Deliverable D400.4

Smart Food Awareness: Final Assessment Report

WP 400

Project acronym & number:	SmartAgriFood – 285 326
Project title:	Smart Food and Agribusiness: Future Internet for Safe and Healthy Food from Farm to Fork
Funding scheme:	Collaborative Project - Large-scale Integrated Project (IP)
Date of latest version of Annex I:	18.08.2011
Start date of the project:	01.04.2011
Duration:	24

|	
Status:	Final
Authors:	Ignacio Gonzalez, Javier Garcia, Carlos Maestre, Marta Fontsere, Eloi Montcada, Ramón Alcarria, Augusto Morales, Sergio Miranda, Alfredo Pedromingo, Agustín Gonzalez-Quel, Huub Scholten, Ayalew Kassahun, Tim Bartram, Sabine Klaeser, Tim Sadowsky, Yann Cassing, Esther Mietzsch, Katalin Viola, Markku Koinstinen, Florian Meyer
Contributors:	ATOS, BONPREU, UPM, ASI, WU, GS1, SGS, KTBL, CBHU, MTT, ATB
Due date of deliverable:	31.12.2012
Document identifier:	SAF-D400.4
Revision:	011

The SmartAgriFood Project

The SmartAgriFood project is funded in the scope of the Future Internet Public Private Partnership Programme (FI-PPP), as part of the 7th Framework Programme of the European Commission. The key objective is to elaborate requirements that shall be fulfilled by a "Future Internet" to drastically improve the production and delivery of safe & healthy food.

Project Summary

SmartAgriFood aims to boost application & use of Future Internet ICTs in agri-food sector by:

− Identifying and describing technical, functional and non-functional Future Internet specifications for experimentation in smart agri-food production as a whole system and in particular for smart farming, smart agri-logistics & smart food awareness,

− Identifying and developing smart agri-food-specific capabilities and conceptual prototypes, demonstrating critical technological solutions including the feasibility to further develop them in large scale experimentation and validation,

− Identifying and describing existing experimentation structures and start user community building, resulting in an implementation plan for the next phase in the framework of the FI PPP programme.
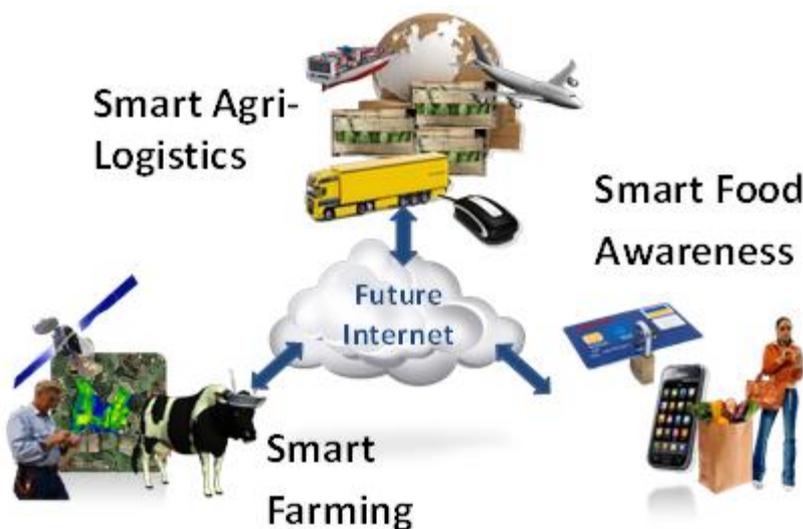
Project Consortium

− LEI Wageningen UR; Netherlands
− ATB Bremen; Germany
− TNO; Netherlands
− CentMa GmbH; Germany
− ATOS ORIGIN; Spain
− ASI S.L.; Spain
− Huawei; Germany
− MTT Agrifood Research; Finland
− KTBL e.V.; Germany
− NKUA; Greece
− UPM; Spain

− Campden BRI Magyarország, Hungary (CBHU)
− Aston University; United Kingdom
− VTT; Finland
− OPEKEPE; Greece
− John Deere; Germany
− Wageningen University; Netherlands
− EHI Retail Institute GmbH; Germany
− GS1 Germany GmbH; Germany
− SGS S.A.; Spain
− BON PREU S.A.U.; Spain

More Information

Dr. Sjaak Wolfert (coordinator) e-mail: sjaak.wolfert@wur.nl

LEI Wageningen UR phone: +31 317 485 939

P.O. Box 35 mobile: +31 624 135 790

6700 AA Wageningen www.smartagrifood.eu

Dissemination Level

PU	Public	X
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)	

Document Summary

This document is related with task 430 of Work Package 400 of the SmartAgriFood project. Its main objective is to expose and analyse the feedback provided by the final user related to the Smart Food Awareness sub-domain within the food chain, and also to evaluate the conclusions obtained during the project within the Retail sector. The targeted audience of this document are persons interested in the food chain, mainly retail sector, and in feedback provided by the super-market customers.

Within this sub-domain two pilots have been defined and developed, the Tailored Information for Consumer (TIC) and the Tracking, Tracing and Awareness for Meat (TTAM), which provide tailored information to the supermarket customer regarding fruits, eggs and wine (TIC), and meat (TTAM), respectively.

Several end-user workshops per pilot have been realized, and are deeply explained and analysed within this deliverable, focusing in the feedback gathered from the consumers. The first workshop was composed of more generic questions for the consumers, but afterwards each workshop asked more accurate questions based on the feedback received from the previous ones.

