Final Report Summary - QUALIFY (Quantify Life – Feed Yourself)

Executive Summary:

1.1 Executive summary

Europeans have low compliance to dietary guidelines and recommendations, resulting in poor health and unhealthy ageing with public health campaigns not having the desired effects to improve the situation. A need for evidence-based tools and mechanisms to achieve sustainable changes in consumer attitude and behaviour concerning both food purchasing and eating habits was recognised. Consequently, better informed consumers will inevitably make better dietary choices based on personal preference, health status and assessment and motivational goals. A number of large and completed FP6 and PF7 projects (e.g. EuroFIR, NuGO, EURRECA, Eurogene and Food4Me) developed concepts and data infrastructures which served as background for the QuaLiFY project to make scientifically validated food and health datasets available to app developers to create a new generation of web-based tools and services.

Solutions for the provision of personalised dietary advice and self-quantification services available within the QuaLiFY Consortium and also non-invasive and minimally invasive quantification methods, available outside the consortium were identified. Selected tools were assessed by nutritional researchers and the lessons learned were used to further improve the methods and develop new services, some of which were directly integrated into the QuaLiFY Server Platform, the main outcome of the project, which was subsequently named Quisper platform. The wide variety of data available enables many different types of services, including provision of personalized dietary advice, food tracking services, menu planners and health assistants. It is feasible to use the server platform so that companies can extend the personalised nutrition services they currently offer.

The beta version of Quisper was implemented, and launched through the website http://quisper.eu. Quisper integrated several webservices for accessing food- and nutrition-related data and knowledge rules for personalized dietary advice. As data and information is coming from different sources, we have developed a methodology to harmonize the Quisper distributed knowledge. Quisper will serve as an important hub of the design of the new RICHFIELDS infrastructure on Food and Health Consumer Behaviour and Lifestyle that enables the EU research community to collate, connect and share innovative and existing research data on a
common data-platform, as well as the wider Food and Health RI framework.

Three field studies, each of them targeting a specific consumer / patient group (type 2 diabetics, overweight children and adolescents with eating disorders) were conducted. An integrated and personalized dietary advice service was designed and provided to each of them, and both health improvement parameters as well as compliance aspects were quantified, providing valuable input to improve personalised dietary advice and self-quantification tools and services.

One of the key goals of the project, apart from developing and testing in real life a joint personalised nutrition offering, was to assure that these offerings would continue to be available after the project was completed. Hence a specific work package explored business model concepts that could deliver these different offerings to potential end-users and assessed possible structures for partners to work together. In parallel, to the business development, the project has disseminated widely to key user and stakeholder groups including dieticians and future clients. The project thus successfully identified an acceptable business model concept for a digital platform through which data and knowledge rules can be offered and accessed by end-users to develop personalised nutrition services. In order to operationalize this concept the Quisper Foundation was discussed and it was launched in February 2016, under which the platform services will be offered by a subsidiary known as the Quisper Services BV. A holding company (Quisper Holding BV) in between the two allows for other initiatives related to its mission to be added while assuring the non-profit purpose of the foundation. Seven project partners have expressed their interest in joining the Quisper Foundation as founding partners and have been formally asked to join the foundation. Possible funding mechanisms were explored as part of the business plan for Quisper, ranging from subsidies from local governmental initiatives to a variety of national and EU-projects. Given the interest and substantial financial support from the North Netherlands Development Agency (NOM), it was decided to set-up the foundation in Groningen, Netherlands.

Project Context and Objectives:

1.2 Project context and objectives

1.2.1 Strategic Objective
QuaLiFY will optimise commercial personalised dietary and lifestyle advice services (henceforth personalised dietary advice) by exploiting a series of deliverables from previously EU-funded projects. The consortium SMEs are all involved in commercial application of evidence based personal nutrition services but, by working in isolation from one another, are each only able to cover limited aspects of individuals’ requirements.
QuaLiFY will allow the integration of these complementary commercial activities into complete services tailored for specific target groups.

1.2.2 Scientific and Technological (S&T) objectives
QuaLiFY has defined a focused set of S&T objectives that will be implemented directly through the research & development (RTD) work packages, namely:
1. Identify and scientifically assess best practice methods and technologies in Personalised dietary advice services and integrate tailored solutions for target group(s) (WP1)
2. Provide access to knowledge databases and technologies for professional and scientifically solid Personalised dietary advice services (WP2)
3. Provide a proof-of-principle ICT infrastructure (QuaLiFY Service Platform) that allows personal data handling (WP2)
4. Validate the functionalities of these solutions in a number of real-life environments (WP3)
5. Construct an ‘open innovation business model’ for SME commercialisation of personalised dietary advice activities (WP4)

Project Results:

1.3 Main S & T results/foregrounds

The work of QuaLiFY was organized into four RTD work packages. The first work package delivered an evaluation of tools, products and services currently provided in the area of personalized dietary advice systems. Work package 1 undertook the feasibility study on the integration with the QSP’ objectively evaluates the potential of QSP. Types of data and knowledge rules for personalised nutrition that can be offered include food composition data, different types of dietary advice, and dietary reference values. The variety of data enables many different types of services, including provision of personalized dietary advice, food tracking services, menu planners and health assistants. The server platform can also be used by companies providing biomarker analysis as an extension to their current analysis. Harmonization of QSP inputs and outputs will be necessary to increase the value of QSP services. A selected number of tools and services also have been tested in real-life human situation by the Nutrition Researcher Cohort (NRC). New NRC procedures
Work package 2 established the knowledge repository and made it accessible through the QuaLiFY Server Platform (QSP). QSP has a server proxy and two portals, i.e. the developer portal and the provider portal. As data and information is coming from different sources, we have developed a methodology to harmonize the Quisper distributed knowledge. The integration testing of Quisper as well as its validation in the QuaLiFY field labs was performed. QSP was presented at the Stakeholder meeting in Leuven (in September 2015), the European Nutrition conference FENS 2015 (in October 2015) and the final project meeting (in December 2015), where also stakeholders from both research and industry were invited. We have already received several requests for the QSP beta version testing from interested stakeholders. The key significant outputs included: (1) Web services to access EuroFIR food composition data and reference values; (2) SafeCape knowledge rules; (3) VivSan German/Austrian/Swiz reference values and Food4Me decision trees were designed, documented and integrated with QSP; (4) The QSP front-end, developer portal and the provider portal were designed and implemented; (6) The NRC portal was developed and connected to QSP as a client app and validated in the TNO field lab; (7) OPEN (http://openl.eu) was connected to QSP as a client app and applied in the TNO field lab; (8) A methodology for the harmonization of QSP data and knowledge rules was developed and supported by the Quisper harmonization webservice; and (9) QSP usability assessment was performed.

Work package 3 performed three field studies, each of them targeting a specific consumer / patient group (type 2 diabetics, overweight children and adolescents with eating disorders). An integrated and personalized dietary advice service was designed and provided to these in a study design, and both health improvement parameters as well as compliance aspects were quantified. For the eating disorder group, no ethical approval was obtained, thus involvement of patients was not possible. Testing had to be restricted to the software, without including patient data. The other two field labs were successfully completed.

Work package 4 successfully completed the collaborative business development process with the agreed set-up of a non-profit organisation, i.e. the Quisper Foundation which will hold the operating structure for the digital information platform to support the development of personalised nutrition offerings. A preliminary set of data and knowledge rules to be offered through the platform has been agreed. Two business development events have shown the interest of a larger group of potential end-users and provided input for further development of the platform and the operational structure for the services. The success is largely due to the set-up of a Business Development Team, a dedicated group consisting of four partners who were given the task by the General Assembly to design solutions for the organisational and operational structure of the platform.

