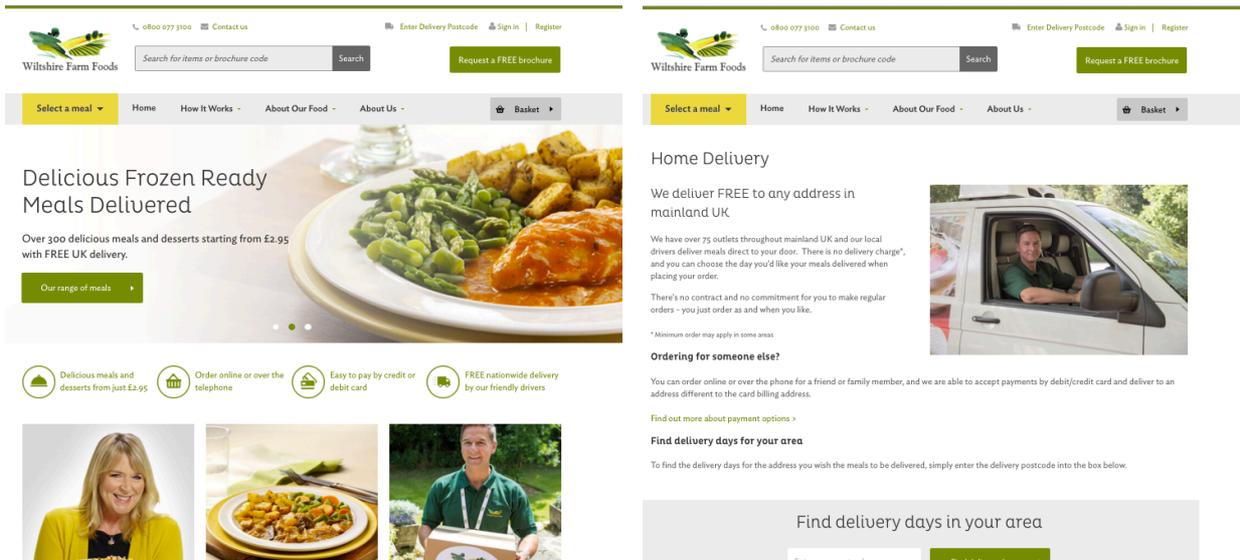
UberEATS is a food delivery service, developed by Uber that delivers meals from local restaurants to users. With this solution, users can browse the menus of local restaurants and make their order through the UberEATS application. Couriers will then pick the food from the restaurants, put it in temperature-controlled bags, and deliver it to the user. They claim to be able to deliver food in as little as ten minutes. Currently UberEATS is only available in some cities in Australia, Canada, UK and the USA. UberEATS is an intermediary between restaurants and users. They are not responsible for the planning and preparation of the meals so their concerns with the nutrition and healthiness of the food is perhaps limited. Nevertheless, Uber, the parent company is a quite recognisable brand with experience in the delivery field.

3.2.3 Wiltshire Farm Food

Markets: Some cities in Australia, Canada, UK, France and US

Website: <https://www.wiltshirefarmfoods.com/>

Popularity: 75 delivery outlets across the UK operated via a franchise model of 60 partners. The estimated revenue in one London's borough was £850k per annum.

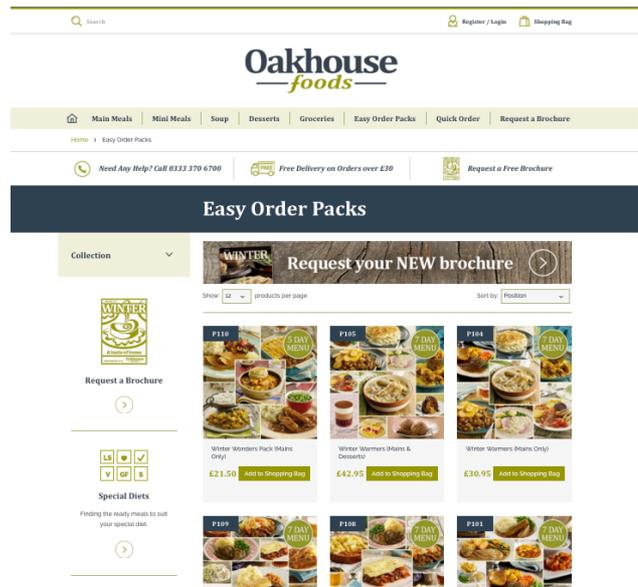


WFF is the leading "meals on wheels" frozen food service in the UK. They have over 300 meals and operate a catalogue/ phone and order service predominately for older people and housebound clients. Meals can be bought online too. The website states that the customer profile is aged 83 – but in reality the customers are older. Customers typically purchase seven days worth of frozen main meals and desserts at a time. Each meal must be reheated via a microwave oven. Incentives such as occasional discounts and free gifts are common such as tea towels and calendars. Whilst the marketing claims that the meals are healthy, high quality and nutritionally balanced, an independent research at CanCook found the contrary. The meals include additives and preservatives and the process of microwaving the food from frozen for a long period changes its constitution, flavour and texture. Also cheaper cuts of meats are used together with vegetable substitutes – an approach predicated on cost saving, rather than a healthier product as the company claims in its sales copy. Interesting learning can be found in the logistical operation and the franchise model. From an operational point of view this enables nationwide coverage and large market share. WFF employs high level marketing techniques: TV advertisements and outdoor media advertising. The products also have a relatively high price point, which indicates a customer willingness to pay, but also presents an opportunity for new more competitive priced products introduced into the same marketplace. Whilst the operational model is merit worthy, the products have numerous gaps which could be exploited to the benefit of a new business model.

3.2.4 Oakhouse

Market: UK

Website: <https://www.oakhousefoods.co.uk>



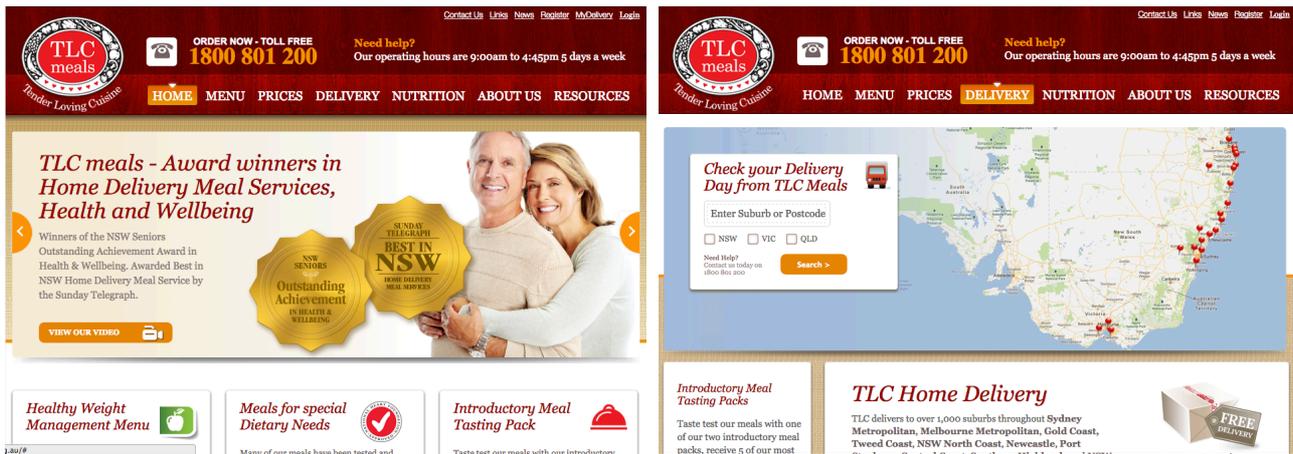
This service is very similar to Wiltshire Farm Foods (3.2.3) in its offering, but the presentation and menu options are of a better standard and less traditional. Orders can be placed by phone or online and frozen meals are delivered to the door. The quality of the food is low quality according to CanCook. Logistic model and marketing reach is of interest. Again similar to the Wiltshire model, the price point of the food products indicate customer willingness to pay that a new operator could exploit with a fresher competitive offer focused sharply on wellbeing and taste.

3.2.5 TLC Meals

Market: Australia

Website: www.tlc.org.au

Popularity: Market leader for referrals from health care providers across New South Wales, Gold Coast and Victoria.



TLC Meals aim to provide "Healthier meals with passion and dedication". TLC claims to be passionate about improving the quality of life for older people and those in need. TLC employs "Client Service Consultants" to design menu choices that ensure customers dietary requirements and personal preferences are met. Most TLC meals are accredited by the Heart Foundation Tick Program and are subject to rigorous independent lab tests to ensure that they meet their nutrition standards. This kite mark ties in with TLC's strategically close alignment with health care providers. TLC offers a 13% discount to all "Senior Card" holders to incentivise their offering which may be a useful tool if incorporated into correct pricing structure. A prudent route to market is utilised by TLC Meals, whereby referrals come from health care providers when patients are discharged from hospital as part of their returning home package – a sensible route to customers.

3.2.6. Healthy Chef Creations

Market: USA

Website: <http://www.healthychefcreations.com/>



The healthy senior product provides a daily menu – breakfast, lunch and dinner – fresh chilled ready meals. Customer can select multiple portion size options, design a personal profile with dietary preferences and restrictions, as well as food sensitivities and allergies, which enables the chef to tailor meals to each customers profile. Healthy chef creations pride themselves on the creation of "fresh wholesome delicious meals – free of preservatives and artificial ingredients and naturally low in sodium, saturated fats and sugar". The service features weekly menu changes. Individual orders are not required, which gives the production kitchen flexibility, provided meals are made in accordance to customers' personal profiles. This could be a very good way to control food waste and to cut out the order process, which can be difficult and overwhelming for some older customers. On the Healthy Chef Creations marketing materials, recognition is given to the fact that it is often family members of the older people that oversee, administrate and order for their older relatives. To this end, the website allows family members to set up a sub-profile so that fresh meals can be ordered and sent to their loved ones. Because of the emphasis on fresh chilled products we think this approach will also offer strong market potential, particularly in attracting a 60+ customer base.

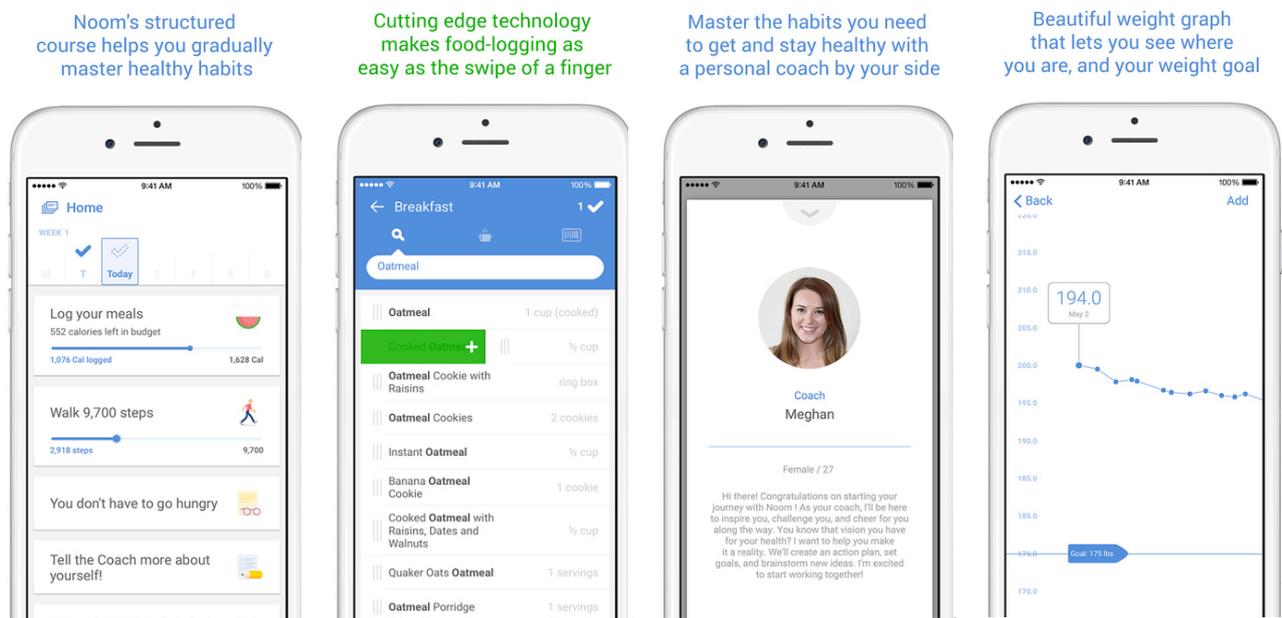
3.3 Food tracking

In this section we aim to catalogue and analyse food tracking and dieting applications currently available in the market. The market of dieting applications is quite extensive, with a large number of alternative for each platform, so we focused on applications that we considered relevant to the goals of Cordon Gris, or the ones with differentiating features.