Finally, based on the results obtained in WP400 during the project, an evaluation of the Retail sector, focused on the Food Awareness, has been done. This evaluation has been addressed from different perspectives, including aspects of the Retail sector and economic and social ones. Moreover a technical evaluation has been done for understanding the possibility of deploying the Proofs of Concept (PoC) in a real environment.

Abbreviations

API	Application Programming Interface		ISO	International Organization for Standardization
CO2	Carbon dioxide		IT	Information Technology
CRUD	Create Read Update Delete		NFC	Near Field Communication
EC	European Commission		PF	Plants and Flowers
EPCIS	EPC Information Services		PoC	Proof of Concept
EMAS	Eco-Management and Audit Scheme		PPP	Public Private Partnership
FFV	Fresh Fruits and Vegetables		QoS	Quality of Service
FI	Future Internet		SAF	SmartAgriFood
FRAND	Fair, reasonable, and non-discriminatory terms		SOA	Service Oriented Architecture
HTML	HyperText Markup Language		US	United States
ICT	Information and Communication Technology		WiFi	Wireless Fidelity
ID	Identifier		WP	Work Package
IoT	Internet of Things		XML	eXtensible Markup Language
IP	Large-scale Integrated Project			

Table of Contents

List of Figures

List of tables

1 Introduction

As explained in the Document summary, this document is related with the task 430 of the Work Package 400 of the SmartAgriFood project. Its main objective is to expose and analyse the feedback provided by the final user of the Smart Food Awareness sub-domain within the food chain, and also to evaluate the conclusions obtained during the project within the Retail sector. Therefore, both the feedback of the final user, i.e. consumer and the feedback of the partners involved in this Work Package are presented in this document.

The chapter 2 of this document is related to the feedback obtained of the consumer of the supermarket during the workshops realized for both the TIC and the TTAM pilot. This chapter is divided in two main sections, one per the workshops of each pilot. These involve real consumers and most of them realized in a supermarket of Bon Preu, located in Barcelona, Spain.

A deep evaluation of the results obtained during the execution of the WP400 can be found in the chapter 3. This evaluation wraps different aspects, making possible a "big picture" of the results obtained during the work realized within the Work Package, and how we envisage the future of the defined applications within the Retail sector, and their connection with the food chain. Of course, this chapter is only a theoretical exercise based on our conclusions and expertise in the Retail sector. Definitive numbers requires actually implementing and deploying the pilots on a larger scale.

Finally, Chapter4 focuses on the conclusions obtained, and further elaborates in how all this work should evolve in the Phase II of the FI-PPP.

2 Validation results

Feedback from end users (consumers) is a key point to assess viability and compliance with their expectations. For this, several sessions have been planned in order to involve consumers in the pilots.

2.1 User evaluation of TIC pilot

The pilot Tailored Information for Consumers has been defined and evaluated by involving directly the end-users, the consumers. For this, several sessions have been performed in a Bon Preu supermarket, where a panel of consumers participated in defining requirements and tested the Web app. The sessions have been called *workshops with consumers*, because of their interactive and open to discussion nature between consumers and the project.

The objective of these workshops has been to involve a panel of 15-20 consumers in all the process of the TIC pilot, its conception, development and evaluation. Four workshops have been carried out in Bon Preu each one with different objectives: the two firsts ones aimed to identify consumer product information needs and requirements on how to get more product information; the second and third ones aimed to test, improve and validate the developed TIC Web app [Figure 2-1]. In the last workshop fTrace [1] from the TTAM pilot and its integration with the Web app was also tested, so consumers could also use fTrace in order to get rich information on meat products. The development of all workshops with consumers in a closed environment enabled detecting and improving the TIC Web App in order to decide on an open deployment in a real supermarket, if the tests assured its viability.

Pre-Workshop
- **Objective**: To know the opinion of consumers about the future supermarket and way of consumption.
- **Date**: 1st and 2nd of November 2011
- **Participants**: A total of 14 people.

1st Workshop
- **Objective**: Introduction to the project, analysis of the current situation (jungle of logos, lack of information) and stipulation of which product attributes consumer would like to know and how while shopping.
- **Date**: 25th of April 2012
- **Participants**: Panel of consumers of 15 people.

2nd Workshop
- **Objective**: Experimentation with the first release of the TIC app at Bon Preu's "Consumer's space" to validate the technology and to improve it according to panel of consumers' proposals.
- **Date**: 6th of Novembre 2012
- **Participants**: Same panel of consumers of 10 people.

3rd Workshop
- **Objective**: Experimentation with the second release of the TIC app at at Bon Preu's "Consumer's space" to a final validation and to get the feedback of expectative of the panel.
- **Date**: 28th of January 2013
- **Participants**: Same panel of consumers.

Figure 2-1:   Objectives of the workshops

Methodology used for workshops organisation and development:

The number of workshops has been chosen to match the phases of TIC pilot development. In this way, a calendar has been developed for setting the dates of each workshop so they could be planed and organised in advance.

Figure 2-2 shows the procedure used for each workshop.

To chose the profile of consumers that will participate in the workshop.

- For the pre-workshop: people between25-45 y.o and between46 -65 y.o

- For the panel of consumers: people between 25-50 y.o, having an smartphone and up to date with new technologies .

To summon 30 to 50 consumers to participate in the workshop, in order to assure the assistance of 15 to 20 participants.

- Consumers with fidelity card and that usually shop at the supermarket next to the Consumers' space, were contacted via telephone by Bon Preu.