1.3.1 WP1
1.3.1.1 Objectives

• Assess solutions for personalised dietary advice and self-quantification services available within the QuaLiFY Consortium
• Identify and assess new non-invasive and minimally invasive quantification methods that would be of great benefit for the participating SMEs
• Identify best practice methods and technologies that allow use of multiple services in applications, thus allowing optimal use of an integrated ‘toolkit’ by all SMEs (to be developed in WP2)
• Provide improved services to the field labs (WP3)

Personalised dietary and lifestyle advice relies on the quantification of individual parameters (sex, age, weight, height, physical activity level, genotype, phenotype, dietary status, health status, etc.). Many novel tools and services that support such advices are becoming available and these will be assessed, integrated and valorised. The following tasks focus on solutions that support the QuaLiFY target groups, i.e. obese children (age range 8-14), children with eating disorders, and type 2 (pre)diabetes patients.

1.3.1.2 Description of work and outputs
Task 1.1
A questionnaire for collection of information on personalised dietary advice solutions available within the consortium was developed by IFR in collaboration with VIV, and was sent to all WP1 partners for completion. Results were compiled into an Excel database and recirculated to the WP1 partners for checking and clarifications. A full summary report was compiled by the task leader (IFR) and the
The report (D1.1) was circulated to all partners so that the results fed directly into further project tasks. Fifteen solutions were identified, which could be broadly categorised into services aimed at researchers and health professionals (e.g. databases, algorithms), and devices or technologies directly targeted to the individual (e.g. mobile apps). 10 of the solutions were already available to end users, though only one free of charge to patients. A broad range of services from dried blood spot kits through to recipe calculation tools were identified for further assessment by the Nutrition Researchers Cohort (NRC). The majority of solutions that are directly available to individuals for monitoring and recording diet/activity/health are mobile/tablet/web applications. Only one app had an associated external device (weighing scales), although some may be able to connect with other commercially available devices. A list of these potential external gadgets was collated as part of Task 1.2 and reported in deliverable D1.2.

Task 1.2
An online solution to collect information on existing and evolving invasive and non-invasive technological gadgets which are not available within the consortium and are relevant to dietary assessment, physical activity, genotype or health was developed by the VIV team, in collaboration with IFR. Information on 105 different devices or apps was collated by VIV and structured into different subgroups, according to the parameters measured, for checking by the NRC and other partners. The different parameters measured by the gadgets were grouped into the following types: urine (2), blood (38), faeces (0), skin (2), breath (7), physical activity (32), sleep (38), food intake (47) and other (11). The major problem with the solutions identified was that the great majority did not have enough scientific backing and there were very few studies conducted using these gadgets in a scientific setting. A summary report was compiled by VIV and access to the online solution was given to all partners to provide relevant information for the scientific assessment of available solutions (Task 1.3).

Task 1.3
The assessment of solutions for personalised dietary services and self-quantification (within and outside the Consortium) depended on NRC processes, which were external to the project, and on the lengthy ethics approval process required. The documents necessary for ethical applications were reviewed, collected and reported in deliverable D1.4 and were tested first in Finland, followed by a 'rolling out' in other countries. By the end of the project ethical approval had been obtained in: Finland, Czech Republic, United Kingdom, Ireland, the Netherlands, Austria, Italy, Switzerland, Spain, Belgium and France. A protocol was also submitted in Germany. Pros and cons of the various phenotyping devices were included as part of deliverable D1.3 and it was concluded that all participants should ideally use one type of monitor.

The NRC study setup for the assessment of tools recruited approximately 200 participants from countries where ethical approval had been obtained. Tools that were assessed included: the Vitas dried blood spot tool; the SwissAnalysis clinical chemistry package; a dried-blood spot based metabolome analysis tool; the TNO “do-it-yourself“ oral glucose tolerance test; the TNO “do it yourself“ microbiome assay; the FatSecret food intake quantification tool; the 23andMe 1M SNP analysis tool. The recruited participants collected samples using the sampling methods and manuals provided by the testing labs. The sampling protocols and the use of the collected data for personalised food advice were evaluated by the NRC participants and QuaLiFY partners. The lessons learned were used to further improve the methods and develop new services, some of which were directly integrated into the Quisper platform. The first assessment results (from Switzerland, Netherlands, Norway) were used to optimize the approach specifically in the TNO field lab, which used several of the self-quantification tools to provide personalised dietary advice for T2D patients. A first version of the dietary advice was also made available for the NRC250 participants (all nutritional researchers) and they were asked to provide suggestions for improvements, in order to make the tools and dietary advice suitable for a general 'healthy' population. The dietary advice was based on food intake (FatSecret) and phenotypic data obtained from Vitas. Results of the NRC assessment of tools were reported in D1.7.

Task 1.4
Details of which services need to be integrated with the QuaLiFY Server Platform (QSP) were collected. The integration of tools available within the consortium, as listed in Deliverable D1.1 started with integrating the web services from EuroFIR (FoodExplorer, Foodbasket) and Safecape (EUROGENE), because those services had APIs in development or were already available (the actual integration of these services within the API management system was part of Task 2.3). To enable integration of tools used in the field lab studies with QSP, key tasks included:

- Publication of NRC code on https://github.com/TNO/NRC to enable easier collaboration amongst developers.
- Extension of the connection between NRC and Human/API, to enable importing of data from within MediSana tools, for use in the fieldlab.
- Developing the NRC tool to enable direct data import by external partners (e.g. Vitas and SwissAnalysis).
- Enhancements were made to link stored data to external databases (e.g. HMDB).
The potential of QSP and outcomes of the feasibility study on the integration with the QSP were reported in deliverable D1.6. Types of data and knowledge rules for personalised nutrition that can be offered include food composition data, different types of dietary advice and dietary reference values. The report concluded that the variety of data enables many different types of services, including provision of personalized dietary advice, food tracking services, menu planners and health assistants. The server platform can also be used by companies providing biomarker analysis as an extension to their current analysis. Harmonization of QSP inputs and outputs will be necessary to increase the value of QSP services.

1.3.1.3 Sustainability and/or contribution to personalised dietary advice tools and services
Solutions for the provision of personalised dietary advice and self-quantification services available within the QuaLiFY Consortium and also non-invasive and minimally invasive quantification methods, available outside the consortium were identified. Selected tools were assessed by NRC and the lessons learned were used to further improve the methods and develop new services, some of which were directly integrated into the Quisper platform. The wide variety of data available enables many different types of services, including provision of personalized dietary advice, food tracking services, menu planners and health assistants. It is feasible to use the server platform so that companies can extend the personalised nutrition services they currently offer. Harmonization of QSP inputs and outputs will be necessary to increase the value of QSP services.