3.3.1 Noom

Market: Offices in New York, Tokyo and Seoul

Website: <http://www.noom.com/>

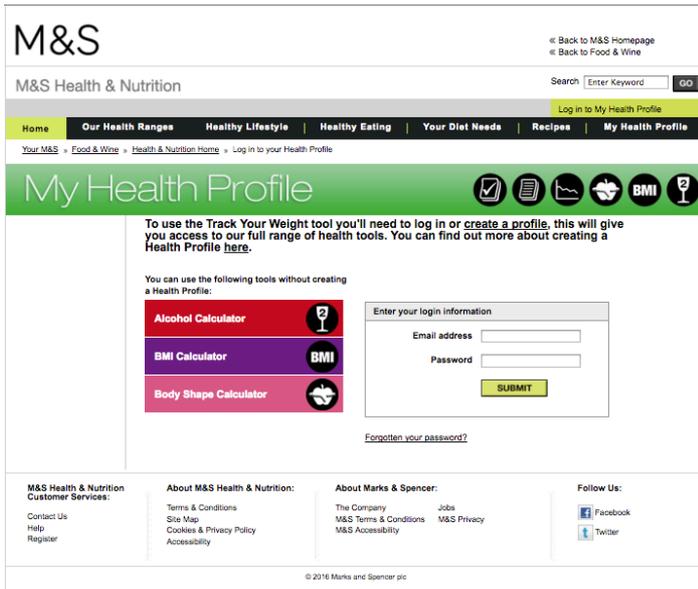


Noom offers a large catalogue of foods, separated into three categories: light, medium and heavy. Entering each meal (including water) is fast and the database contains foods from all over the world. If you can not find food, you can add it. In addition, you can scan the barcode of an item to identify it. The app allows the user to register their meals, get nutrition tips, keep track of the amount of water that has been drank. As Noom is more focused on weight loss, it does not share the same approach and purpose of Cordon Gris, promoting healthy nutrition habits. However, what Cordon Gris can learn from Noom, is how to create goals/tasks and adapt them accordingly, in case they were not met.

3.3.2 Balanced for you by M&S

Market: UK

Website: <https://health.marksandspencer.com/our-health-ranges/balanced-for-you>



Balanced For You was launched in January 2010. It was developed with expert advice from scientists at the Rowett Institute of Nutrition and Health at the University of Aberdeen, renowned for its ground-breaking research on effective weight-loss. All products in the range are high in protein and can be included as part of a weight loss or weight maintenance diet. An easy and delicious meal planner is provided to help the user get started. Applying nutritional science to food retailers may be Cordon Gris' key focus. M&S has trialled its concept on its stores, developing a range of pre-prepared foods geared towards people's biological needs. Since its launch, M&S has grown the brand and its services. The retailer provides diet plans, weight tracking and nutritional advice. M&S has a high level of commitment in regards to healthy living and eating.

3.3.3 Food Profiler

Market: The Netherlands

Website: <http://www.wageningenur.nl/foodprofiler>

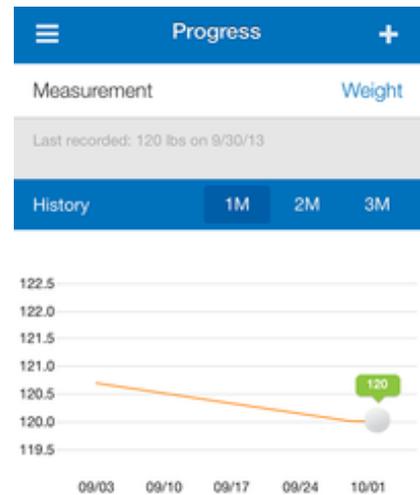
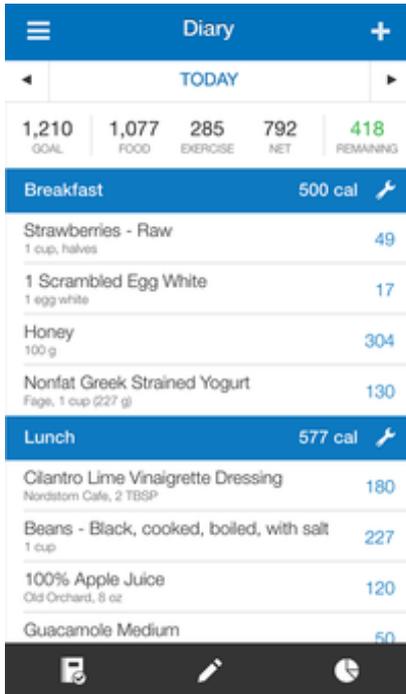


The FoodProfiler is developed by researchers of Wageningen UR. It intends to collect nutrition and consumption information of people from the Netherlands in a structural manner in order to understand the individual and collective dietary pattern of Dutch people. By means of a randomly daily reminder, people are asked to enter self-reported data of their consumption pattern of the last two hours, following the near time registration method. After approximately two weeks, when the person's profile is completed they get to know what type of eating person users are, for example "environmental friendly", "price/quality aware" or more focused on feelings. This will be compared to the average Dutch person. Also, the app provides fun facts about the food the person is consuming. In the end, the app can indicate when, with what, why and who eats which kind of food products. The app is based on the food frequency questionnaire, food choice motives and the NEVO-table. One of the interesting aspects of the FoodProfiler is the approach to collect self-reported data. Rather than requiring users to keep a complete food diary, they make use of notifications to prompt users to report what they ate in the last two hour. This strategy can help to ease the collection of eating data.

3.3.4 MyFitnessPal

Market: Worldwide

Website: <https://www.myfitnesspal.com>



MyFitnessPal is a calorie counter and diet tracker application. It works with a food database of over 5 million food items (basic foods, recipes, and restaurant menus). Besides manual logging of food, it integrates a barcode scanner to add additional items. With the premium version it is also possible to record macronutrients values. MyFitnessPal is one of the major players in the field of diet tracking applications. They offer a free version and a premium version for \$9.99 per month or \$49.99 per year. Among other features, the premium version offers exclusive content (e.g. articles and tips), food analysis, quick-add of macronutrients, or different goals by day.

3.3.4 Mijn Eetmeter

Market: The Netherlands

Website: <http://www.voedingscentrum.nl/nl/thema-s/apps-en-tools-van-het-voedingscentrum/voedingscentrum-apps.aspx>

Popularity: 700.000 downloads

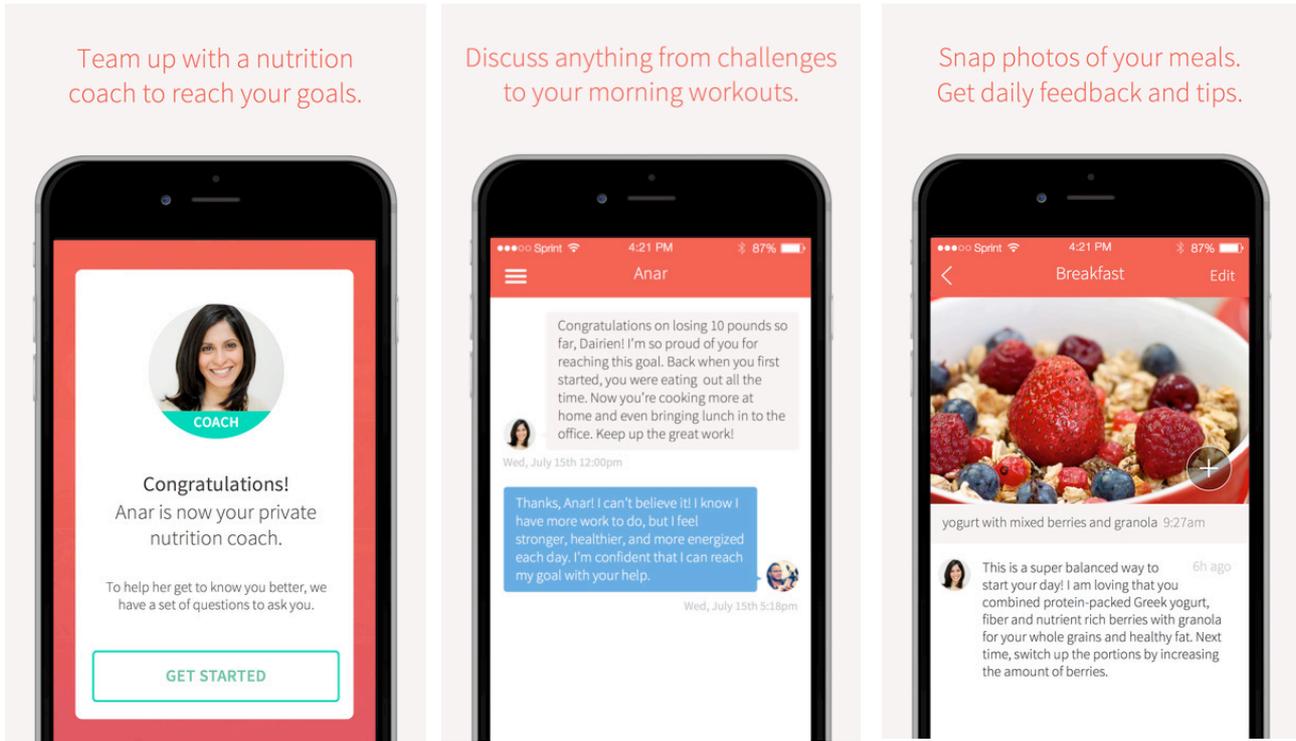


Mijn Eetmeter app enables people to track things like vitamins, minerals, energy etc. for a total of 25 different nutrients. By means of food logging, people can keep track of the amount of consumed calories and what kind of nutrients they still lack in general or on a specific day. Also, it includes a BMI calculator to keep track of weight and a function to enter data about physical activity. The registered information are constantly compared to the 'Schrijf van Vijf' (the current nutrition guide of the Netherlands), which is developed by The Netherlands Nutrition Centre Foundation that also developed the app. Thereby, the app can provide personalised nutrition advice. Cordon Gris can take this app as a good example of an existing strategy from the Netherlands. It shows how to combine self-reported data about nutrition and physical activity. Especially, since this app relies on the official nutrition data from the Netherlands, it is reliable and thereby relates to the objective of Cordon Gris to include the nutritional values of different countries into account.