To prepare the material for the workshop (products, powerpoint, documents, surveys, pilot server, wifi...)

Pre-test.

- For the 2nd and 3rd workshops, a pre-test is planned some days before where people from Bon Preu test the TIC app previously to the workshops in order to detect operational errors .

Workshop day.

- The workshop is 1,30h long (from 19h to 20,30h aprox.)

- Held by 1-2 Bon Preu employees.

- In the Consumers' space located in Barcelona (Spain).

Completion of the evaluation and satisfaction surveys.

- One survey per participant regarding the development of the workshop and one survey regarding the subject treated or the tests done in the workshop.

Analysis of the results and conslusions.

- Analysis of the survey.

Dissemination.

- New in the SAF web page.

- Video

Figure 2-2:   Methodology of a workshop

The place: *Consumers' Space*

The workshops with consumers are organised in the Consumers' Space [Figure 2-3], located next to one of Bon Preu supermarkets in the neighbourhood of l'Eixample in Barcelona (Spain).

Consumers' Space is a place that Bon Preu used for consumer-retailer interaction in order to have feedback from its regular consumers (the ones with Bon Preu fidelity card) about different subjects such as: new products offered by the supermarket, cooking classes, master classes of nutrition, etc. It is a room with capacity for maximum 25 people with all the facilities for carrying out workshops, talks, cooking classes, and so on. A detailed explanation has been done in D400.3 [2].

Figure 2-3:   Picture of the Consumers' Space where the workshops with consumers have been organised.

The panel of consumers:

The number of consumers participating in the 4 workshops varied from 10 to 16 people. The percentage of female was always higher than male (Figure 2-4). Most of the participants (72%) were between 30 and 45 years old (Figure 2-5).
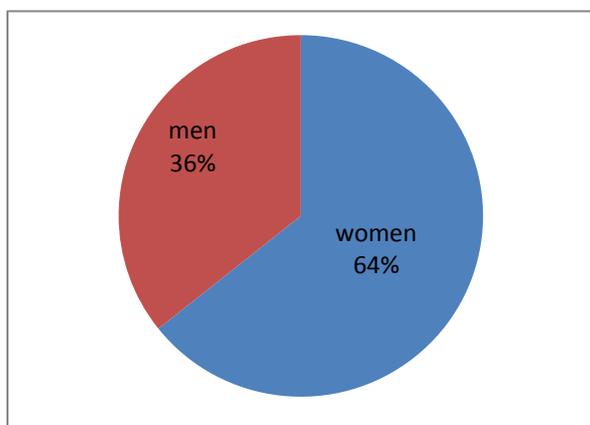
Figure 2-4: Percentage of male and female in the panel of consumers.
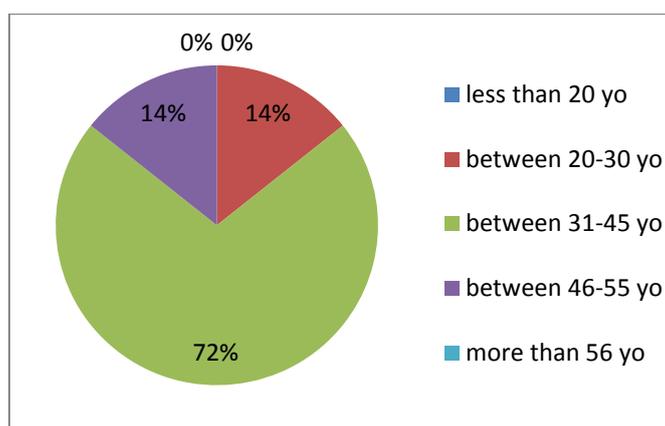
Figure 2-5: Range of age of the panel of consumers.

2.1.1 The pre-workshop

Objective:

The pre-workshop was held on the 1st and 2nd of November 2011 coinciding with the conception and definition of the TIC pilot. The main objective of this workshop was to develop an open discussion to know how consumers of different ages would imagine a future way of consumption, so to collect ideas of new and innovative ways of purchasing agri-food goods.

That allowed identifying current habits, shortcomings, pros and contras of current way of shopping and how consumers would imagine a future supermarket.

Methodology:

In order to take into consideration all consumer profiles, two workshops where carried out: one with participant from 25 to 45 years old; another with participants from 46 to 65 years old.

Both workshops were performed in three parts: (1) current shopping habits, (2) detected shortcomings in the current way of shopping, (3) imagining a future supermarket.

Participants had to answer several questions for each part, promoting a discussion environment between the participants and the mediator of the workshop. Chapter 6.1 in Appendix A - Material used in the workshops with consumers (TIC pilot) shows the questions discussed during the workshop

Results:

All answers were recorded in order to analyse results and conclusions. The main conclusions for the different discussions are as follows:

- *Discussion about how future supermarkets would be.*
  Participants closely relate the future with new technologies.
  Participants imagine a system that could inform consumers about new products for people with allergic problems, about special offers and that could facilitate the procedure for complains.

- *Discussion about current shopping habits: How do you organize your shopping? Do you like going to the supermarket or buying on line?*
  Consumers use to buy once per week or twice per month, mainly prepared/manufactured products than can be stored for a longer time. And two or three times per week, fresh products.

Half of the participants claim that they don't like going to the supermarket, the other half, say that doing their shopping is a distraction.
The group is reluctant to buy online, especially when it comes to fresh products and for the lack of flexibility with delivery hours.
The majority of the participants claim they use a shopping list when going to the supermarket.