1.3.2 WP2
1.3.2.1 Objectives
Develop and provide ICT solutions for professionalism of SME activities in Personalised dietary advice services, leading to an integrated a personalised dietary advice open platform based on all relevant knowledge, information and personal data, and a connection point between subjects and their dieticians, thus optimally empowering the subject
• Establish knowledge bases on genotype-phenotype-nutrition relationships in Personalised dietary advice services for use in SME-driven personal dietary advice systems
• Identify gaps especially considering genotype and phenotype data
Dietary advice needs to be based on solid scientific and evidence-based knowledge. On top of this, personalised dietary advice needs to be presented in a sympathetic, easily understood and inspiring manner, to the right target group, and in the right format, if used by service applications (e.g. web-based and mobile applications). WP2 extended the (a) various knowledge bases available on relationships between nutrition and genotype, health status, food composition, biomarkers, etc.; and (b) algorithms to translate multiple parameters (genotype, phenotype, dietary intake, physical exercise, etc.), which have been created by EuroFIR, NuGO, EURRECA, Food4Me etc., and other projects, to these requirements and provided them for the QuaLiFY SME Consortium in the form of integrated ICT solutions. Thus, WP2 had two major activities: firstly, to develop and disclose these knowledge bases in Personalised dietary advice services (Tasks 2.1 and 2.2) and, secondly, to develop and provide ICT solutions for professionalism of SME activities in Personalised dietary advice services (Task 2.3).

1.3.2.2 Description of work
The QSP knowledge repository was established and is accessible through the QuaLiFY (Quisper) Server Platform (QSP):
• EuroFIR web service providing data about generic food composition – developed by EuroFIR and JSI;
• SafeCape web service for accessing the distributed knowledge base maintained by the EUROGENE service containing validated genotype-phenotype-nutrition associations – developed by SafeCape;
• VivSan web service to access D-A-CH dietary reference values – developed by VivSan;
• PDAS (Personalized Dietary Advice Service) web service based on the Food4Me level 3 advice, based on food intake, biomarkers and genotyping – developed by theHyve and TNO;
• EuroFIR webservice to access European dietary reference values (for Germany, Austria, Switzerland, Slovenia, Czech Republic, Italy, UK, Nordic countries, EFSA) – dietary reference values were collected by EuroFIR and the webservice was developed by JSI;
• VitalinQ (IPH) webservices – developed by VitalinQ;
• FoodWiz webservice – developed by FWiz;
• Webervices providing Vitas and SwissAnalysis analytical results for biomarkers – the VITAS webservice was developed by Vitas and the SwissAnalysis webservice was developed by Sonce.net under supervision of SwissAnalysis.
• SafeCape webservice was adapted to the REST protocol – done by SafeCape.

The beta version of QSP was implemented and launched through the website http://quisper.eu. QSP has integrated several webservices for accessing food- and nutrition-related data and knowledge rules for personalized dietary advising:
• The 3scale system has been used as the central part of the QSP. This hosted system (https://qualify-admin.3scale.net) contains all administrative functionality that is needed to manage the APIs – by the Hyve. Other WP2 partners contributed to design;
As data and information is coming from different sources, we have developed a methodology to harmonize the Quisper distributed knowledge. The integration testing of Quisper as well as its validation in the QuaLiFY field labs was performed. QSP was presented at the Stakeholder meeting in Leuven (in September 2015), the European Nutrition conference FENS 2015 (in October 2015) and the final project meeting (in December 2015), where also stakeholders from both research and industry were invited. We have already received several requests for the QSP beta version testing from interested stakeholders.

1.3.2.3 Outputs

D2.1 Distributed knowledge database on genotype-phenotype-nutrition relationships: Due date of deliverable was M9 and it was compiled by JSI and VIV on M11. As partners from the Consortium were involved in several EU-funded projects and Networks of Excellence (EuroFIR, NuGO, EURRECA, EUROGENE, EURODISH and Food4Me) focused on nutrition and food, basic knowledge was extracted from evidence-based data and information resources (Section 2 / Tab. 1) developed by these projects. Identified gaps in this knowledge was filled with knowledge collected from SME partners through development of existing dietary assessment and self-quantification tools (Section 3 / Tab. 2). However, as knowledge coming from SMEs was not proven to be evidence-based, it had to be validated by the QuaLiFY Expert Group before integration with basic knowledge.

D2.2 Implementation of first version of QSP: Due date of deliverable was M14 and it was compiled by the Hyve on time (on 6th March 2015). D2.2 reported the implementation of the first version of the Quisper Server Platform (QSP). User and technical specifications of QSP were prepared and several open source API management systems were identified. These were validated, compared and the best candidate (3Scale) fulfilling all the user and technical requirements was selected. In order to test it, several web-services were implemented and connected them to the QSP through so-called Application Programming Interfaces (APIs). The administrative system provided within 3Scale was validated and upgraded with developer and provider portals. QSP will be accessible through the QuaLiFY website; the connection has been designed and mocked-up. First client applications, developed to support the QuaLiFY field labs, were connected to QSP.

D2.3 Documentation for QSP: Due date of this deliverable was M23 and its first version was prepared by JSI before the final meeting. In D2.3 documentation about the QSP is provided. QSP supports development of new ICT-based solutions for personalized dietary advising by providing easy access to a set of webservice, bringing together data and knowledge about food and nutrition. Firstly, the general concept of QSP is briefly presented in this deliverable. Its architecture relies on a proxy server and portals for developers of new client applications as well as for webservice providers. Secondly, webserving providing access to data and knowledge, gathered by various EU projects (e.g. EuroFIR, NuGO, Eurogene, Food4Me etc.) and SMEs are briefly described. We also present a webservice for semi-automated harmonization of terms and concepts used in QSP webservies, which relies on the Quisper taxonomy and ontology. Then, several client applications that were developed in the project to validate the QSP concept in the field labs on obesity and eating disorders in adolescents and diabetic adults are presented. Finally, needs for further research based on identified gaps concerning genotype and phenotype data are discussed. Results of testing QSP are also provided.

D2.4 Final implementation of QSP: Due date of this deliverable was M23 and its first version was prepared by the Hyve before the final meeting. In this public deliverable, detailed documentation about QSP is provided. Firstly, the architecture of the platform and configuration of the proxy server are explained. Then, the administrative management system of the platform is briefly described. The developer portal, which is the entrance point for developers using the QSP webservies, allows developers to apply for one or more webservies. The developer portal is visually integrated with www.quisper.eu. The provider portal will be used by providers of datasets or knowledge rules. In the portal the providers can see statistics and handle webservice users. Finally, the user manuals for the...
administrative management system, the developer portal and the provider portal are provided.

1.3.2.4 Sustainability and/or contribution to personalised dietary advice tools and services

EuroFIR and IFR performed discussions with EURODISH, i.e. the FP7 project developing the roadmap for food and health research infrastructure. The project RICHFIELDS is a H2020 continuation of EURODISH with an objective of designing a world class research infrastructure (RI) on Food and Health Consumer Behaviour and Lifestyle that enables the EU research community to collate, connect and share innovative and existing research data on a common data-platform. The QuaLiFY (Quisper) Server Platform will serve as an important hub of the RICHFIELDS infrastructure.

1.3 WP3

1.3.3.1 Objectives

The objectives of WP3 was to implement and evaluate a series of integrated Personalised dietary advice services based on non- and minimally invasive measurements (such as food intake, lifestyle assessment, pheno- and genotyping) and provided through the QuaLiFY Service Platform, for three target groups: (1) (pre-) obese children and adolescents, (2) children and adolescents with eating disorders and (3) type 2 (pre-) diabetes patients. This is tested and implemented in a series of targeted pilots. In the end the business models related to these implementations are being tested and validated.

1.3.3.2 Description of work

A series of integrated personalised dietary advice services based on non- and minimally invasive measurements (such as food intake, lifestyle assessment and pheno- and genotyping) and provided through the QuaLiFY Server Platform were implemented and evaluated for three target groups: (1) (pre-) obese children and adolescents, (2) children and adolescents with eating disorders and (3) type 2 (pre-) diabetes patients.