3.3.5 Rise

Market: The Netherlands

Website: <https://www.rise.us/>

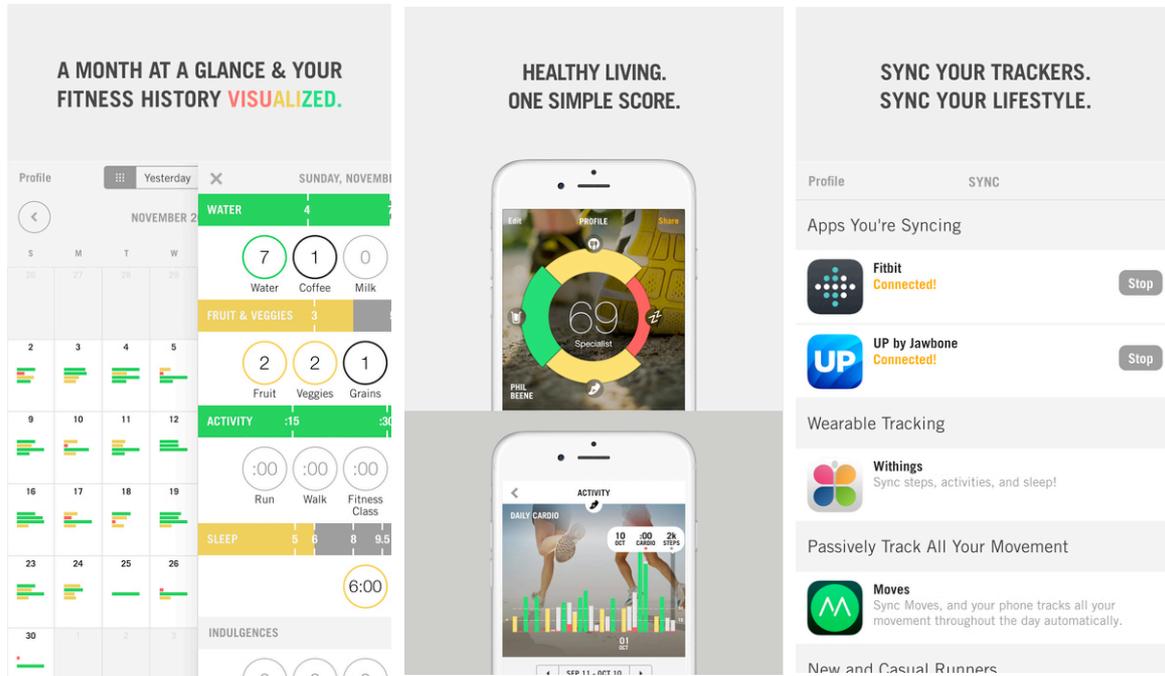


Rise is an app that offers personalised diet plans created by nutritionists. Rise pairs users with selected nutritionists who adjust the diet according to their needs. Users take photos of their meals which are later analysed by the coach to identify problematic areas. Every day the user's coach will review meals and provide tips. The nutritionist will provide weekly action plans reviewing last week's trends and planning for next week's challenges; share meals and snack ideas; select healthy options at restaurants, airports, or happy hours (when given advance notice); answer questions about specific food choices and its nutritional value. Rise implements a subscription model where members pay \$48 per month or \$120 quarterly. While most dieting applications aim to automate most of the process of logging food, Rise employs a more personal approach that connects nutritionists with patients. This approach deviates from the initial goal of Cordon Gris.

3.3.6 Nudge

Market: USA

Website: <http://www.nudgeyourself.com>



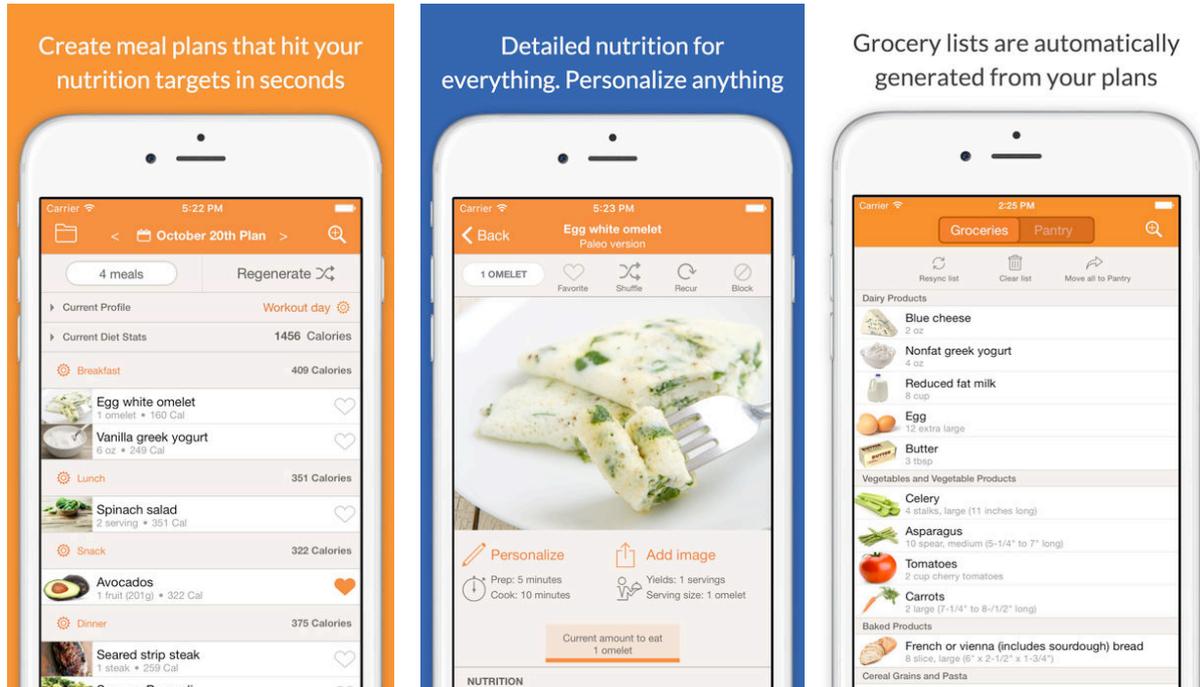
Nudge is an app that aims to help people to have more healthy habits. Nudge brings together data from different services and devices in a single place. Currently, the app explores four main domains: nutrition, sleep, activity, and hydration. For tracking health data, it employs a user interface that can be adjusted to the lifestyle and tracking goals of the user. That is, users are able to pick which tracking options will be displayed, so that the main interface does not become too cluttered. In addition to the tracking of health data by the user, there is also an option to get in touch with a professional health coach.

A distinct feature is a 30-day health score that rates how healthy the person is living from 1-110, offering a clear picture of how well the person is doing in each domain. The app includes thematic clubs, where one can share experiences and ask for help with other users with similar interests. Clubs also include a leaderboard where users are rated by their score. An interesting part of the Nudge app that could be further explored is the approach to the food logging task. Most food diary apps use a search based system in which the user adds food to the diary based on a query that needs to be typed manually. Nudge uses a simplified system in which users are only required to enter the main food groups (e.g. dairy) rather than the actual ingredients. Food groups can also be customised so users only need to log things they care about. This approach is not without inconveniences since less eating data will be available to the recommendation engine. However, a better acceptance and usage rate from elderly people might be able to compensate the more inaccurate data of this approach.

3.3.7 EatThisMuch

Market: USA

Website: <https://www.eatthismuch.com>



EatThisMuch is a meal planning application that is able to generate menus and shopping lists automatically. Plans can be personalised based on the nutritional requirements, food preferences, budget, and personal diet goals. The application is available for free but with a limited set of features. The premium version is available for \$8.99 per month or \$84.99 per year. With the premium version it is possible to generate a meal plan for the entire week, automatically plan leftovers, grocery list and pantry tracking, daily calorie tracking and customisable weekly layout. With regard to Cordon Gris, the most relevant feature is the capability of automatically creating meal plans. While most nutritional applications include a food diary, the ability to generate meal plans is not a very common feature. Also pertinent to the goals of the project, is the incorporation of budgetary constraints in the generation of the menu. This option allows the user to set a daily budget for the meals.

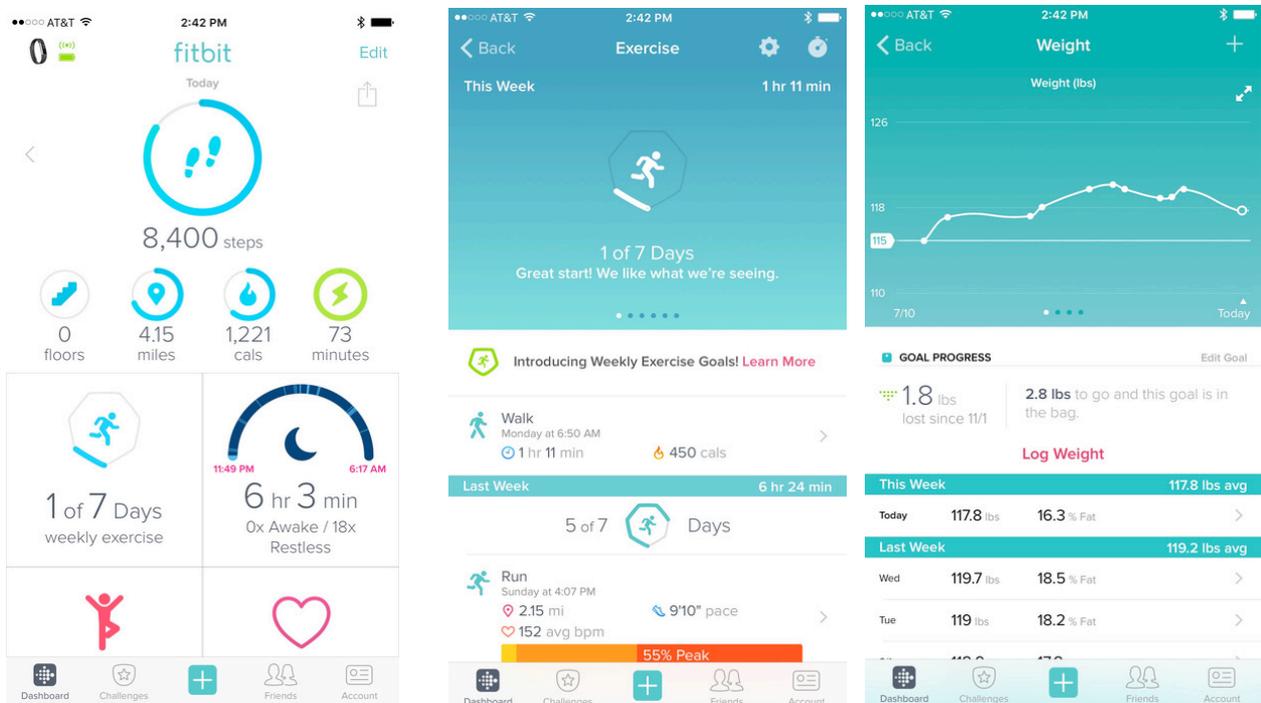
3.4 Activity tracking

In this section we aim to catalogue and analyse activity tracking applications currently available in the market. The market of activity tracking applications is quite extensive and is frequently related to other areas, such as nutrition and healthcare. We focused on customisable applications mainly because we found it more fitted to the goals of Cordon Gris.

3.4.1 Fitbit

Market: USA

Website: <https://www.fitbit.com>

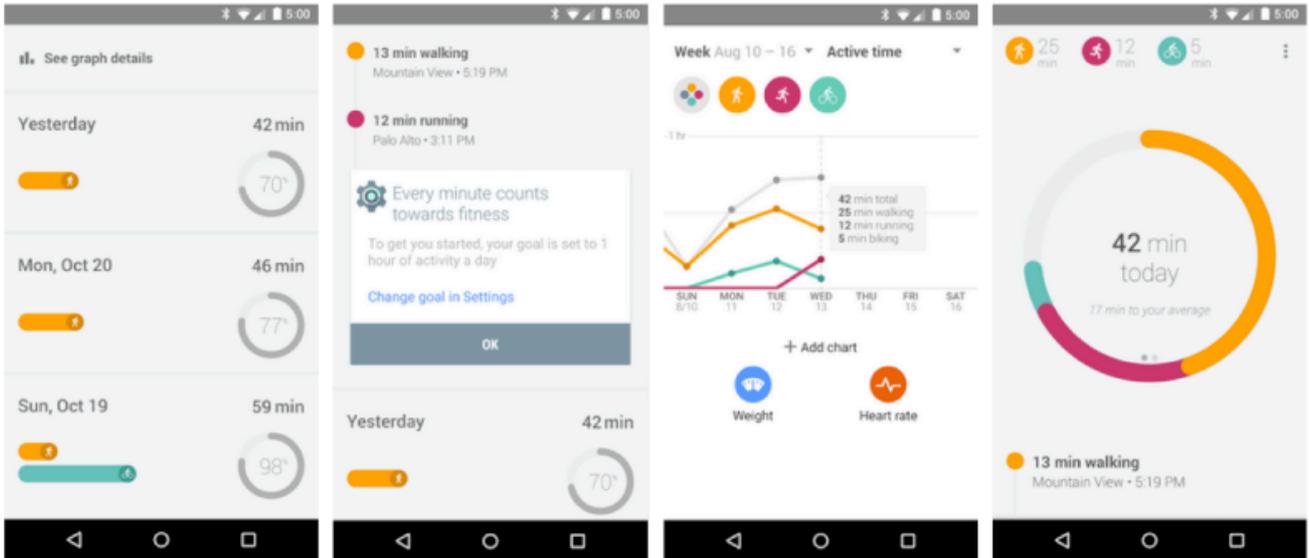


FitBit counts your steps through its connected accessories and then calculates the intensity of physical activity performed, distance travelled and calories burned. Other exercises, such as cycling or lifting weights can be entered manually. The catalogue is very broad and allows the user to add actions, such as mowing the lawn or taking the bus. As a total package of various features, the FitBit app serves as a best practice for Cordon Gris. In terms of the interface, as well as its practicality relating to nutrition and physical activity Cordon Gris can build upon.