- *Discussion about how to improve the shopping act according to consumer personal interests.*
To the first proposal: *"Imagine a device installed in the shopping cart that identifies your fidelity card and that allows you to identify the shopping list, to inform you of special offers and new products and to guide you through the shop, depending on the products you want to buy..."*. The participants claim that this would facilitate the purchase, but they show reluctance to reveal too much information about shopping habits to the supermarket. The idea "scares them" from the start.
To the following proposal: "*imagine that you fridge could find out automatically what food you need to buy*". This idea is not accepted by the group, because fresh products vary depending on the season and/or conditions, so they would like to see and choose the fresh products themselves.
Consumers claim that they like to be informed about special offers.

- *Discussion about current information in product labels.*

The majority of the consumers only read the labels of new products or when they need to check the ingredients/composition for allergies or health problems; they are also interested in a product's origin.

The group ensures that information about the environmental impact of a product does not influence their purchase; they prefer knowing more aspects directly related to the quality or composition of the product.

Consumers miss a wider variety of ecological products, products for vegetarian people, for people with allergy problems.

- *Discussion about ways of receiving product information.*

They are interested in the implementation of new systems in supermarkets that could facilitate their shopping.

In general, the group likes the idea of having information points available in the supermarket. They would like to receive information on products, the quality, nutrition aspects, and composition for allergies. They would also like to have this information available at home.

- *Discussion about shopping habits and interests (definition of a consumer profile).*
Participants define their profiles according to their tastes and habits; however, they claim that the profile follows a pattern that changes along the life (having children, specific health problems ...).
They do not like the fact that supermarkets could have too much information about consumers (mood, etc.); they believe it would be crossing a line of privacy. They do not perceive any benefit from this idea.

Not many differences between the two classes of consumers were detected. However, we can conclude that shoppers from the second group (46 to 65 years old) prefer the physical act of shopping, paying in cash and are more demanding with fresh product.

2.1.2 First evaluation results of TIC pilot (Spain)

Objective:

The 1st workshop was held on the 25th of April 2012 coinciding with the conception and design of the TIC Web App. This workshop aimed to create and motivate a panel of consumers consisting of 15-20 Bon Preu regular customers that would participate in the three main workshops; a panel involved in the definition, evaluation and improvement of the TIC App.

The aim of this 1st workshop was twofold:

1. To know what product information consumers would like to know while shopping
2. To know how consumer would like to get this information.

That allowed identifying consumer information needs and interests, as well as new ideas on how to provide product information to consumers.

Methodology:

The session was structured in three parts: firstly an introduction to the SmartAgriFood project and an analysis of the current situation was done. Secondly, the focus group was split in teams that played different games to let them discuss about the following aspects: *"what would you like to know about products that you can find at a supermarket?"; "do you think that there is currently a lack of information concerning food products?"; "how would you like to access to this information?"*. Thirdly, each team shared their proposals.

Chapter 6.2 in Appendix A - Material used in the workshops with consumers (TIC pilot) shows the questions discussed during the workshop and the PowerPoint presentation used.

Results:

Two surveys, one for evaluating the session itself and another gathering the opinion of the different consumers about the subjects discussed during the workshop were used to analyze the results of this first session.

Main conclusions:

- The results of that first workshop showed that a high percentage of participants ignored the existence and the meaning of a big amount of logos. More than half of consumers don't take into account the currents warranty means like labels.
- The new concept of *Tailored Information* has sense, because the workshop confirms that each consumer has different priorities concerning attributes that he/she would like to know about products in the supermarket.
- The consumer is willing to use a new technology device to make a conscious purchase.
- The process of participation of the workshop was successful and almost all participants want to participate in the following ones.

Results of the logos awareness:

After showing a list of 20 logos that can be found on different products in a supermarket, consumers had to choose for each logo one of the following options: *"I have never seen this logo before", "I have seen it sometimes, but I don't' know what it means", "I know what it means, but I don't take it into account", "I know what it means and I take it into account while shopping"*. The results are shown in Figure 2-6.
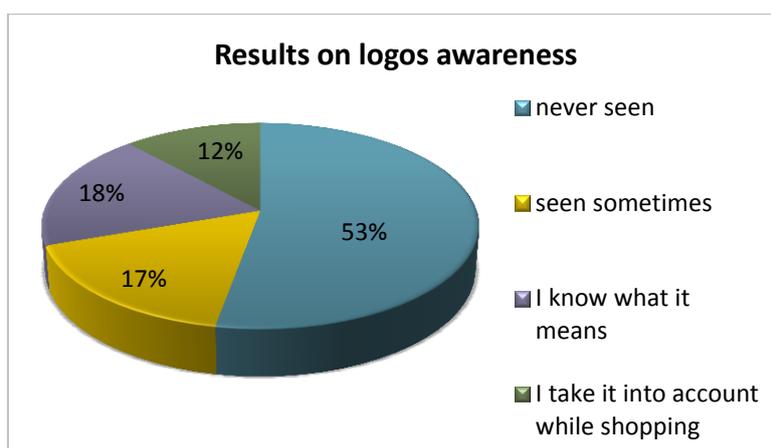
Figure 2-6:   Results on logos awareness on a panel of 14 consumers.

Results of the preferences on product attributes:

Consumers had to rank between 0 and 2 (being 0 "not interested" and 2 "very interested") a list of attributes that could be provided for agri-food products in a supermarket, as shown in Table 2-1.

Table 2-1:   List of attributes presented to the consumers.