Field-lab 1 - Pre-obese and obese children and adolescents

Field study 1 tested a Smartphone App (FoodWiz2) developed by Food Angels UK Ltd. (Newmarket, UK). The app was designed to allow users to record intake of food products by either scanning barcodes for branded products or searching an embedded database of branded and generic food products available in the UK. The app also allows users to record duration of physical activity, which could be selected from an extensive range of activities. Recording physical activity, in addition to food intake, allowed users to receive instant feedback on their overall calorie balance or against a targeted daily energy intake allowance. The aim of the field study was to assess the ease of use, acceptability and perceived effectiveness of FoodWiz2, and to test a Smartphone app approach for the measurement of food intake and exercise in adolescents compared with a more traditional paper-based food diary approach. At the end of each phase of the study, participants were asked to complete an online questionnaire about patterns of use, attitudes to the interventions, and their perceived impact on dietary and physical activity behaviour. An additional section was completed at the end of the app phase to assess attitudes to features of the app.

Field-lab 2 - Children and adolescents with eating disorders

VIV implemented its vitakid food and health platform in a clinical setting to assist clinical personnel (dietitians and caretakers) to deliver personalized dietary advice for children and adolescents with eating disorders. The focus was on technical implementation, as ethics approval could not be obtained, as strict guidelines for the German national data privacy and IT-security legislation have to be met for IT applications in clinical settings. During the course of the project, VIV achieved eligibility to work with governmental institutions with the implementation of BSI-Standard 104. BSI-Standard 104 is a data security standard which has to be fulfilled by entities working with government institutions in Germany. It comprises legal and IT aspects primarily within an organization. Corresponding process adaptations/ alterations on VIV's side were also successfully implemented (e.g. Notfallplan [emergency plan], etc.). Rearrangements during the final months of the project, due to newly passed legislation in July 2015 (IT-Sicherheitsgesetz), which classified clinics / hospitals as a “critical infrastructure” and put higher data and IT-security measures into place, were handled successfully by VIV.

Field-lab 3 - Type 2 (pre) diabetes patients

Field-lab 3 applied a personal dietary advice system in a pilot study for diabetes mellitus type 2 (T2D) patients who were under the management of dieticians. The main research question for this pilot study was whether personalised dietary advice (PDA) could contribute to the improvement of T2D patient metabolic health. The PDA was based on Food4Me algorithms, which were adapted for this pilot-study. 28 patients (16 interventions - 12 controls) with T2D were recruited. Several tools and devices were used to obtain value for biomarkers of risk, genetic information, body measurements etc. These measurements where used as input for the Personalised Dietary Advice Service, an IT service that was connected to Quisper and able to generate PDA automatically. After the pilot study, the
dieticians were interviewed about their experience with the different tools and services, the PDA, study portal and the study.

1.3.3.3 Outputs
D3.1 Report on initial set of tools needed for integrated Personalised dietary advice. Some of the personalised dietary advice services that were identified by WP1 and WP2 were applied in three field-labs (WP3). This deliverable 3.1 reported on the initial set of tools that were needed for integrated personalized dietary advice within the field-labs.

D3.2 Report on the optimal package of integrated personal dietary advice tools for each target group. Services, methods and processes were previously identified use in three real-life scenarios (field labs), which are of prime importance in re-gaining optimal “health with a major dietary influence”, for (pre) obese children and adolescents, children and adolescents with eating disorders, and (pre-) diabetic adults. For each of these target groups the optimal package of personal dietary advice tools was designed. Field lab 3.1 put a focus on monitoring, dietary intake quantification, feedback and coaching system and developed these for (pre) obese children and adolescents considering UK legal circumstances. Field lab 3.2 for children and adolescents with eating disorders in a clinical setting planned to focus on monitoring, dietary intake quantification, work process integration and data security compliance, whereas field lab 3.3 focuses on diagnosis based on non-invasive and minimally invasive pheno- and genotyping methods, monitoring, dietary intake quantification, feedback and coaching system.

D3.3 Ethics documents to national data protection authorities related to the three fieldlabs. This deliverable contains the ethical documentation for the different field-labs as they were, or were planned to be filed with the relevant authorities. Although the Local Ethics Committee approved the study protocol for the field-lab for (pre-) obese children and adolescents in November 2014, a change of Chief Investigator lead to renewed approval before recruitment could begin. For the second field-lab on children and adolescents with eating disorders in a clinical setting, ethical documents had not yet been sent to the Medical Ethical Commission (MEC) at the time of preparation of this deliverable. The third field-lab studying the impact of personalised dietary advice services among type-2 diabetics filed the protocol on 12th January 2015 and received approval.

D3.4 Report on lessons learned on integration, use and business models for each target group. This deliverable includes the results and feedback from the field labs for the three target groups: (1) (pre-) obese children and adolescents, (2) children and adolescents with eating disorders and (3) type 2 (pre-) diabetes patients. Field-lab 1 demonstrated that an app to record food intake and physical activity could be useful for adolescents where lifestyle education might have a significant impact on health in later life. Field-lab 2 had to focus on technical implementation, as ethical approval could not be obtained in time. Field-lab 3 provided important insights into improvements for both integration with Quisper, as well as the business model for personalised dietary advice for dieticians. Dieticians saw real added value in the measurement of genetics and blood biomarkers. Based on the field study, the dieticians expressed interest in Quisper as part of their specialised dietician software/ portals used to track and advise patients.

1.3.3.4 Sustainability and/ or contribution to personalised dietary advice tools and services
Field-lab 1 tested a Smartphone App (FoodWiz2), which was designed to allow users to record intake of food products by either scanning barcodes of branded products or by searching an embedded database of branded and generic food products available in the UK. The App also allows users to record durations of physical activity selected from an extensive range of activities. Recording physical activity in addition to food intake allowed the user to receive instant feedback on their overall calorie balance or against a targeted daily energy intake allowance. The FoodWiz dataset has been integrated into the Quisper platform and provides access to compositional data of UK branded and generic foods as well as to their meta data (e.g. EAN barcodes). The field trial demonstrated that an app to record food intake and physical activity could be particularly useful in adolescents where lifestyle education at a relatively young age could have a significant impact on health in later life.

Field-lab 2 implemented the vitakid food and health platform into a clinical setting to assist the clinical personnel in implementing software which helps dieticians to deliver personalized dietary advice to children and adolescents with eating disorders. The focus was on technical implementation, as ethics approval could not be obtained, as strict guidelines for the German national data privacy and IT-security legislation have to be met for IT applications in clinical settings.

Field-lab 3 applied a personal dietary advice system in a pilot study for diabetes mellitus type 2 (T2D) patients that where under control of dieticians. The main research question of this pilot study was whether Personal Dietary Advice (PDA) could contribute to the improvement of the metabolic health of T2D patients. The PDA was based on the EU project Food4Me algorithms which were adapted for this pilot-study. For this study, 28 patients (16 interventions - 12 controls) with T2D under control of a dietician were recruited for participation. Several tools and devices were used to obtain (blood based) biomarkers, genetics, body measurements etc. These
measurements where used as input to the Personalized Dietary Advice Service, an IT service that was connected to the Quisper service and is able to automatically generate PDA. During the pilot, participants were asked about their experience with the tools and services, after the pilot study, the dieticians were interviewed about their experience with all the different tools and services, the PDA, study portal and the study itself. The lessons learned were used in the development of further related services. Based on the field study, the dieticians expressed interest in the integration of the Quisper service in their specialized dietician software/portals that the target group uses to follow and advice patients.