3.4.2 Google Fit

Market: USA, Worldwide

Website: <https://www.google.com/fit/> <https://play.google.com/store/apps/details?id=com.google.android.apps.fitness&hl=en>



Google Fit is a health-tracking platform developed by Google for the Android operating system. It is a single set of APIs that blends data from multiple apps and devices. Google Fit showcases how an app can be a daily companion for health and fitness monitoring. The app is present across multiple platforms and it gathers data from several sources, including nutritional behaviour. Cordon Gris can learn on how to integrate different sources of information and be an everyday presence in the lives of its users by closely studying how Google Fit performs.

3.4.3 Apple Health

Market: USA, Worldwide

Website: <http://www.apple.com/ios/health/>

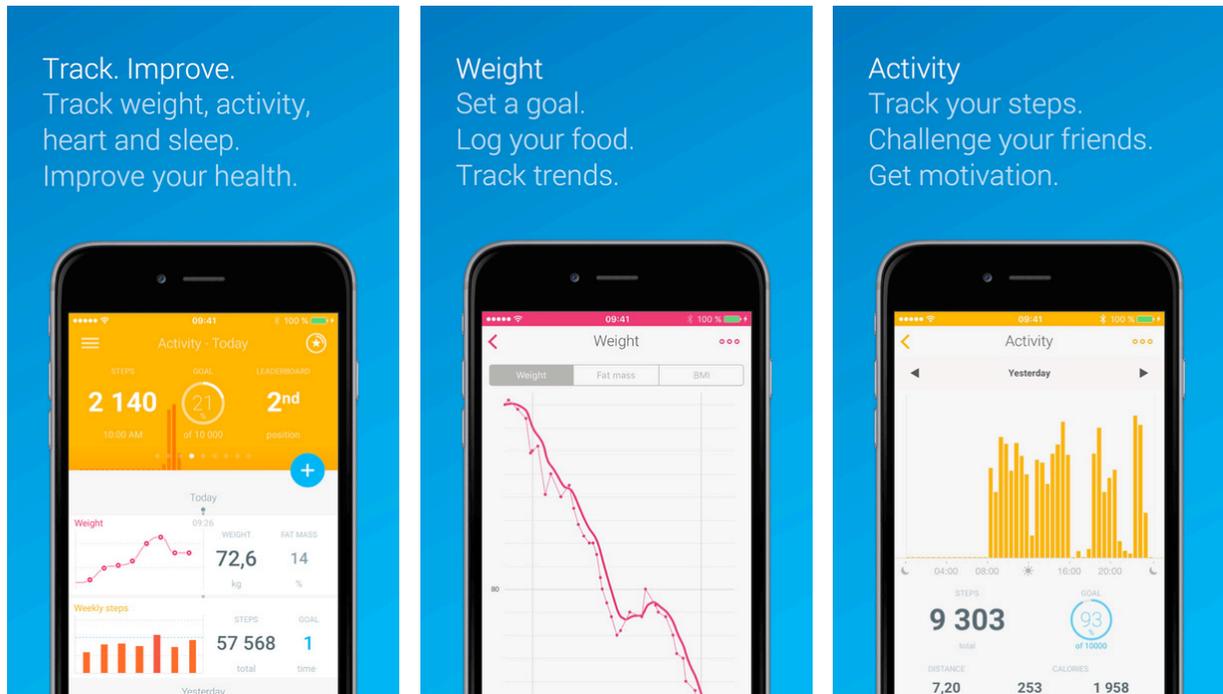


The Health app shows your health and fitness information all in one place. To use the health app, users need to download the latest version of iOS for iPhone or iPod Touch. Then it will be possible to track health information from multiple sources, like compatible apps and fitness accessories. Apple Health is a great example for the Cordon Gris project due to the extent of its health and wellbeing focus. The app extensively covers several aspects of health, ranging from sleep to activity. The app also features a biological profile of its users saving all the key health figures and facts.

3.4.4 Withings

Market: France, Worldwide

Website: <http://www.withings.com/eu/en/>



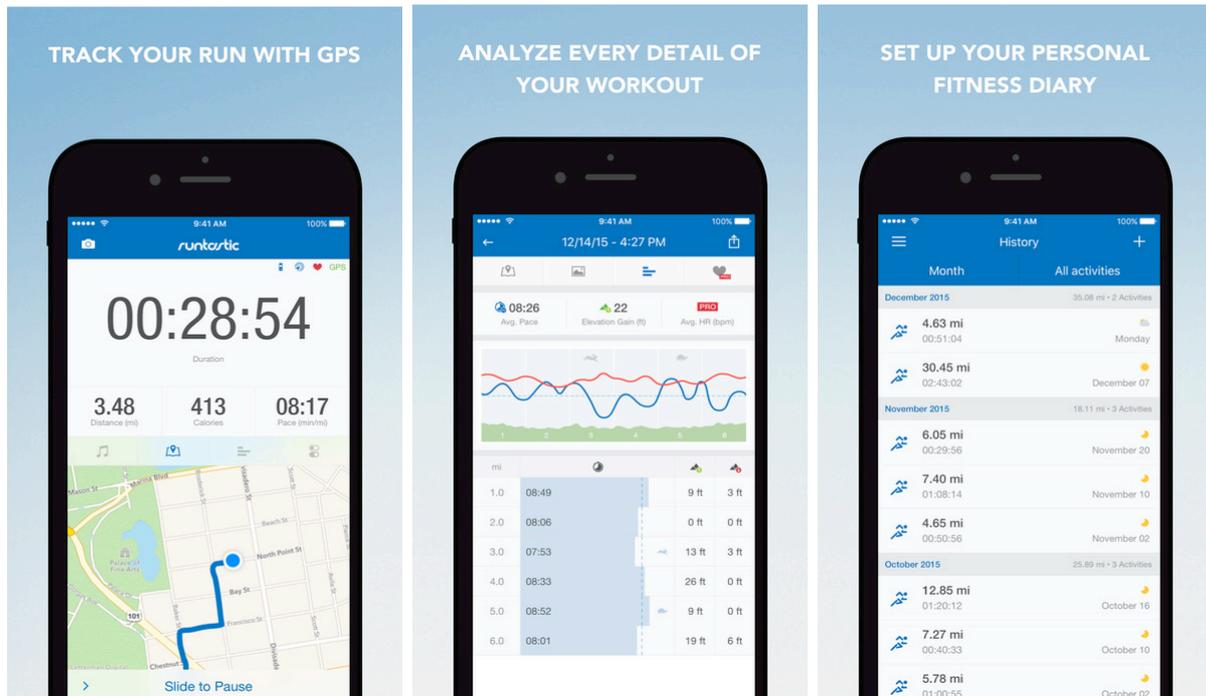
Withings is a French consumer electronics company, known for its great design and innovation in connected health devices, such as the first Wi-Fi scale on the market, an FDA-cleared blood pressure monitor, a high-definition wireless security camera, a smart sleep system, and a line of automatic activity tracking watches. It is a flagship company of the French Tech community and has received numerous awards for its products and innovation, including CES awards. Withings is a key benchmark for the Cordon Gris project since it's a prime example of how health tracking software can have multiple interfaces. The company has built an extensive set of health devices and integrates information gathered from users to produce key insights about them, far more extensive than a simple app. The Cordon Gris project can look into how Withings works, to figure out how traditionally household objects can be explored and used in a digital health-monitoring context, eliminating the need for senior people to manually log information.

3.4.5 Runtastic

Market: Austria, Worldwide

Website: <https://www.runtastic.com/>

Popularity: As of November 2015, Runtastic had surpassed 150 million downloads across its apps.



Runtastic is an Austrian mobile fitness company that combines traditional fitness with mobile applications, social networking and elements of gamification as a logical reaction to the quantified self movement. Runtastic develops activity tracker apps, hardware products and services, such as: online training logs, detailed data analysis, comparisons to other users, and many more functions to help users improve their overall fitness. Runtastic is one of the most successful activity tracking apps out there. It has pioneered the concept of activity tracking and paved the way for the integration of hardware products under the fitness umbrella. The Cordon Gris project relates with Runtastic since the app has been very successful creating engagement with its users through gamification features.

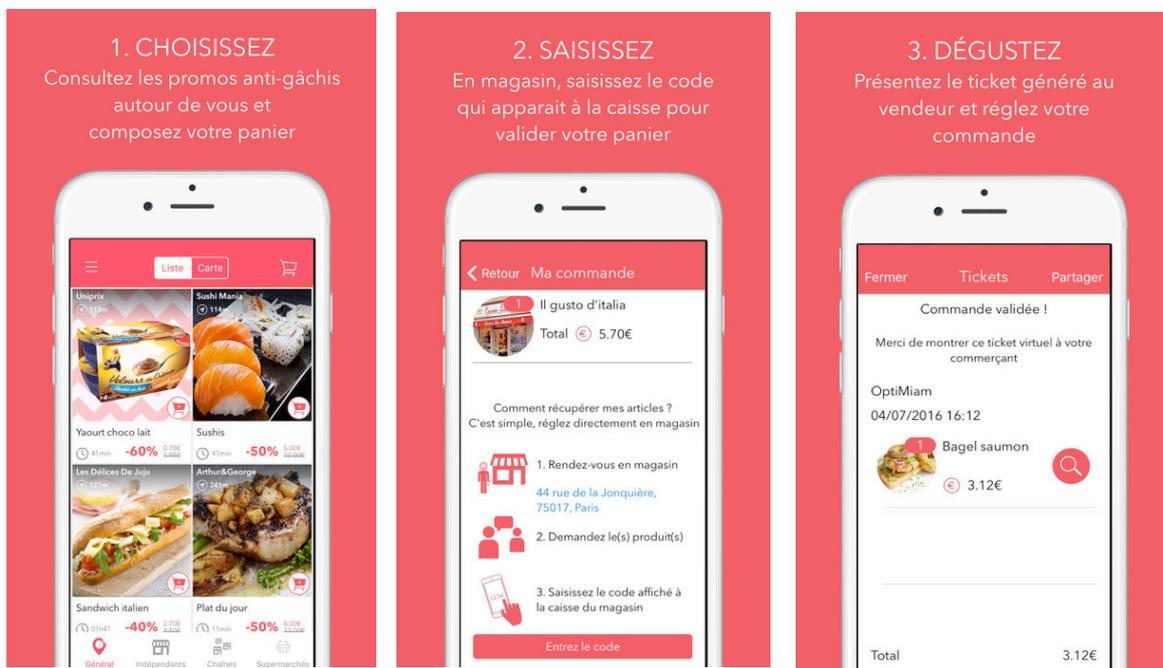
3.5 Food stock management

Since more and more food is wasted annually that can emerge during the production, storage, processing, at the retailer, and at home, there are increasingly more apps created to fight food waste and promote food stock management.