Origen	Animal feeding
Gluten contain	Data of production for vegetables and fruits
Pesticides contain	Date of catch for fish
Conservatives contain	Date of slaughter for meat
Additives contain	Ingredients
GMOs contain	Traces of elements that can cause food in-tolerance
Conventional or organic farming	Water footprint
Carbon Footprint	Certificate of organic food
Recyclable packaging	Certificate of fair trade product
Recycled packaging	Certificate of animal welfare
Halal /Kosher product	Quality aspects
Product with denomination of origin	And more ...
Local product	

The attributes that consumers find more interesting and would like to know while shopping are shown in Figure 2-7.

Results product attributes preferences

Additives contain
Quality aspects
Certificate of fair trade product
Certificate of animal welfare
Carbon Footprint
GMOs contain
Water footprint
Ingredients
Date of catch for fish
Animal feeding
Product with denomination of origin
Conventional or organic farming

0% 2% 4% 6% 8% 10% 12%
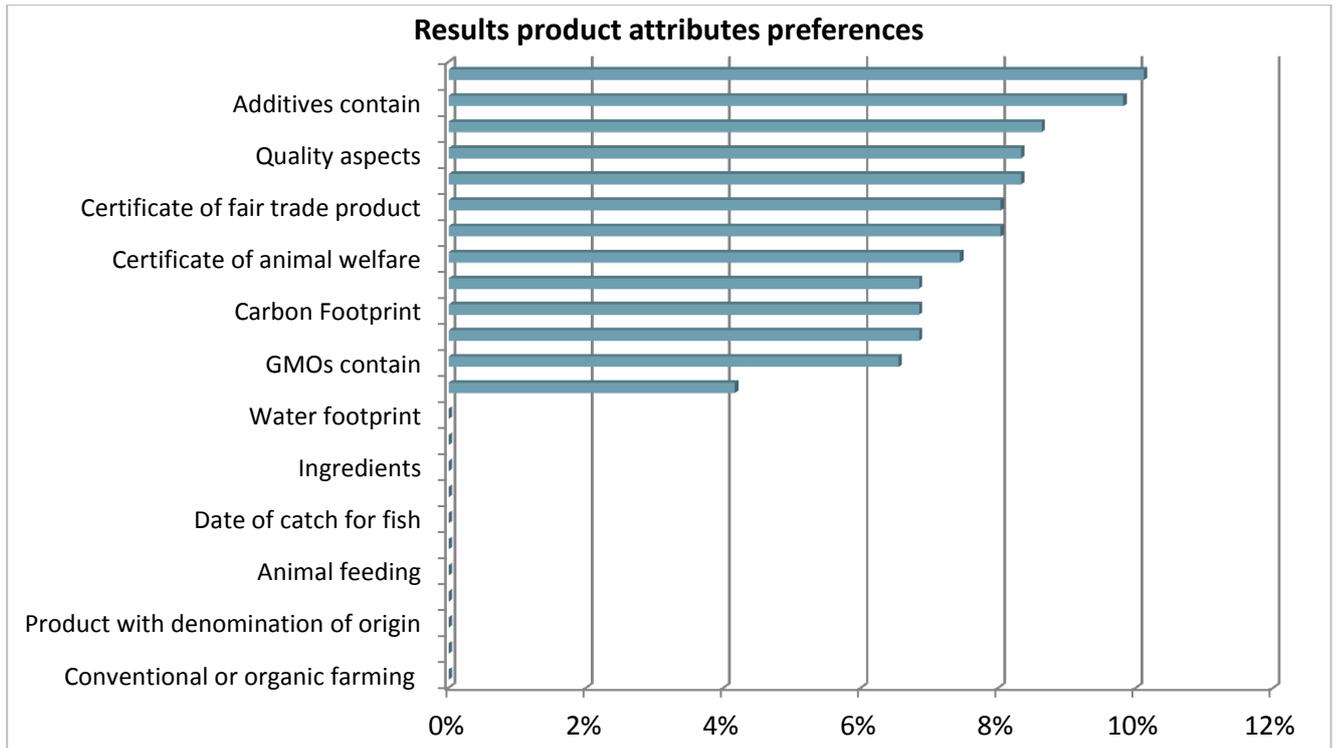
Figure 2-7:   Results on product attributes according to the preferences of a panel of 14 consumers.

Each working group agreed on three attributes which they found the most interesting. The results are shown in Figure 2-8.

Highlighted attributes by working group

Origin
Additives content
Gluten content
Denomination fo Origin
Sustainable packaging
Organic farming
Animal feeding
Ingredients