1.3.4 WP4
1.3.4.1 Objectives
The objectives of Work package 4 were 1) to facilitate the collaborative development of a business model concept to support personalised nutrition offerings for end-users and 2) to prepare structural and operational aspects in order to ensure sustainability of this business model. The ultimate goal of the WP4 was thus to prepare for an agreement between the partners on the business model, the business plan, the architecture, legal framework and procedures for a cooperative business that can continue the activities in real life after the completion of the project.

In order to achieve this, shiftN performed a number of specific roles. It had a designer role helping partners think through the various possible collaborative business model concepts. ShiftN was also a facilitator developing a realistic framework for business cooperation between the partners, based on the agreed business model and reflecting the partners’ wishes with respect to their roles and value exchange. And finally shiftN had a monitoring and observing role with the aim to record, analyse and distil guidelines about the collaborative open innovation and cooperative business development process. This guidebook can to be used by SMEs and other organisations wishing to embark on a similar process, whether under the EU grant framework or not.

WP 4 was divided into three main tasks. One of the tasks was business model development for collaborative products and services in personalised dietary advice, focusing on what products and services would be offered to whom. A second task focused on process design and management, defining on how the partners would work together in order to deliver this business model. This covered several elements like: roles of each partner in the cooperation, the legal structure and operational procedures as well as the business plan. The third task finally focused on the guidebook.

1.3.4.2 Description of work and outputs
Setting the legal framework (Jan 2014)
One of the first tasks accomplished was the development of a legal checklist that could be considered as a comprehensive list covering all the typical issues for the future cooperation of QuaLiFY partners. It was performed at the very beginning of the project. This list has subsequently been used as a guideline for discussions with the partners with the aim to define the business model concept, the activity model describing the activities and which partner will do what and the legal structure & operational procedures. The list ensures that no topic was disregarded.

Developing the business model concept (Jan – Sept 2014)
It was decided to start the business model development process at the kick-off meeting in January 2014 when all the partners were together for the first time. Despite the fact that partners were still unfamiliar with each other, it was felt that the process would benefit from a joint process improving common understanding of what each partner could offer and was aiming for with regard to the business models. The result was a first structured overview of the potential QuaLiFY business model elements.
From February till June 2014, individual discussions with each partner took place to further develop the business model concept. The result was presented and agreed upon at the 2nd Consortium meeting (September 2014). Figure 1 (separate document) summarises the business model concept: a convenient one-stop shop where all the necessary and scientifically valid data and knowledge rules are available through a single interface and with the assurance of data coherence between the various sources. Future customers are thus not consumers of personalised nutrition offerings but SMEs, companies and organisations offering these services or with linkages to it as well as companies and organisations doing research related to it.

Defining the legal structure (Q4 2014 – Dec 2015) building on the mission and vision
At the 3rd Consortium meeting (January 2015), potential legal structures were presented. Work was done in the second half of 2014 to prepare for this. EuroFIR, as well as other non-profit organisations, were researched for as examples. However it became clear that the partners were looking for a mission and vision before deciding onto the desirable legal structure. This was subsequently developed at the Consortium meeting itself, and became the basis of any further work.
The mission was described as: the cooperation strives for an enhanced public health by making scientifically sound data and knowledge rules, related to personalised nutrition and lifestyle advice, publicly available through a digital platform. It envisages a future where all people are conscious about what they eat and how they live. Its ambition is to ensure proper scientific data and knowledge rules are applied by all organisations and companies providing personalized dietary and lifestyle advice or using it for their own research or product or service development purposes.

Based on this mission and vision, it was obvious to aim for a non-profit organization. Given hands-on experience from one of the partners, EuroFIR, an International Association based in Belgium (AISBL) was further explored. Statutes were drafted (legal contract model). This however was stopped at the end of November, following the interest of an external investor (NOM, Investment and development Agency for the Northern Netherlands). This lead to a change of the non-profit legal structure, the choice was made for a Foundation based in the Netherlands (Groningen).

Defining activities and exploring the role of each partner in the cooperation (Q4 2014 – Dec 2015)
From the early stages of the project, partners were asked what activities they envisaged themselves doing in a future cooperation, and where they wished to play a leading role. This was subsequently mapped with the Activity Model shiftN developed. This Activity Model provided an overview of all the activities required to effectively deliver the business model concept. At the 3rd Consortium meeting (January 2015), discussions took place to further fine-tune this. From these discussions it became apparent which partners wanted to play an active role in running the platform, and which partners rather considered themselves as providers of data and knowledge rules or as users of these, or providers of ancillary services. Based on this the members of the members of the business development team were chosen in the 4th Consortium meeting. This team was set up to bring the business model concept into reality, building the work done in the first 18 months.

Summarised, in order to achieve its' mission, Quisper will do a number of activities (Figure 2). On the one hand the focus is on ensuring users get easy and fast access to scientifically validated data and knowledge rules as well as supporting services (Activity 1, 2 and 3). On the other hand it is crucial to promote and disseminate Quisper to a wide group of stakeholders, with the aim to attract more users, to attract new suppliers and to attract additional funding for further development (Activity 4 and 5).

Defining & further developing the detailed offering (Q4 2014 – Dec 2015)
A first pre-view on the data and knowledge rules each partner could offer was developed in the second half of 2014. From January till June 2015 the focus was on better understanding these different data and knowledge rules and on facilitating discussions on further potential integration of them. This led to a better understanding amongst the partners of what each partner could offer and how they could work together to develop integrated knowledge rules. During the second half of 2015 further work was done on this. The current status is that six database and three knowledge rules are available; In the near future two additional databases and two additional knowledge rules will be made available.

1.3.4.3 Sustainability and/ or contribution to personalised dietary advice tools and services

Moving from business model concept to reality (June 2015 – Dec 2015)
At the 4th Consortium meeting a decision was taken to set up a business development team with the specific task to ensure sustainability of the business model concept. shiftN coached the team. On the one hand the team explored two possible external investment routes, Leuven and Groningen. On the other hand, more hands-on input from potential customers was sought in a business development event in Leuven (BE). In addition, further work was done on the statutes of the legal structure AISBL, and a business plan was drafted including a financial plan and potential organisational set-up.

Based on the latter input, partners were asked whether they were interested to join the co-operation. More than half of the partners showed interest, which was a good basis for discussions with the NOM. Early December, the NOM clearly confirmed its interests; Final negotiations took place end of December. February 4th 2016, the Foundation named Quisper was set-up with NOM and 7 partners from QuaLiFY as founding members.

Developing the guidebook
The different steps described in the description of work were finally used as structure for the guidebook. This was done at the end of the project. During the full period of the project, monitoring and observation took place, providing the necessary input on lessons learned.
Potential Impact:
1.4 The potential impact

During its two-years of activity (2014-2015), QuaLiFY has demonstrated how data and knowledge from publicly funded projects can be used for personalised dietary advice services and the necessary functionality, established a not-for-profit business model for supporting such an infrastructures (Quisper), and secured investment that will allow further development and commercialisation by prior partners (Founding) and future (Ordinary) member organisations.

Participation has raised the profile of research partners (JSI – SI, IFR – UK and TNO – NL) not only within the research environment, but also amongst biotech SMEs and healthcare professionals, and broadened recognition as leading research centres for personalised dietary data and knowledge and IT infrastructure. Together, these have increased networking opportunities, within and beyond the consortium, knowledge transfer, and the potential for exploitation through joint publications (pocket-sized scales and portion sizes), conference proceedings (e.g. FENS 2015) and future research projects (e.g. H2020 RICHFIELDS – Grant Agreement No. 654280).