3.5.1 Optimiam

Market: France

Website: <http://www.optimiam.com/>

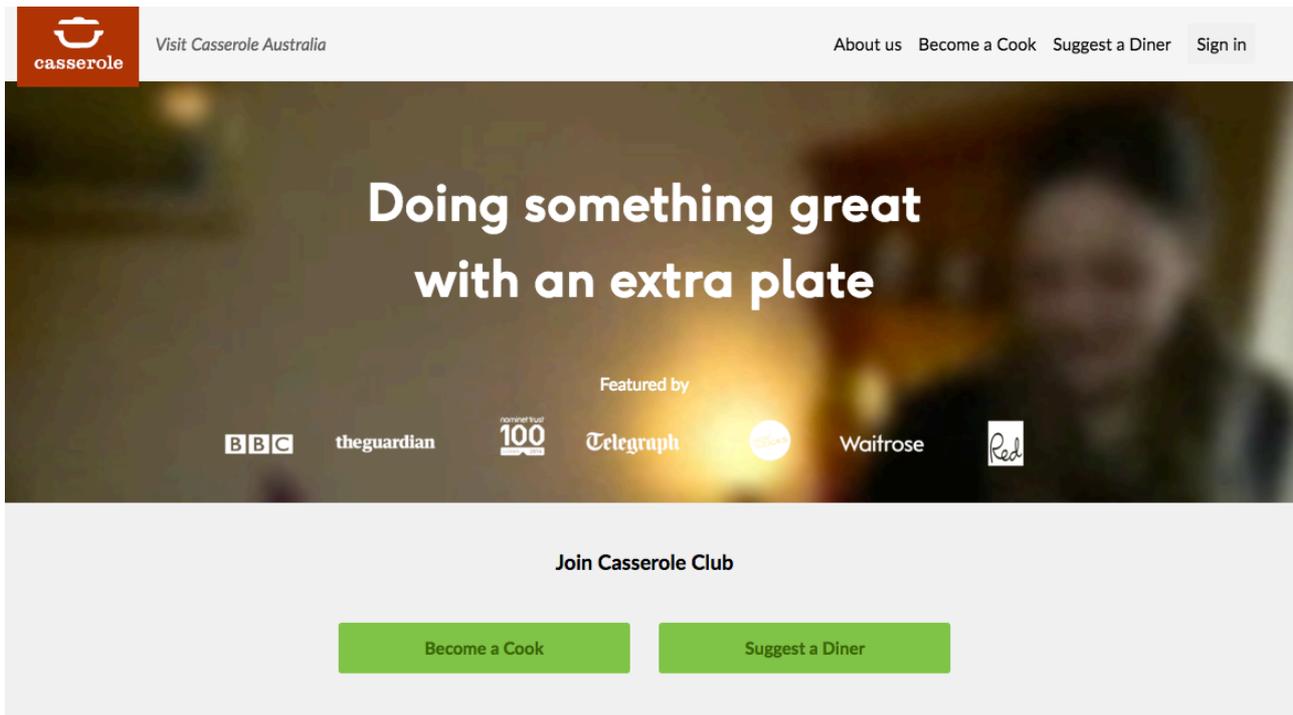


OptiMiam's mission is to help local shops to sell their surplus food on time. This is a location-based mobile application that connects real-time local shops to consumers located around them to sell their stocks of fresh products as "flash exclusive offers". The concept is to purchase food "just in time" in order to reduce food waste. Even if helping stores selling their surplus food is not the priority of the Cordon Gris project, we'll consider different models that connect food suppliers, service providers and service users, in order to help reduce waste and improve nutrition of people that are not motivated to cook or are physically impaired and therefore cannot go to buy fresh groceries every single day.

3.5.2 Casserole Club

Market: UK

Website: <https://www.casseroleclub.com/>



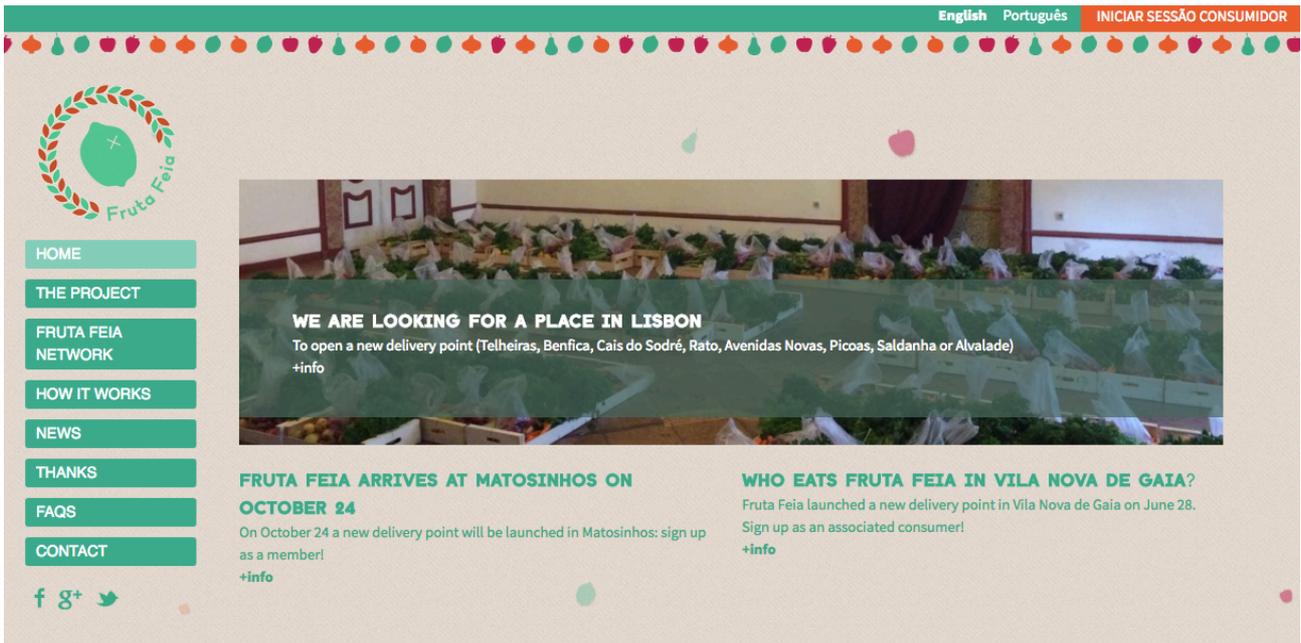
Casserole Club is a service created by FutureGov and provided with the support of local authorities and third-sector organisations. Casserole is a project that connects people who like to cook and are happy to share an extra portion of a delicious home-cooked meal, with older neighbours living close by who could really benefit from a meal and a friendly chat. Like a local, community-led take-away, Casserole Club members serve up tasty, home-cooked food to their neighbours, getting more people eating and cooking fresh meals while strengthening local neighbourhood relationships with every bite. Elderly people would very much benefit from such a solution. Because it is common that users live alone, one of their concerns is that cooking for just one person is not ideal as it takes the same amount of time and energy (and cost to a certain extent) to cook for a family. Something that would be worth exploring is the likelihood to extend this solution to different markets to see if users would use it.

3.5.3 Fruta Feia

Market: Portugal

Website: <http://frutafeia.pt/en>

Popularity: After two years operating and with the current 1400 associated consumers, Fruta Feia Co-Op has saved 312.881 Kg of wasted fruits and vegetables.



Every week Fruta Feia works directly with local producers, gathering from their farms the misshaped products that they cannot sell. With these products – always local and from the season – they set two types of boxes for their associated consumers. The consumers pay an annual fee worth 5€ when picking up their box for the first time. Fruta Feia is a subscription service of fruit boxes that has been growing tremendously. It doesn't allow its customers to choose delivery slots nor pick up spots. The key factor is that the company is basically a project geared towards reducing food waste, and that resonates heavily with its relationship with its customers. Its value proposition is solid, since it reduces food waste and, by selling misshaped fruit, its cheaper than a supermarket. From this solution we can learn how social responsibility can be used toward engaging with consumers.

3.5.4 Josephine

Market: Some cities in the US

Website: <https://www.josephine.com>

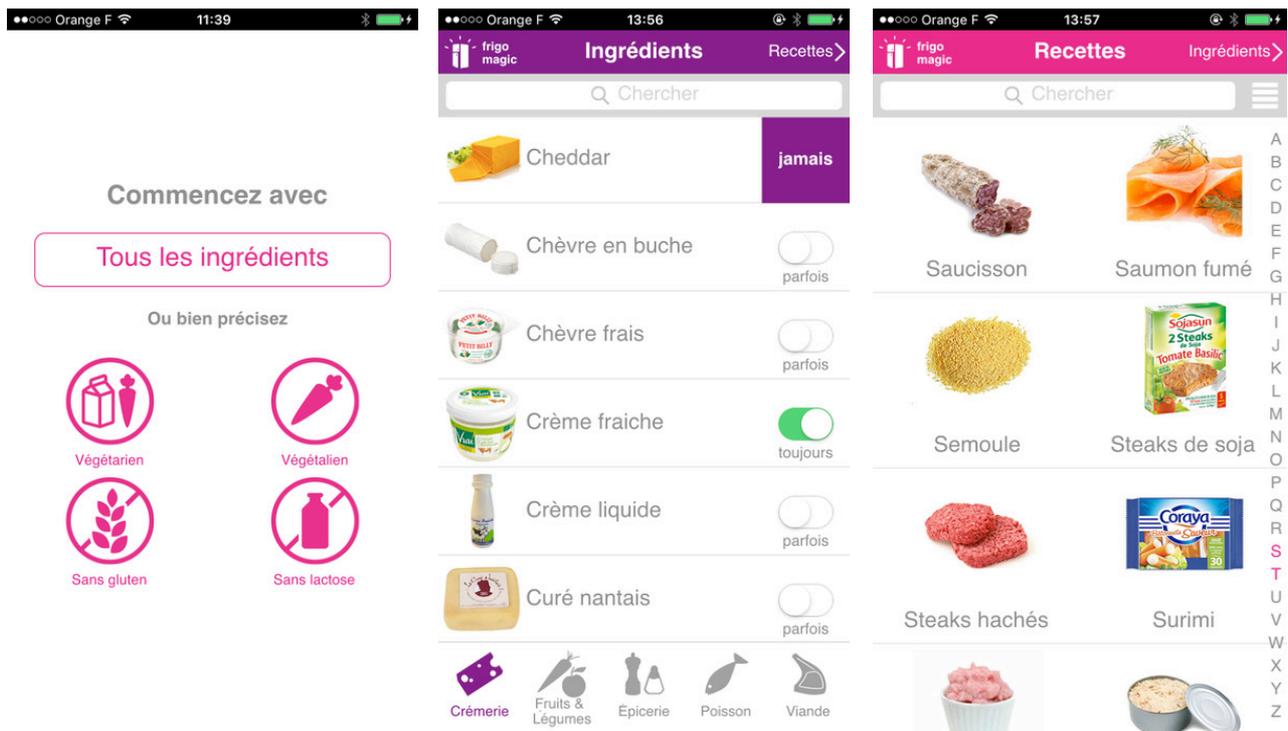


Josephine is a food service that connects neighbors cooking meals at home with people looking for ready-made meals. In this service, the user finds meals that fit their tastes, location, and schedule from a verified "Josephine cook". The order and payment is made online, and then the pickup location is sent to the user. Later, the user will grab the food from the cook's home. With Josephine anyone can apply to be a cook. There are however an interview and training process to follow before starting to use the service. In terms of the business model, the cook keeps 90% of the sales and the rest is kept by the company. Josephine can be a valuable way to connect neighbors and to create personal relationships among the community. One concern with the operational model of Josephine is safety of the food. While the cooks that are part of Josephine are vetted, meals are cooked by people at home on their own kitchens and without the safety control that might be required in a professional environment. Local health regulations may also be a concern in a model like this, since this type of market is new and most likely unregulated.