0% 5% 10% 15% 20% 25%
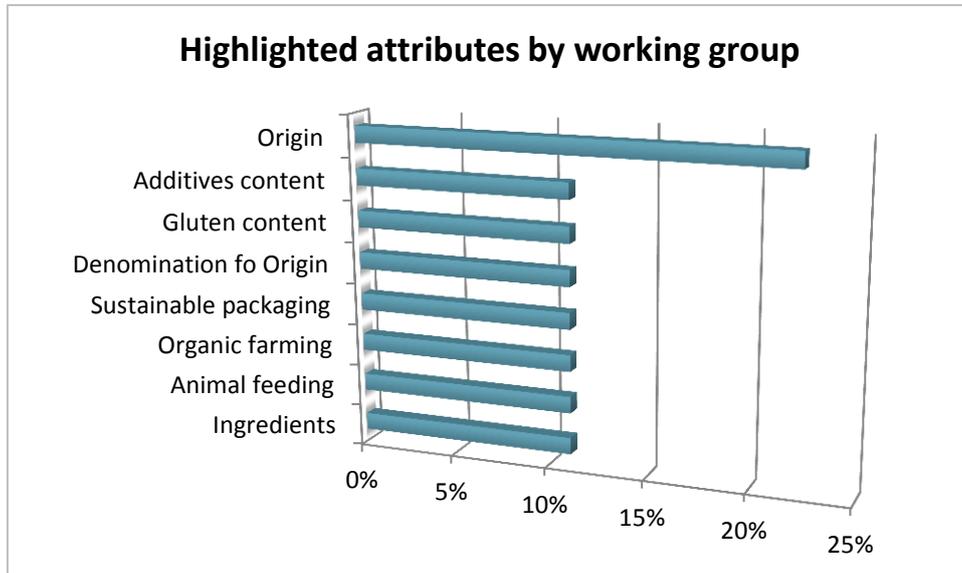
Figure 2-8:   Results on product attributes according to the preferences of each working group.

Results on how consumers prefer to get product information:

Consumers had to rank between 0 and 2 (being 0 "not useful" and 2 "very useful") a list of different ways of getting information of a product. Table 2-2 shows the list of proposed attributes.

Table 2-2:   List of communication media presented to the consumers.

By the supermarket web	By e-mail (e-mail notification of the exceptional week of organic wines…)
By a poster arranged close to the product	By a specific arrangement at the supermarket (shelf products without gluten, shelf products without GMOs…)
By visual recognition thanks to coloured sticker	Weekly or monthly magazine sent at home or that you can consult or take at the supermarket
On the current label of the product	Through a Smartphone application
By a certificate	On a screen arranged on the shopping cart
By phone (offer products without gluten…)	And more ...
Kiosk or information product centre	
Mobile and manual scanner	

The ways of getting product information that consumers find more interesting and would like to use while shopping are shown in Figure 2-9 for the individual results and in Figure 2-10 for the results per group.
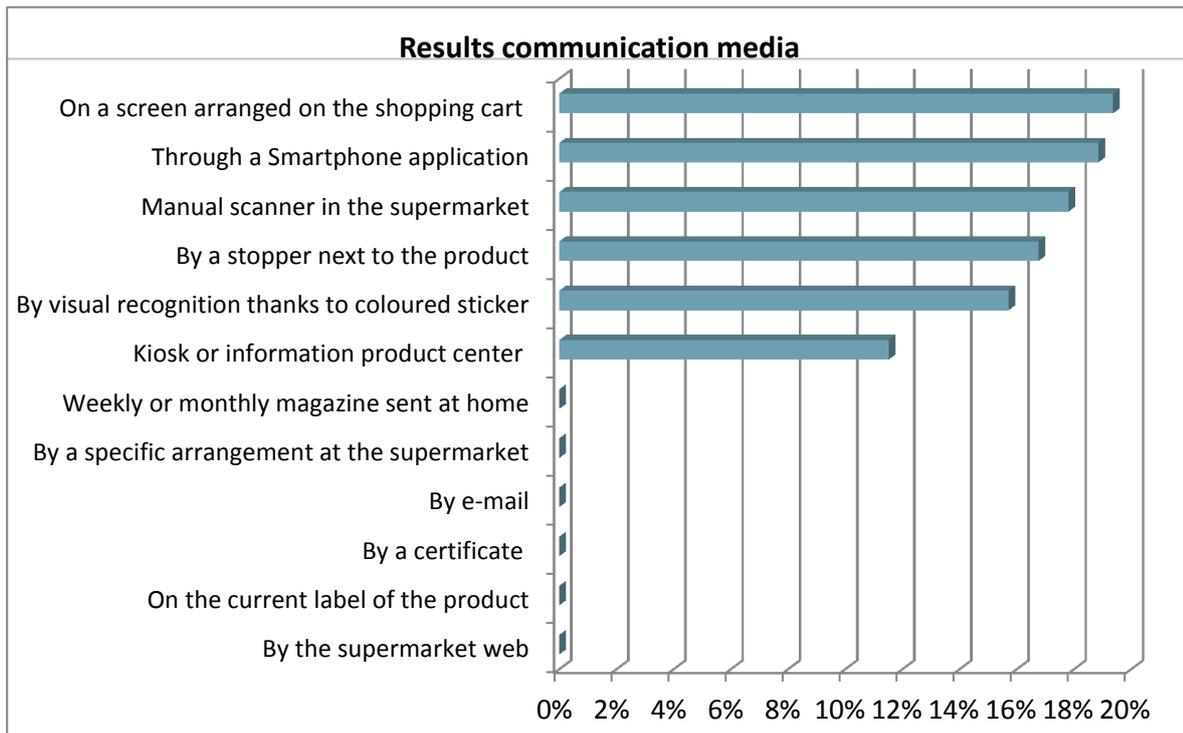