QuaLiFY has also impacted the research and innovation potential of individuals, partner organisations and Member States, especially Slovenia, through dissemination of knowledge about information technology architectures and web-services for personalised dietary advice services, and application of this knowledge by stakeholders (e.g. biotech SMEs, healthcare professionals) for the benefit of European citizens. For example, a novel approach for semi-automatic harmonisation and interoperability data and knowledge lead to the development of a standardised taxonomy and ontology as well as new web-services. These will allow future research in this field to generate, access and disseminate robust, comparable data and knowledge for personalised dietary advice from a variety of sources.

Importantly, the three research centres have extended their experience of collaborating with SMEs, which are more immediate (shorter term planning, e.g. 1-3 years compared with 3-5 years), and responsive to market needs and requirements. As a result, these research organisations have been able to identify gaps in data and knowledge required for personalised dietary advice and, by gathering together existing data and knowledge, they have also learnt more about the needs for advanced research methods, and interoperability data and knowledge. By contributing to development and continued use of the QuaLiFY Server Platform, these research organisations will advance the research quality and performance of Quisper, underpinning its potential for exploitation in personalised dietary advice services and tools.

Unlike existing commercial activities for personalised dietary advice, few of which are science-based or address only individual aspects of interest/ concern (e.g. steps per day, calories consumed), QuaLiFY has added value to data, knowledge and technology generated with EU-funding by enabling exploitation. More specifically, QuaLiFY has supported access to data and knowledge for personalised dietary advice by application developers, and empowered developers to create applications that make use of scientifically valid data and knowledge. The design and accessibility of the QuaLiFY Server Platform encourages and supports application development by large enterprises and independent developers. The proxy-server, and developer and provider portals are Open Source Software, which means the source code is available for everyone (with an Affero GPLv3.0 license), and can be examined, amended and further distributed. This means the major output from QuaLiFY benefits not only the partners, but also the wider biotech and IT sectors. QuaLiFY has shown how future innovations can be included, and explored the mind-set of organisations involved in this sector whether IT-, research or health-orientated; overwhelmingly, the prefer business model was not-for-profit even amongst SME partners that want to generate revenue, but also benefit society and citizens. In doing so, QuaLiFY has established a best practice model for delivery of scientifically validated data and knowledge, and business models for European organisations – commercial or academic – seeking to exploit diet and health research outputs. The uses of such data and knowledge are not restricted to personalised dietary advice services or tools, although this is one of the best-developed models for exploitation.

QuaLiFY focused on the interaction between dieticians/ nutritionists/ advisors and clients/ patients, largely because this is the most familiar/ preferred scenario across Europe, as demonstrated by Food4Me: in European healthcare culture advice is received one-to-one or in small groups from an (perceived) expert. By performing a series of real life activities (field labs), QuaLiFY has supported SME partners with different applications and markets in the development of scientifically robust, user-friendly products and services, in partnership with healthcare professionals, which will impact how personalised dietary advice is accessed and delivered in the future. The experience was not good. For example, the experience of Dutch dietitians and type 2 diabetic patients with OPEN – food intake database and intake registration system – was that the system was slow to access and search, users needed advanced computer skills, and searches intuition (i.e. volkoren brood had to be entered as brood and then volkoren from a list of suggestions). However, this feedback has impacted the software design positively. Previously, the software had only been used by a small number of dietitians who were familiar with the computer skills needed and methods typically used in searching for foods (e.g. bread, brown rather than brown
QuaLiFY has helped dietitians understand what they want and need from these potential tools, and highlighted the limitations as well as benefits. For example, Voedingscentrum was more intuitive than OPEN, and individual as well as composite foods uploaded easily, but not all micronutrients are reported (e.g. omega-3 and 6) or require additional calculations. As a result, dietitians’ expectations of electronic tools and apps have been managed appropriately and, in addition to well-established issues with reporting food consumption (e.g. unreliable/ over/ under-reporting, absence of portion size information and difficulties in estimating some nutrients), QuaLiFY has identified needs and gaps in the market, which are important for developers and research organisations as well as testing an alternative in the real-world.

As a result of the Dutch study, diabetics were also able to explore the options for recording activities (e.g. intake and exercise). Both groups agreed that, to achieve a good estimate of intake, kitchen scales are essential but one-to-one training is unnecessary, and no more reliable than independent trial-and-error or food frequency questionnaires (FFQs). Patients liked the graphical presentation of measurements (e.g. high- and low-thresholds and you-are-here, progress plots), but only where progress was visible (e.g. movement into the acceptable range or weight reduction). Adolescents using an app or paper food and exercise diary, for healthy lifestyle choices, participants aged 16-19 years, found an app easier to use, especially in a social setting, and thought it had an impact on intake and exercise. These results suggest not only that presentation of information and as feedback is important for success in personalised dietary advice, but also that graphical formats should not be used for factors that do not change significantly or the scale adjusted for smaller changes. These outcomes should impact the update of existing apps and the development of future example.

In general, fasted blood sampling for glucose and cholesterol was considered inconvenient by patients and dietitians alike. The tools were reported as relatively easy to use, and patients were unconcerned by the need to sample multiple times or reset devices. Given the participants were clinically diagnosed diabetics, fasted glucose was irrelevant, and HbA1c should be included and would have been preferred by the dietitians. This demonstrates that most users will engage less readily with some activities at specific times of the day because of intrinsic (e.g. low mood in fasted individuals) or extrinsic (e.g. school run, morning commute) factors, which could impact the perceive success of personalised dietary advice services if not adapted appropriately (e.g. glucose 1-2 hours after a meal, HbA1c or dried blood spot analysis, which were on the whole much more readily accepted). Similarly, commercial tools proved problematic to use and suggest an opportunity for Quisper to work with developers to design and create more robust tools with better functionality.

Dietitians expressed some concerns about the lack of information available, not only about the tests undertaken during the QuaLiFY studies, but also in general. The public as well as healthcare professionals have high expectations around genetic information in diet and health. However, these expectations need to be managed carefully if demotivation and fatalism are to be avoided, and dietitians continue to feel ill equipped to discuss this with patients, despite the literature calling for improved involvement, confidence and knowledge since 2005. Thus, Quisper could have a real impact on professional dietetic practice by developing and disseminate scientifically valid information about the various measurements, including nutrigenetics (relationship between genotype, phenotype and specific nutrients).

Dietitians use a number of different incompatible systems in professional practice, and expressed a desire for a more integrated single system. This should impact how professional dietetic software is designed in the future, and offers Quisper an opportunity to work with software developers to integrate existing systems. However, some of the personalised dietary advice generated contradicted dietetic opinion (e.g. increased carbohydrate intake versus low carbohydrate diet). This raises issues around trust, professional practice, and state-of-the-art knowledge. The advice might be based on the most up-to-date knowledge and the dietetic perspective currently less valid. Equally, the advice might be based on a scientific model that is flawed. Similarly, some of the suggested foods were too generic (berries) or occurred regardless of the input (e.g. blueberries). Quisper has an opportunity to work with dietitians to examine these issues, and impact both professional practice and the scientific models used to generate personalised dietary advice as well as the specificity of the output.