3.5.5 Frigo Magic

Market: France

Website: <http://www.frigomagic.com>

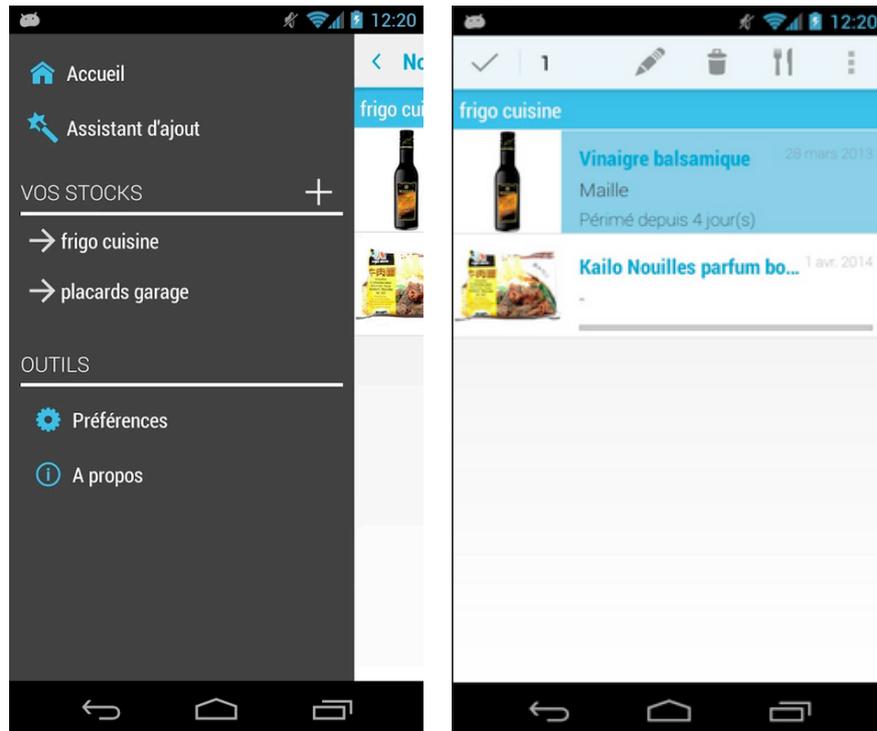


Frigo Magic offers recipe ideas for your everyday meals with products available in the fridge and cupboard in your kitchen. The app features more than 600,000 versions of quick and easy recipes. In order to incentivise older people to eat what they have in their fridge, it will be helpful to consult an application like Frigo Magic that gives users suggestions about what to cook. Even if the idea is potentially valid, we believe it is very unlikely that elderly people would open the app everyday and fill out the ingredients that they have available in the fridge. In the future, with the Internet of Things taking shape in our every day's life, it would be worth considering such solution if the fridge has a technology that identifies the items inside of it and automatically updates the app.

3.5.6 NoMaggot

Market: France

Website: <https://www.data.gouv.fr/fr/reuses/nomaggot-gere-ton-frigo/>



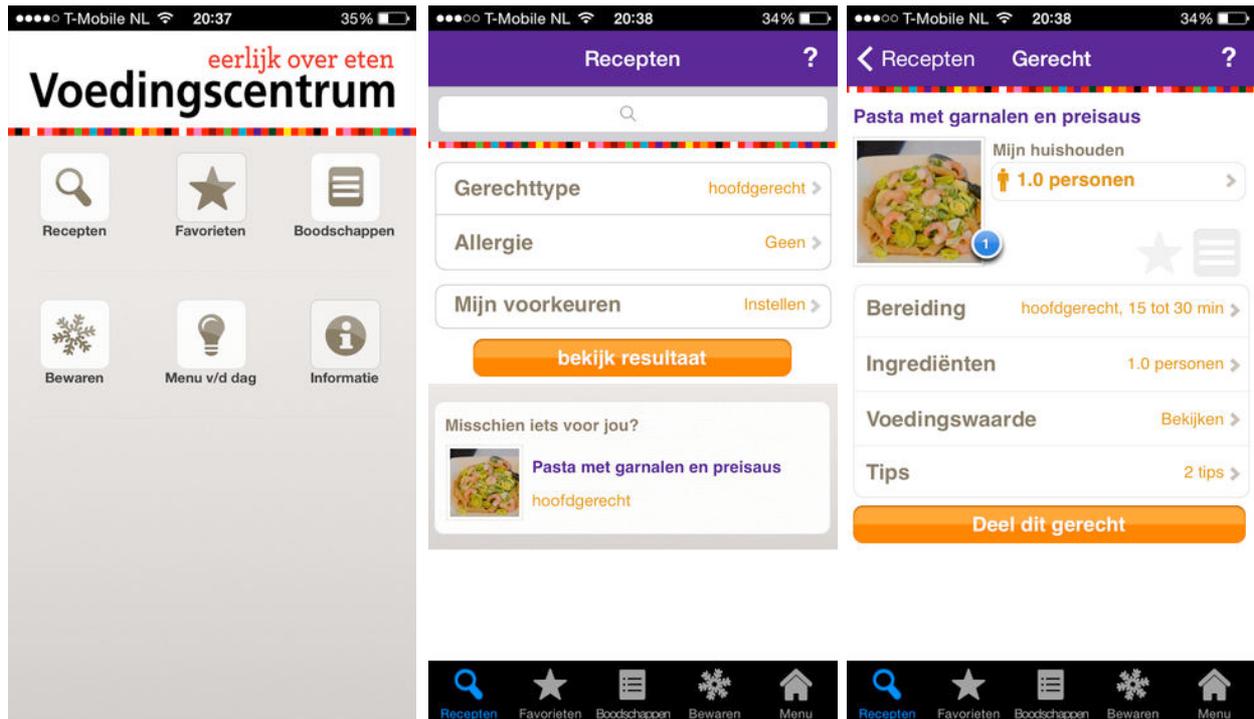
This is an application that helps prevent food waste. Its objective is to warn users when the expiration date of the products that are in your refrigerator is reached. To use it, users simply scan their products via a barcode before storing each item. The app will alert the user a few days before the expiration date of the products that have been listed. This app would come handy for elderly people that happen to throw away lots of items. As the idea is potentially beneficial, we believe it is hard to make the users scan the barcode of every single item they buy.

3.5.7 Slim Koken

Market: The Netherlands

Website: <http://www.voedingscentrum.nl/nl/thema-s/apps-en-tools-van-het-voedingscentrum/voedingscentrum-apps.aspx>

Popularity: 50.000 – 100.000 downloads



Slim Koken is an app, developed by The Netherlands Nutrition Centre Foundation to optimally make use of stored food and thereby control and minimise food waste. This app will help people to cook portions of the right size based on the number of people who will join the meal and their nutritional needs. Users can search for the ingredient they still have at home and receive recipes that require those ingredients. They are also able to save recipes in the recipe book, create a shopping list, receive tips about how to store food, and there's an option to share tips and pictures with other users. This app shows how to combine recipes, shopping lists and storing tips and thereby controlling food waste. This links to Cordon Gris and shows which practices are currently applied in the Netherlands and how Cordon Gris can act upon.

3.5.8 Cabaz do Peixe

Market: Portugal

Website: <http://www.cabazdopeixe.pt/>

Popularity: On average, per week, the service delivers 30 baskets of fresh fish each with 3kg of fresh fish (data from 2015)



CABAZ
DO PEIXE

DO PESCADOR PARA SI
PESCA ARTESANAL



SEGUE-NOS NO FACEBOOK 
PARA FICARES A PAR DAS NOVIDADES

REDES
REDES DE EMALHAR

São aparelhos relativamente simples, pois consistem, na sua forma básica, em estêngulos de rede com flutuadores numa extremidade e pesos na oposta, que é lançada à água num local onde se sabe haver cardumes de peixe a nadar.

Os peixes ao quais ficam "emalhados" ou seja presos nos malhas da rede, normalmente pelos espinhos ou operículos. Podem ter poucos minutos e ser operados apenas por dois pescadores.

This initiative aims at bringing the fishermen closer to the general public by shortening the distances between them through a subscription program. In addition, the Cabaz do Peixe brings in some innovative recipes in order to allow the consumer to learn how to cook different types of fish. By being cheaper and reducing food waste, Cabaz do Peixe markets itself as a social responsibility initiative, in a clear statement of how our ability to be social responsible is valued by consumers.

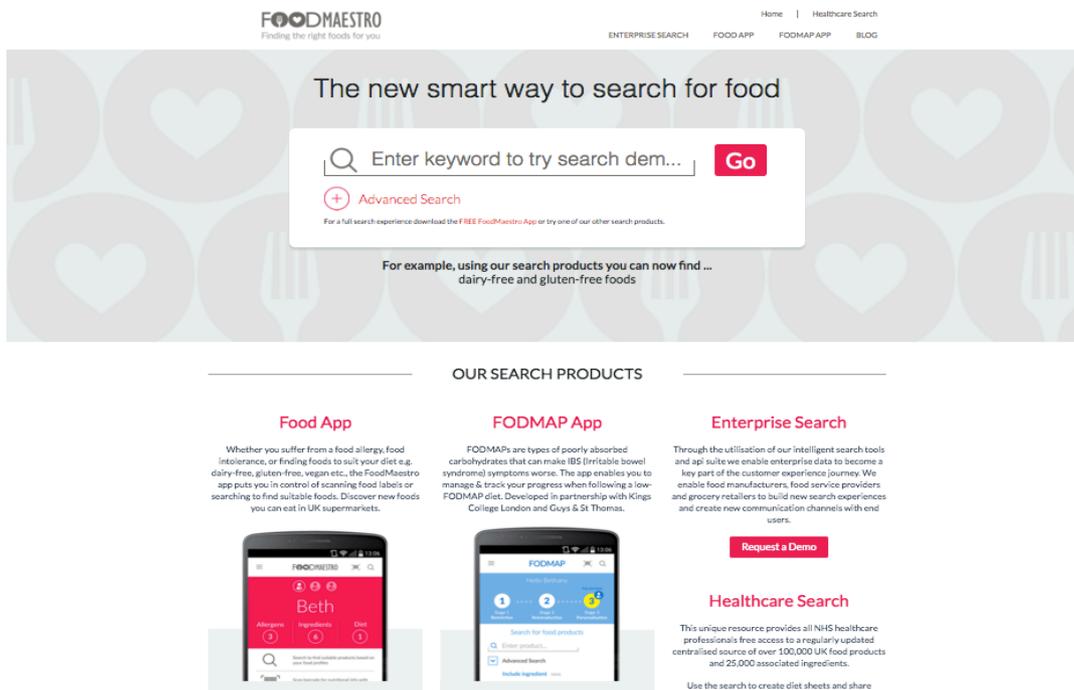
3.6 Others

The following section is comprised by three applications that offer unique services that do not belong to any of the categories that we have previously identified. Two of the solutions aim to offer an insight on products through extensive databases (Food Maestro, ShopWell) and another one is a platform that combines multiple services related to two of the categories analysed in this research: grocery delivery and ready-meals delivery (Food Connect).