Figure 2-9:   Results on ways of getting product information according to the answers of a panel of 14 consumers.
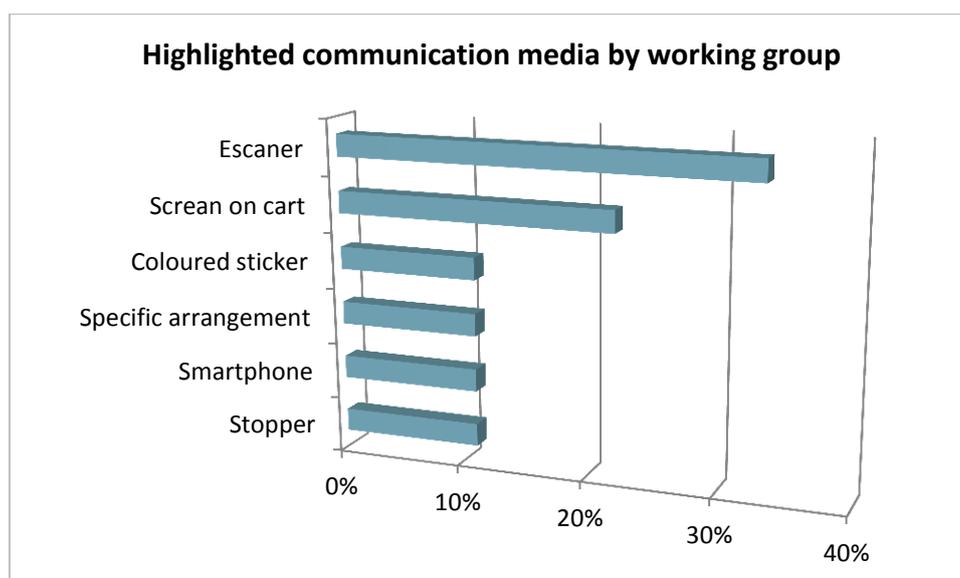
Figure 2-10: Results on communication media according to the preferences of each working group.

In conclusion, it points out that consumers want to get the information through a new technology device like a screen, a scanner or a Smartphone. The Smartphone is a mix of screen and scanner.

In the Appendix A - Material used in the workshops with consumers (TIC pilot) the results of the surveys about the evaluation of the session are presented.

2.1.3   Intermediate evaluation results of TIC pilot (Spain)

Objective:

The 2nd workshop was held on the 6th of November 2012 coinciding with the first development of the TIC app. The same panel of consumers that participated to the 1st workshop was invited for this 2nd workshop.

The objective of the workshop was to present to consumers the developed online application and to carry out a first validation process that allowed detecting functional problems, knowing consumers opinion about the app interface, design, operability, content, etc. in order to solve the detected problems, improve the app considering the panel recommendations and expectation and then validate this first release to continue working for a second release of the TIC app.

Methodology:

The workshop was performed in two parts: (1) presentation of the TIC app, (2) test with the TIC app using the Smartphone of each participant. Instructions on how to proceed with the test were explained.

For this, a variety of products were used for the experimentation, having each product its unique QR code. The process was quite simple: consumers needed to connect to Bon Preu's WIFI and to get access to the online app using an URL, select the language, then register to create their own consumer profile by filling in a short questionnaire about their preferences ("*I am interested in: food origin, sustainability aspects, chemical content, allergens, animal welfare, etc.*"), afterwards scanning the QR code to get the product information that fits with their consumer profile and finally the application showed the tailored information of that product.

Figure 2-11 shows some pictures taken during the 2nd workshop with consumers; some participants are using the Web app to get tailored product information.

Figure 2-11:   Several pictures of the 2nd workshop

Chapter 6.3 in Appendix A - Material used in the workshops with consumers (TIC pilot) shows the survey used for the pilot evaluation and the PowerPoint presentation used.

Results:

In general, participants showed a big interest in the TIC app, they found it an innovative tool with high capacity for improving awareness concerning agri-food products; it is user-friendly and intuitive. However, some problems and improvements were detected and are now being solved. Furthermore, participants made interesting proposals concerning the interface (how to show product information) and enriched the attributes by suggesting new ones. (Annex A shows the questions discussed during the workshop).

Two surveys, one for evaluating the session itself and another for the Web app evaluation were used to analyze the results of this second session.

Chapter 2.1.5 shows a comparison between the results and conclusions of this 2nd workshop and the 3rd workshop where the first and second iterations of the Web app were tested.

2.1.4   Final evaluation results of TIC pilot (Spain)

Objective:

The 3rd workshop was held on the 28th of January 2013 coinciding with the second development of the TIC app.

The objective of the workshop was to test with the consumers the second iteration of the Web app by carrying out a second validation that allowed detecting other functional problems, knowing consumers opinion about the app interface, design, operability, content, etc. in order to improve the app considering the panel recommendations and expectation and then validate this second release to continue working for a final version of the TIC Web app.

Methodology:

The workshop was performed in two parts: (1) presentation of the TIC app (summary of its functionalities), (2) test with the TIC app using the Smartphone of each participant. Instructions on how to proceed with the test were explained.

Figure 2-12 show pictures taken during the 3rd workshop with consumers where participants are using the Web app to get tailored product information.

Figure 2-12:   several pictures of the 3rd workshop

Chapter 6.4 in Appendix A - Material used in the workshops with consumers (TIC pilot) shows the survey used for the pilot evaluation and the PowerPoint presentation used.

Results:

The Web app was valued by the consumers with an average score of **7.2/10.**

The majority of scoring is between 6 and 8. The maximum score has been a 10 and the minimum a 5. Figure 2-13 shows the distribution of the scoring given by the participants.
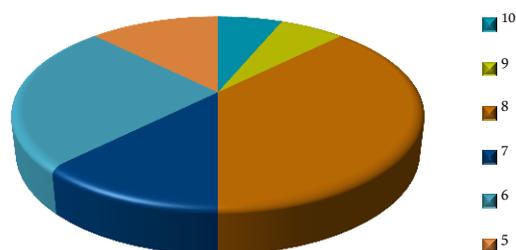

Figure 2-13:   Scoring distribution of the Web app among a panel of 16 consumers.