As a result of these studies, QuaLiFY has impacted the perception of and confidence in personalised dietary advice amongst young people (16-19 year olds) in the UK, and Dutch dietitians and their type 2 diabetic patients. QuaLiFY also highlighted data protection issues associated with bringing the federated IT system necessary for supporting personalised dietary advice into a clinical environment in Germany. In turn, the young people, dietitians and German clinics have provided important feedback in practice, which will not only enable Quisper to be refined, but also individual products, such as FoodWiz2 app and the blood collection kits, which are fundamental for the SMEs involved in terms of success and the potential impact of personalised dietary advice on this sector and the wider economy. This exchange will facilitate more rapid adoption of personalised dietary advice as well as the creation of tools and
services and, ultimately, uptake amongst the general public, impacting how Europeans receive and act on public health recommendations in the future.

➢ Science-based personalised dietary recommendations
Personalised dietary advice needs to be evidence-based to assure trust and confidence in the products and services. The advice must be accessible, easily understood and non-judgemental, tailored to the individual and delivered in an appropriate format using tools that are widely accessible (e.g. web-based, and tablet or smart phone applications). Existing products and services make limited use of established research, and the personalised dietary advice lacks specificity, transparency or continued support. QuaLiFY has demonstrated robust, standardised and integrated solutions, which can be further exploited by SMEs to deliver scientifically validated personalised dietary advice tools and services.

➢ Provision of modern tools for dietetic practice
Dietetic practice whilst tailored to individuals’ needs is based on intake and energy expenditure, which was developed in the 20th century. QuaLiFY has provided a modern toolkit for dieticians and patients, based on the latest scientific knowledge, delivering personalised nutrition advice face-to-face and/ using web-services, and received feedback from Dutch dietitians and type 2 diabetic patients. In doing so, QuaLiFY has impacted tool functionality (e.g. DIY blood collection kits) and trust in personalise dietary advice, underpinned by scientifically assured food and health information, and supported continuing professional development for dieticians to foster confidence amongst practitioners at all levels.

➢ Enhancing cooperation between scientific disciplines and stakeholders in Europe
QuaLiFY has worked across the scientific and SMEs communities of Europe, and created a multi-disciplinary team of academic and SME partners with expertise ranging from food composition to nutritional and clinical interventions as well as ICT solutions. QuaLiFY has shown what is (e.g. Dutch dietitians and diabetic patients, young people in the community) and what is not possible (e.g. young people with eating disorders in a German clinical environment) currently, potential benefits (e.g. increased awareness of intake and exercise), and limitations that might be overcome (e.g. access to the clinical environment, professional distrust) in the future. Thus, in the future, Quisper will impact how these sectors interact.

➢ Best practice business models for exploitation of established research
QuaLiFY has delivered a flexible framework with best practice (not-for-profit) business model, which is widely applicable and clearly defines roles, responsibilities, and outcomes. The mix of academic centres of excellence and innovative SMEs will help maximise impact and uptake amongst stakeholders, ensuring a legacy of best practice.

1.4.1 Socio-economic impact and the wider societal implications
Traditionally, Europeans have very low compliance with dietary guidelines and lifestyle recommendations, often because the advice is generic and unrelated to short-term quantifiable outcomes (positive or negative). Healthy choices for diet and lifestyle does not compete effectively with glossy advertising for unhealthy food products (high salt, sugar and fat) or overcome increasingly sedentary working environments and leisure time (i.e. ‘obesogenic environment’). Together with a culture of free healthcare at-the-point-of-need (i.e. ill-health), these factors contribute significantly poor health, premature ageing, and unsustainable healthcare costs as well as poor quality-of-life. Expensive public health campaigns have little impact on compliance or long-term behaviours of individuals, but new paradigm is emerging with ‘personalised products’, based on an individual’s goals, health status and motivation, particularly amongst higher social-economic groups.

During its two-years of activity (2014-2015), QuaLiFY has had limited socio-economic impact, which was only to be expected: QuaLiFY was not undertaking ground-breaking research nor did the budget and human resources attract the attention of innovators, such as Google or Apple. Nevertheless, QuaLiFY has been pivotal in moving on the state-of-the-art in development and testing of tools, resources and new approaches in exploiting data and knowledge for personalised dietary advice in Europe, as well as generating robust evidence of the potential benefits and limitations. Measures of socio-economic impact arising from QuaLiFY, and the wider societal implications of personalised dietary advice, will manifest in the medium- (ca. 5-10 years) and longer-terms (10-25 years), especially following investment from NOM, the Investment and Development Agency for the Northern Netherlands.

The potential market for personalised dietary advice, more widely, which affects how SMEs regard translation of diet and health research into business opportunities – including QuaLiFY partners – is enormous whether measured in terms of individuals (e.g. obese or over-weight adults globally 1.5 billion people), actors (e.g. employers, health insurance, healthcare including public health, food industry), healthcare challenges (e.g. weight control, diabetes, cardiovascular disease, food allergies, digestive tract conditions [e.g.
to assure that these offerings would continue to be available after the project was completed. Hence WP4 of the project explored business model concepts that could deliver these different offerings to potential end-users and assessed possible structures for partners to work together to do so.

The project thus successfully identified an acceptable business model concept for a digital platform through which data and knowledge rules can be offered and accessed by end-users to develop personalized nutrition services. In order to operationalize this concept, the project successfully managed a consensus amongst the majority of the interested partners to establish a future business consortium. Given the agreed mission and vision of the business consortium, it was agreed that it should become a non-profit organization and it was finally decided that the structure would be a foundation, rather than an association. Although the project’s aim was to deliver a stepwise plan that would allow to set-up this structure after the project, the General Assembly of the project agreed that it would be necessary to take the necessary for setting up the foundation already during the project to assure the continuity of the work after the project. Possible funding mechanisms were explored, ranging from subsidies from local governmental initiatives to a variety of national and EU-projects. Given the interest and substantial financial support from the North Netherlands Development Agency

Specific impacts include:

- **Empowerment of individuals in their healthcare**
  Whilst the focus of one field lab was the interaction between dieticians and clients/patients and development of best practice business models, QuaLiFY has also demonstrated personalise dietary advice services are readily adopted by other groups in the general population, specifically young people (16-19 year olds). Normally a hard-to-reach population group, the app delivering personalise dietary advice was readily accepted and improve not only participants’ health in the short-term (four weeks, weight and exercise levels), but also their perception of such tools and services. Evidence shows that impacting behaviours earlier in life lowers healthcare costs and reduces risk of chronic disease population-wide.

- **Increasing innovation potential and competitiveness**
  Creation of a Dutch (non-profit) Foundation and investment by NOM will enable Founding Members to innovate more readily and create new resources within a flexible legal framework. In addition, Quisper has already demonstrated that it is an attractive prospect for stakeholders (e.g. Mindgate in Leuven (NL), SMEs participating in the Quisper launch event) seeking to exploit diet and health research outputs, and deliver information to consumers, directly or indirectly.

- **Implementation of key EU policies**
  By supporting private enterprise to develop tools and resources for healthcare, specifically personalised dietary advice services, using research outcomes already funded by the EU, which can improve health (weight management), prevent disease (diabetes), promote health (healthy eating) and protect citizens from health threats (reduced risk of cardiovascular disease and cancer), QuaLiFY has and Quisper will contribute to: I. Good health for everybody; II. Health Strategy and Programme; III. Healthier eating; IV. Research and innovation; V. Access to medical treatment everywhere in the EU; VI. Access to finance; VII. European standards; and VIII. Industrial competitiveness and innovation.