3.6.1 Food Maestro

Market: UK

Website: www.foodmaestro.me

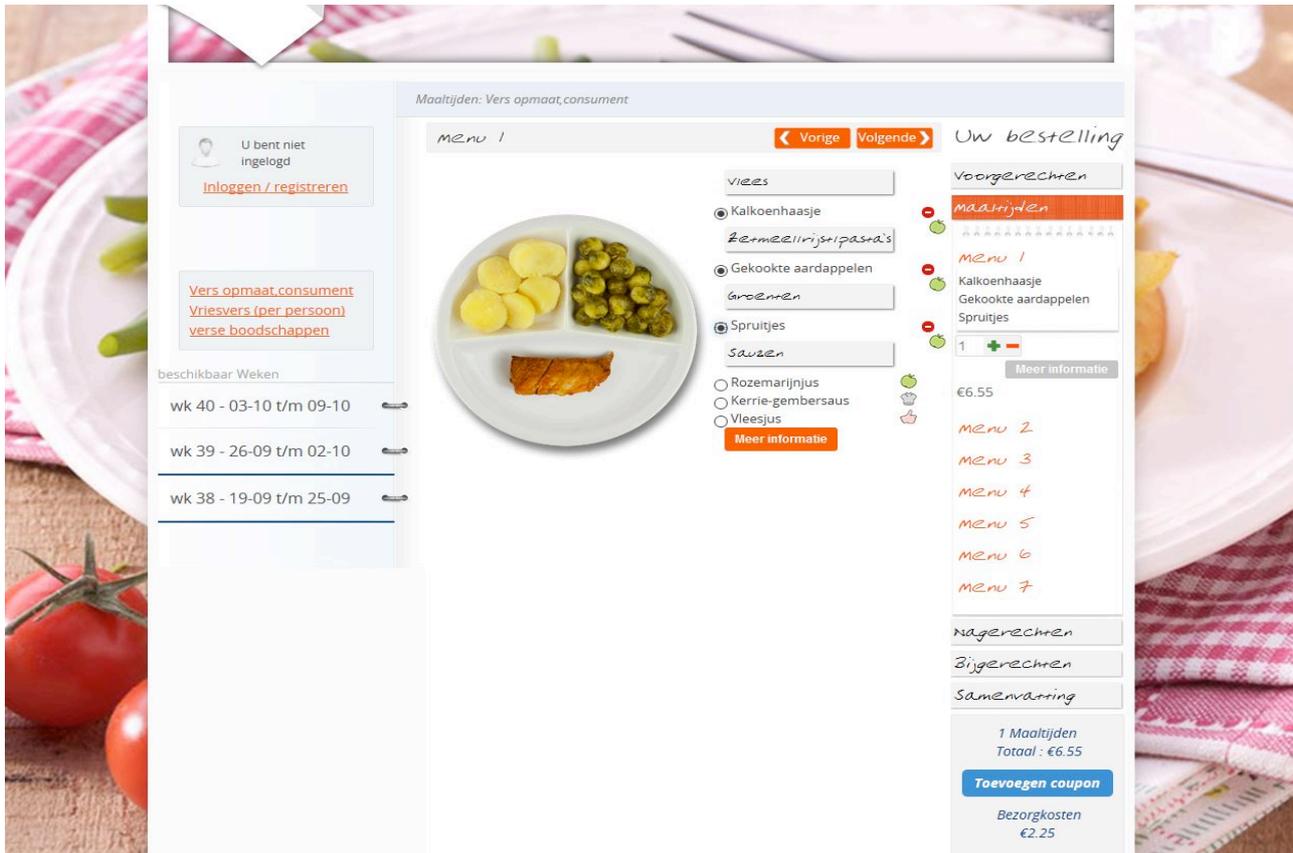


FoodMaestro is a food data platform that answers the question "Can I eat this?" based on a medical condition or dietary preferences. By selecting specialist medical filters or scanning a barcode, FoodMaestro will advise if the item is suitable based on an individual's needs. Alternatively, the platform can be used to find a product that is suitable, according to a user's dietary profile, by displaying a list of products on an app. This provides a first example for Cordon Gris, how a food platform with search engines, based on medical and dietary preferences can be built, not in terms of categorisation, but in terms of personalisation. However, it is still far away from one of the purposes of Cordon Gris, which is to provide detailed and highly personalised nutrition advices.

3.6.2 Food Connect

Market: The Netherlands

Website: <http://www.foodconnect.nl/>

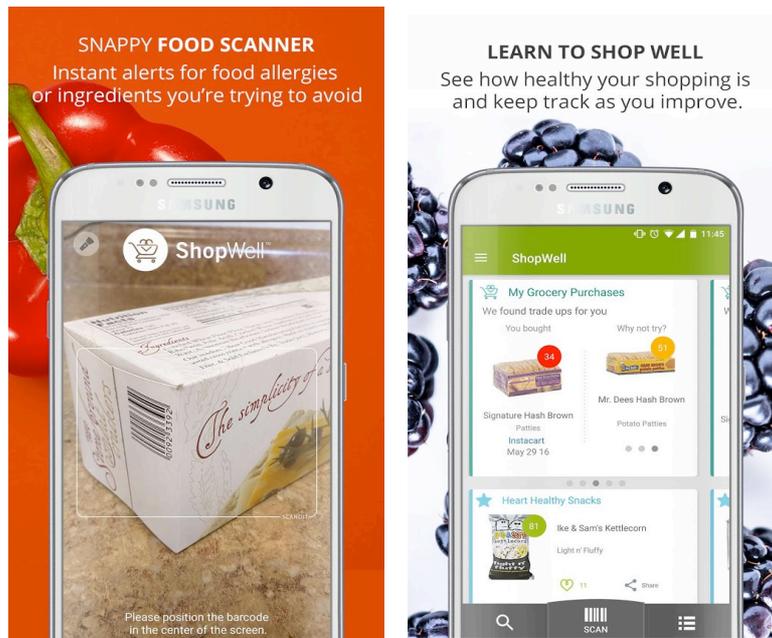


Food Connect is a delivery service in the Netherlands. Users can choose between a tailored meal, a frozen meal or even fresh groceries. This can be ordered via the website of Food Connect for individuals or groups. Food Connect delivers food to companies or residential facilities. Besides direct delivery, Food Connect also offers a meal vending machine. The web shop provides information about ingredients and possible allergies for each meal. It is also possible to adapt the portion size of the meal(s). Each ingredient is labelled with an icon, either indicating to be 'healthy', 'good' or 'delicious'. Furthermore, Food Connect is connected with VodiService. If questions about nutrition arise, users can contact a dietitian through a video chat system. Cordon Gris can be based on Food Connect in terms of the classification system. The meal delivery system has established a classification system on healthy, good and delicious meals. Cordon Gris can use it as a best practice example to build an appealing web shop system to order ready made meals. Food Connect offers a visualised design of ready made meals and visualises the process of tailoring its own meal.

3.6.3 Shopwell

Market: The Netherlands

Website: <http://www.shopwell.com>



ShopWell is a shopping assistant application that aims to help people to make more informed shopping decisions. At the store and with the assistance of the food scanner it is possible to get personalise nutritional information on the items users are about to buy. In order to have personalised recommendation users can register their health information (allergies, preferences, or health goals) in the application. ShopWell can also be linked with loyalty and rewards cards from stores to automatically retrieve the nutritional information of the purchases made using those cards. The integration with grocery stores loyalty and rewards cards is one of the interesting aspects of this solution in relation to Cordon Gris. Given the involvement of retail chains in the project, it would be worthwhile to explore how to integrate shopping history data with the recommendations made by the system.

3.7 Conclusions of section 3

Grocery delivery

The various applications that we have analysed aim to satisfy different needs and are targeted to different types of users. Supermercato24, Jumbo and Appie focus on the delivery of food directly from supermarkets: this is a service that would appeal to people that are used to shopping at a well recognised brand and want to benefit from the delivery of their shopping, without having to visit the store. Abel and Cole focuses on the same market, but differs from the previous solutions because they provide organic food items, which they sell exclusively online. Hello Fresh, Simply Cook, Blue Apron and Gousto are leaders in measured ingredients delivery in different markets: the value proposition behind these services is that users do not have to think about what to cook and they do not have to search for recipes, as this service does everything for them, including the delivery of food in the right quantities. The only solution that is targeted to the same users Cordon Gris addresses is Helping Hand, which has been produced by Red Ninja Studios (one of the partners of the consortium): the key differentiator of this solution is that the user interface is very easy to use and it increases the chances elderly people will use it as part of their shopping habits. Grocery delivery applications could benefit elderly people that lack transportation or have mobility issues. A growing number of platforms provide grocery and measured ingredients delivery. By using one of these services, elderly people can plan ahead what to eat, vary their diet and prevent malnutrition and inadequate food intake. Cordon Gris can learn from these applications, by offering recommendations as well as personalised diet plans based on each user's needs. The system should consider specific individual problems (such as allergies, oral and dental health issues, medication usage) in order to provide elderly people with a sustainable diet. Still, buying groceries online is not the top choice of consumers due to different reasons. According to a recent study, the main concern people interviewed cited for why they have never bought groceries online was their preference to pick the food they want themselves. In other words, for many users buying food, especially fresh products, remains a tactile, personal experience.

Ready meals delivery

The frozen ready meal service is well established in the UK and other parts of Europe with a number of service providers dominating the supply chain. These service providers target the elderly people's market. The model relies on customers having limited food choice due to poor health or social isolation and is offered as door-to-door service. As products, the frozen ready meals are of poorer food quality and contain numerous additives. Due to the lack of competition the meals are also sold at a relatively high price point. Outside the UK, other models such as UberEATS have started to appear, positioning themselves between a likely younger age group, who with their disposable income can choose restaurant prepared meals as an eat-at-home option. Taking a view on market opportunities, some models have aspects such as choice and convenience that are to be viewed positively. Healthy Creations (USA) appear to provide a service that has a stronger alignment with the health and wellbeing of the older customers who would require food to be delivered to their door. In UK supermarkets, there seems to be a growth in the fresh chilled take away meal category. Mixing the USA approach with the ongoing UK growth of fresh chilled meals could add value to customers (health and wellbeing) and if competitively priced, it is a category of product that could prove to be commercially viable.

Food tracking

There is a broad range of options in the market of food tracking and dieting applications, such as Noom, Nudge and EatThisMuch. However, the most established application in the market is MyFitnessPal. Despite all the differences between individual applications, overall these applications allow users to monitor their calories consumption by manually logging what they eat. However, the main issue with current food tracking solutions is the mechanism for registering food into the database. Current logging systems are quite cumbersome, since they require the user to manually input everything they eat throughout the day. The barriers to reliable food entry are also something to consider in the design of our solution in Cordon Gris, as people do not always know what and how much to enter in the food journal, either because it is difficult to estimate the quantities of what they cook or because they are entering food from restaurants or from meals prepared by friends and family. Food databases are not always reliable, and sometimes users just lose the habit of counting calories (Cordeiro, 2015). Some solutions in the market try to mitigate this problem by simplifying the amount of information that is required from the user, or by automating the process of entering food data. Nudge, for instance, only requires users to log from specific food groups and not the actual food. Another strategy to ease the process of logging food is the one used by the FoodProfiler application. Instead of requiring the user to compile a complete log of what they ate, the application tries to create a profile of the user's diet by randomly sampling the user and asking them to log what they ate in the last two hours. An application like Rise has a different model in which the effort is shifted to the application, or more exactly, to the nutritionists who are part of the service. Users only have to take photos of the food they eat, and the nutritionist will later analyse manually those photos in order to evaluate their diets and make recommendations. While none of the strategies used to ease the input of data is perfect, the goal is usually to balance the amount of information required by the system with the willingness of users to enter information. More information will allow for the creation of better nutritional profile, but on the negative side, it might lead to greater attrition in terms of the usage of application. Requiring less information will create an apparently incomplete profile, but can lead to more satisfying experiences and long term usage of the service. One of the main propositions of the Cordon Gris system is the ability to generate personalised meal plans based on the nutritional requirements, type of diet, food preferences, and personal goals of the users. However, most existing applications in the domain of nutrition are calories counting applications that require manual input. Based on the applications listed on this document, only the EatThisMuch app offers an option to automatically generate meal plans. Another opportunity in the market of dieting applications is related to the target group of the Cordon Gris project. Most applications seem to target people who are looking for an application to help them to lose weight. None of the applications, that we are aware of, target the needs of older adults in particular.

Activity tracking

This category has shown how extensive activity tracking applications are getting. From the early start of monitoring weight loss and kilometres run, activity tracking apps are becoming full personal health assistants. App developers are realising that health and wellbeing is a 24h a day process, thus apps are increasingly featuring other trackers, being food, sleep and medication. Activity tracking is therefore becoming more personal, more complete, more intimate and more important in the lives of people.