1.4.2 **Exploitation of results**

One of the key goals of the project, apart from developing and testing in real life a joint personalised nutrition offering, is to assure that these offerings would continue to be available after the project was completed. Hence WP4 of the project explored business model concepts that could deliver these different offerings to potential end-users and assessed possible structures for partners to work together to do so.

The project thus successfully identified an acceptable business model concept for a digital platform through which data and knowledge rules can be offered and accessed by end-users to develop personalized nutrition services. In order to operationalize this concept, the project successfully managed a consensus amongst the majority of the interested partners to establish a future business consortium. Given the agreed mission and vision of the business consortium, it was agreed that it should become of a non-profit organisation and it was finally decided that the structure would be a foundation, rather than an association. Although the project's aim was to deliver a stepwise plan that would allow to set-up this structure after the project, the General Assembly of the project agreed that it would be necessary to take the necessary for setting up the foundation already during the project to assure the continuity of the work after the project. Possible funding mechanisms were explored, ranging from subsidies from local governmental initiatives to a variety of national and EU-projects. Given the interest and substantial financial support from the North Netherlands Development Agency
(NOM), it was decided to set-up the foundation in Groningen, Netherlands.

Hence the project succeeded in creating the Quisper Foundation under which and the platform services will be offered by a subsidiary known as the Quisper Services BV. A holding company (Quisper Holding BV) in between the two allows for other initiatives related to its mission to be added while assuring the non-profit purpose of the foundation. Quisper Foundation has been officially registered on 5 February 2016 in Groningen, just about one month after the project has been completed.

Seven project partners have expressed their interest in joining the Quisper Foundation as founding partners. They are formally asked to join the foundation at the moment of this final report.

Two business development events were organised in Leuven, Belgium and confirmed the serious interest of a number of clients to start using the Quisper services. Although the possible personalised nutrition services are still limited, there is a lot of interest from potential end-users to work together with the platform and to expand its services. This is also confirmed by the large number of requests for testing the ‘beta’-version of the platform currently made available as the final result of the project.

The project has proven that within a period of two years, it is possible to conceive from scratch a business model concept through a collaborative business development approach and to set-up an operational structure from within an EU project environment.

1.4.3 Main dissemination activities
Dissemination in QuaLiFY had to main purposes. First, promote the project itself, which was the main aim in the first year of the project. In year two the focus was on a second objective – to promote the main outcome of the project, the QuaLiFY Server Platform also named Quisper.

After the kick-off meeting a press release informing stakeholders about the project, its objectives and approach, was published in English and in French. Together with other dissemination material like a factsheet, a general PowerPoint presentation, a poster and a flyer it is available on the project website (http://qualify-fp7.eu/).

To expand the audience reached, collaboration in dissemination was initiated with PRECIOUS (611366) (http://www.thepreciousproject.eu/): PRECIOUS aims to support a healthier lifestyle through a technology-based, personalized approach, which could be underpinned by Quisper. The collaboration started in Period 1 and significantly increased the outreach of QuaLiFY. PRECIOUS presented QuaLiFY in its newsletter, and a joint article was published in the FST journal ‘Electronic tools for healthy choices’. In October 2015, PRECIOUS and QuaLiFY shared a stand at the EFAD conference in Amsterdam (NL, 23rd-24th October 2015).

In year one of the project several presentations were made at relevant meetings for a scientific audience. The first main one was the EuroDISH Stakeholders’ Meeting (Brussels – BE, 20th May 2014). The aim of EuroDISH is to provide advanced and feasible recommendations on the needs for research infrastructures (RIs) to ESFRI and other stakeholders.

The second QuaLiFY consortium meeting was aligned with another important meeting - the 11th NuGOweek focusing on ‘Nutrigenomics of Foods’ (Naples – IT, 8-11th September 2014). Satellite meetings included not only QuaLiFY but also the NutriTECH, EuroDISH, Pathway 27 and Food4Me projects. The consortia of these projects, as well as NuGO Association members, had opportunities to meet and discuss their activities.

A major large congress to promote both QuaLiFY and Quisper was the FENS conference – 12th European Nutrition Conference (Berlin – DE, 20th-23rd October 2015) with more than 1500 participants. It focussed on ‘Nutrition and health throughout life-cycle - Science for the European consumer’. A whole session with four presentations was reserved to addressed QuaLiFY and Quisper:

- Ben van Ommen, TNO: Personalised nutrition: from science to reality
- Paul Finglas, IFR: Using harmonised data and knowledge rules to deliver personalised nutrition services
- Barbara Koroušic Seljak, JSI: How to connect to and make use of the QuaLiFY Server Platform (Quisper)
- Jo Goossens, shiftN: Current and future scenarios for personalised nutrition services

The session attracted 100 participants, led to several tweets about QuaLiFY and raised interest in Quisper and the launch event in December 2015.

Cooperation with PRECIOUS allowed a joint exhibition at the 9th EFAD conference (Amsterdam – NL, 23rd -24th October 2015) to address the stakeholder group of dieticians. EFAD, the European Federation of the Associations of Dietitians brings together dieticians and dietetics students from all over Europe. With 404 delegates from 36 countries the conference was undoubtedly a success.
The QuaLiFY business development event (Leuven – BE, 29th September 2015) was the first of two events to present Quisper to a chosen group of stakeholders. Its main objective was to collect feedback on the current offering of Quisper and the needs of future clients. The program included the following presentations:

- Introduction into Personalised Nutrition - by Jo Goossens (shiftN)
- Introduction into Quisper - by Hille Meetsma (IPH)
- Focusing on the scientific basis of Quisper - by Paul Finglas (EuroFIR)
- Demonstration of Quisper - by Robert Horlings (The Hyve) and André Boorsma (TNO)
- Short presentation on harmonisation - by Barbara Korousic (JSI)
- Questions & collective brainstorm on the potential of Quisper

Feedback collected from participants was used to improve the Quisper offering.

Shortly before the end of the project, a Quisper launch event (Leuven – BE, 8th December 2015) was organised. Representatives of organisations that had previously shown interest in Quisper where invited. Introductions to QuaLiFY and Quisper were followed by more detailed information about the content of Quisper and demonstration. The agenda included:

- Introduction to QuaLiFY from the ECs point of view – by Alexandra Tuijtelaars (Project officer, EC)
- Introduction to QuaLiFY – by Ben van Ommen (Scientific coordinator, TNO)
- Introduction of personalised nutrition - by Jo Goossens (shiftN)
- Introduction of Quisper - by Jo Goossens (shiftN)
- Demonstration of Quisper - by Diego Werba (The Hyve) and André Boorsma (TNO)
- Questions & collective brainstorm on the potential of Quisper
- Get together

The event finished with a lively discussion and a reception. Presentations are available on Slideshare (http://www.slideshare.net/quisper_platform?utm_campaign=proletracking&utm_medium=sssite&utm_source=ssslideview).

List of Websites:

1.5 The project public website and relevant contact details
1.5.1 Project website

A public website (http://qualify-fp7.eu/) has been launched shortly after the beginning of the project and will be kept online until the end of 2016. Although the website will not be updated actively, it contains an overview of the project and dissemination material, as well as the link to the Quisper website. The Quisper website (http://quisper.eu/) was designed in the last months of the project to inform about Quisper, the QuaLiFY Server Platform. A whiteboard animation (Figure 3, https://www.youtube.com/watch?v=nv9s9UjdZMM) introducing Quisper can be found on YouTube.

1.5.2 Post-project contact details

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