Food stock management

One important topic is how to manage stock and reduce waste. One example is the OptiMiam's app that sells fresh products as "flash exclusive offers". Other interesting solutions are Fruta Feia (Ugly Fruit) and Cabaz do Peixe (Fish basket) that aim to reduce food waste by local producers and fisherman. Food surplus or storage at consumers' home is another topic which is tackled by some food stock management services. Frigo Magic is one solution that aims to manage consumer's storage in the fridge and cupboard, by providing suitable recipes. Cabaz do Peixe is carrying out a similar idea. Related to that, NoMaggot helps users to manage their stock, by taken the product's expiration date into account. Slim Koken is an app that plans the portion size of the meal and provides recipes ideas for stored products. Local food movements – also known as Locavores – have been gaining some voice lately. In order to sell surplus in OptiMiam, a connection between local shops is created to optimise the food sales. Also, the Casserole Club intends to support local authorities and connects elderly people in a local setting. Fruta Feia (Ugly Fruit) connects the local shops in the sense that all small, big or misshaped products are gathered. Also, we have Cabaz do Peixe that aims to promote the sales of unpopular fish from local fishermen. Interestingly, Casserole Club particularly targets elderly people and combines the food sharing, food stock management with a social element, which at the same time decreases energy and time for cooking of only one person. In conclusion, food stock management services are part of a growing and important field, which Cordon Gris intends to tackle as well. By connecting local stores and neighbours with each other, the problem of food waste can be reduced. Social responsibility seems to play a big role in the various solutions, which can further be tackled by Cordon Gris.

Others

This section of the research takes into account solutions that showcase some of the diverse and innovative services that are available in the marketplace. Nowadays users are becoming more aware of the different possibilities technology gives them to automate and improve their lives. By knowing what an ingredient is composed of, users can make conscious choices before purchasing food items and they can also plan a balanced meal by selecting and combining the most appropriate ingredients. Applications such as Shop Well, allow the users to automatically get nutritional information by scanning the barcode of an item without the need to look at a small (and often incomprehensive food label) that lacks basic and clear information that certain users might need in order to eat products that fit their health requirements. Other applications such as Food Connect, allow users to search and buy different types of products from the same platform. This type of solution fits very well with our target market as elderly people do not tend to have a great relationship with the digital world. Therefore, it is probably easier for them to learn how to use an application and complete multiple actions from the same system rather than having to learn how to use different user interfaces.

4. Research projects

In this section we will outline research projects that relate to Cordon Gris. Since some AAL (Ambient Assisted Living) projects focus on nutrition or food-related solutions already, we identified four AAL projects that relate to the Cordon Gris approach. The general purpose of the AAL programme is to prolong the time people can live independently and healthily, by increasing their autonomy, self-confidence and mobility. Thereby, different stakeholders are addressed, whereby older or impaired elderly people, their informal caregivers and families are the focus of the solution and thus the primary target group. Formal caregivers, service providers and voluntary organisations are an important group as well and therefore identified as the secondary target group. We include four well developed AAL projects that specifically relate to nutrition. Thereby, we can identify current focus points, challenges and look for entry points. Since AAL projects are working cross-country wide it helps to generalise our results and draw a coherent conclusion. In the following, we will outline four AAL projects and set out for each project the relationship with the Cordon Gris approach. In the summary we address relevant topics that combine all four AAL projects.

4.1 Food4Me

The purpose of the Food4Me project is to develop a business model for personalised nutrition with technological advances. The aim of a recently conducted study was to assess the effectiveness of personalised nutrition via an internet intervention, in comparison to a conventional non-personalised intervention in a six-month randomised control trial. Results show that personalised nutrition advice was more effective in improving dietary behaviors than the conventional method. Phenotypic or phenotypic plus genotypic information have not affected the results. However, the results showed that personalised nutrition advice is effective and that the internet is an effective medium to provide the relating information (Celis-Morales, 2016).

Since the project shows that personalised nutrition advice is effective, it encourages the Cordon Gris project to take into consideration the use of personal and tailored advice. Furthermore, it shows promising results for using the internet as a medium. Market research within the project shows a business opportunity to establish dietary behaviour change. Thus, for Cordon Gris it amplifies the focus on personal and tailored advice and shows promising results to tackle lasting dietary behavioural changes.

4.2 Diet4Elders

The purpose of the project Diet4Elders is to prevent and detect malnutrition. The self-feeding activities of elderly people are tracked by a system: elderly's diet and related unhealthy behavioral pattern are the results of the analysis. Doctors and dietitians can adapt and re-plan the end-user's diet. An online automatic ordering service enables the right food for the end user. Marketplace services can register their services and offerings. All relate to the aim of providing a balanced nutritional intake (Taweel et al., 2016).

The state of the art report of the Diet4Elders summarises the current lack of well-designed food recommendation systems, which tackle malnutrition causes and contextual and circumstantial factors. Existing strategies miss to approach nutrition behaviour reasoning processes; and/or only offer a limited amount of nutrients included that for example only allow for losing weight; and/or miss to personalise specific nutritional profiles; and/or includes a system that is still dependent on a nutritionists who provide advice. Even though strategies that tackle nutrition exist, "a holistic approach to malnutrition and diet management that covers the entire lifecycle of a nutrition care process" (Taweel et al., 2016, p.226) still lacks.

The solution developed by the Diet4Elders Consortium includes services, which are tailored to the needs of the elderly people after screening. Thereby, unhealthy and healthy elderly people receive a personalised diet plan and are continuously monitored. Monitoring helps to compare to their actual food intake. By combining this to service functions, automated shopping is enabled. Actions relate to food ordering, feeding assistance and nutrition education. Implicit and explicit data acquisition strategies are used, whereby the latter one relates to self-reported data by the end-user. The former one relates to the use of sensors (Taweel et al., 2016).

Since the Diet4Elders project is part of AAL and relates to nutrition in order to prevent malnutrition, it is included in the current state of the art report. Even though the Diet4Elders project still needs to be further evaluated, it is interesting to mention the existence of the project and emphasises the need to develop a holistic approach to tackle malnutrition. The project combines personalised nutrition prescription, nutrition aware food ordering and nutrition education. Food ordering and delivery services are core to the project and contribute to a holistic approach to malnutrition. The project Cordon Gris can build upon and add to a holistic approach of including service providers, retailers, user data and food composition databases to offer a system supporting grocery shopping assistance, meal and activity recommendation. Even though the projects resemble in their system, the extended version of including service providers and retailers, based on a flat-rate approach, malnutrition can be prevented, but also food waste as well as financial and human resources can be reduced. Cordon Gris aims to act as a companion and additionally control supply and demand in an efficient way. Since the results are not evaluated to that point, Cordon Gris needs to stay updated to emerging research results in order to be aware about interesting research results that can be tackled and incorporated by Cordon Gris.

4.3 FOOD (Framework for optimizing the process of feeding)

The aim of FOOD is the development of specific AAL services, dedicated to the kitchen environment, to support elderly people in carrying out food-related daily living activities and interacting with home appliances in a much simpler, safer and rewarding way. The proposal addresses elderly people with a sufficient level of autonomy for independent life, if suitably supported. It aims at preserving and enhancing independence of elderly people in all aspects of daily life (addressing activities at home, security, health care control), to guarantee them the possibility of taking active part in the “self-serve” society (ability to access information and negotiate and or be supported for getting necessary items if mobility out of the house is a problem), and to secure social contacts and/or support, when necessary. The devised solution consists of a home-based system that enables elderly people to deal with feeding and food-related tasks in a safe, effective and rewarding way. It is based on the seamless integration of sensors, intelligent appliances able to offer functionalities in the house and internet based services and applications, able to give access, through a natural interface, to information and communication in different social environments. Its innovation lies in the integration and cooperation of Internet of things, Semantic Web and Web 2.0. The availability of relevant data from sensors on people and their environment and the cooperation of artificial and human intelligence through the network will contribute to support independence of people. Moreover, it is supposed that the quality of the end-users everyday life will improve not only due to the support in crucial activities in the house, but also for the possibility of interaction with the outside world both for practical purposes (e.g. ecommerce, e-government, etc.) and for socialising.

The project is related to Cordon Gris to the extent that it promotes independency in elderly people through the help of technology. It shows how different technology elements can be combined to ensure internal generation of data and advice (for example kitchen safety and recipe generation), as well as the external connection of integrating a neighbourhood community. The smart kitchen environment combines several variables by means of sensors, smart kitchen appliances and user interfaces. Cordon Gris and FOOD resemble in their companion approach, of offering recipes databases and shopping list options in a personalised manner. Whereas the FOOD project is more related to the direct kitchen environment, Cordon Gris also aims to facilitate grocery and meal deliveries and to reduce food waste. Thereby, Cordon Gris rather builds on integrating service providers in order to create a holistic environment, whereby food waste, financial and human resources can be reduced and used in an optimal way. Deliverables of the FOOD project show that during pilot testing, participants missed the feeling of being challenged. Frustrations were the results of not being challenged and malfunctioning of the application (Food, 2015). Therefore, Cordon Gris can learn from this and in the future integrate an open communication approach to integrate participant’s feedback to increase involvement.

4.4 ChefMyself

The goal of ChefMyself was to develop an automatic cooking solution to support elderly people in preparing meals and maintaining healthy eating habits. The system is based on a commercially available food processor that was adapted to the needs of older adults. The food processor was connected to the cloud and could be controlled remotely by a tablet with an interface specifically designed for seniors. The tablet interface was used to guide elderly people during meal preparation by guiding them step-by-step. In addition to meal preparation assistance, the system provides support on meal planning and grocery shopping, it offers a social component that includes the sharing of recipes, and a social network for communication between the users of the system. Fraunhofer Portugal and Unie KBO, two of the partners in the current Cordon Gris project were also part of the ChefMyself project.

Although the solution developed in the ChefMyself project was different from the purpose of Cordon Gris, both projects targeted the same audience and shared similar concerns and motivations with the needs of older adults. ChefMyself also tackled one of the technical problems that is going to be addressed in Cordon Gris, namely generating meal plans based on the user needs and preferences. Generating meal plans in Cordon Gris is arguably more complex, since it needs to accommodate for more variables – flat-rate, service providers, or user activity, but the end result is similar in both solution in this domain.

4.5 Conclusions of section 4

The results of the research projects are based on existing AAL projects, which emphasise the relevance to the target group of elderly people, the target of independence as well as ICT solutions. Results show that some AAL projects already specifically target food and nutrition related solutions that focus on personalisation. In this setting, personalisation is identified as a success factor for nutrition and food related solutions among elderly people. Particularly, this is revealed in the projects Food4Me that started in April 2011 and lasted four years, FOOD that started in September 2012 and lasted three years, ChefMyself that started in June 2013 and continued for two years and Diet4Elders project that started in July 2013 and lasted three years. All in all, all projects show how different technology elements are combined to ensure generating of data in order to provide personalised advice.

The outlined AAL solutions support users in their planning process. This includes features such as grocery shopping assistance that applies in Diet4Elders, FOOD and ChefMyself to recipes generating, applied in FOOD. It reaches from generating specific meal plans, tackled in ChefMyself and Diet4Elders to the idea of integrating food ordering and meal delivery services, as already applied in Diet4Elders.

Particularly applied to malnutrition, Diet4Elders also integrates the screening of malnutrition. Monitoring of nutritional behaviour is core to the system, but also relies on self-reported data. FOOD points out an approach for social interaction, as does ChefMyself, by allowing for communication between users, by means of a social network feature.

Even though the outlined AAL projects already focus on nutrition and food related practices to promote independency among elderly people, Cordon Gris will extend currently developed ideas, by building a holistic system that incorporates and aligns various variables in order to tackle the complex problem of malnutrition among elderly people. The complexity of the system lies on the integration of a complex network of service providers with behaviour monitoring, focussing on the innovative flat-rate approach, whereby supply and demand is controlled in an efficient way to reduce food waste, financial and human resources.

As not all the relevant case studies can be listed in this document and some might have been overlooked, the work started with this deliverable and summarized in the State of the art, will continue in Work Package 5 (D5.2 – Market research & technology watch). All the partners involved in that task will actively look for additional solutions that are related to the work being developed in the Cordon Gris project and we'll adapt our goals accordingly.

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