Strong aspects

75% of the participants consider as the main strong aspect of the Web app the information given. In this sense, it stands out:

- The wide variety of available product information.
- The usefulness of the app.
- The associated values as trust, autonomy and awareness.
- The tailored concept: being able to choose which information is interesting in a user level.

Secondly, 12.5% of consumers enhance the clarity of the Web app (easy to use) as a strong aspect.

Lastly, one person appreciates the rapidity and another consumer, the fact that thanks to the Web app the product does not need to be touched to get information on it.

Weak aspects

The results show that 66.7% of the participants consider that the principal weakness of the application is slowness, followed by a 13.3% of contestants that consider the lack of information on some items as the weakest point.

One participant highlights the lack of veracity in some of the information (in particular, the carbon footprint of the kiwi). Another person points out the design of the application as neither attractive nor intuitive.

General evaluation of the Web app

Firstly, all the users were asked if the different functionalities that the application offers worked correctly. The results, expressed in percentage of correct functioning, are shown in Table 2-3.

Table 2-3:   Technical evaluation of the TIC Web app. Percentage of consumers that were able to use each functionality.

FUNCTIONALITY	CORRECT FUNCTION-ING
Access to the initial website of the application	93.75%
User registration	93.75%
Profile creation (definition of the user preferences)	93.75%
QR code scanning	87.5%
Application feedback (information received about the products)	81.25%
Other options of the application (language, information about the project...)	87.5%

All the functionalities of the application worked correctly in 80 and 94% of the cases.

The functionalities that worked better are: the access to the initial website, the user registration and the profile creation, which just failed once for the same user.

The functionality that worked the worst and therefore should be revised and improved is the application feedback, with an 81% of successful cases.

Three participants were asked to evaluate different items of the application from 0 to 3, three being the highest rate.

Equal to the previous case, the evaluation was undertaken segregated for each of the functionalities of the application.

The results obtained are shown in Figure 2-14, .where the punctuation is from 1 to 3. An average is calculated for the panel of consumers.
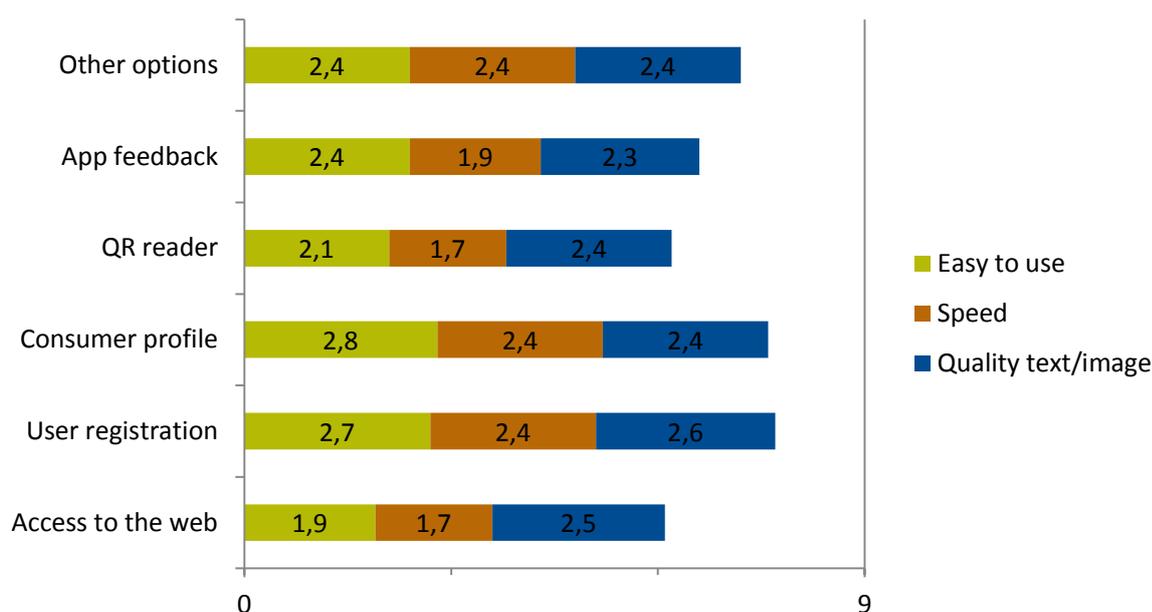

Figure 2-14:   Technical evaluation of the different functionalities of the Web app regarding three aspects: easy-to-use, speed, quality of the text and images.

The results of the graphic representation show that the most rated utility in terms of usefulness, speed and quality of the text and images, is the **user registration** and the **creation of the consumer profile** (with a total rating of 7.7 and 7.6 out of 9, respectively).

On the other hand, the **quality of the text and images** of the different utilities receive the best rating with 14.6 point out of 18, followed by **easy to use** (14.3 out of 18). On the contrary, **speed** (12.5 out of 18) is the utility that should be the most improved upon others, although it could be due to an inefficient Wi-Fi connection.

2.1.5 Comparative results between the first and second evaluation of the TIC Web app with consumers

Consumers were able to test two iterations of the TIC Web app. The first test allowed detecting some problems and improvements that were corrected for the second test. New functionalities were included to be tested in the 3rd workshop. Figure 2-15 compares the technical evaluation of the pilot for each functionality.
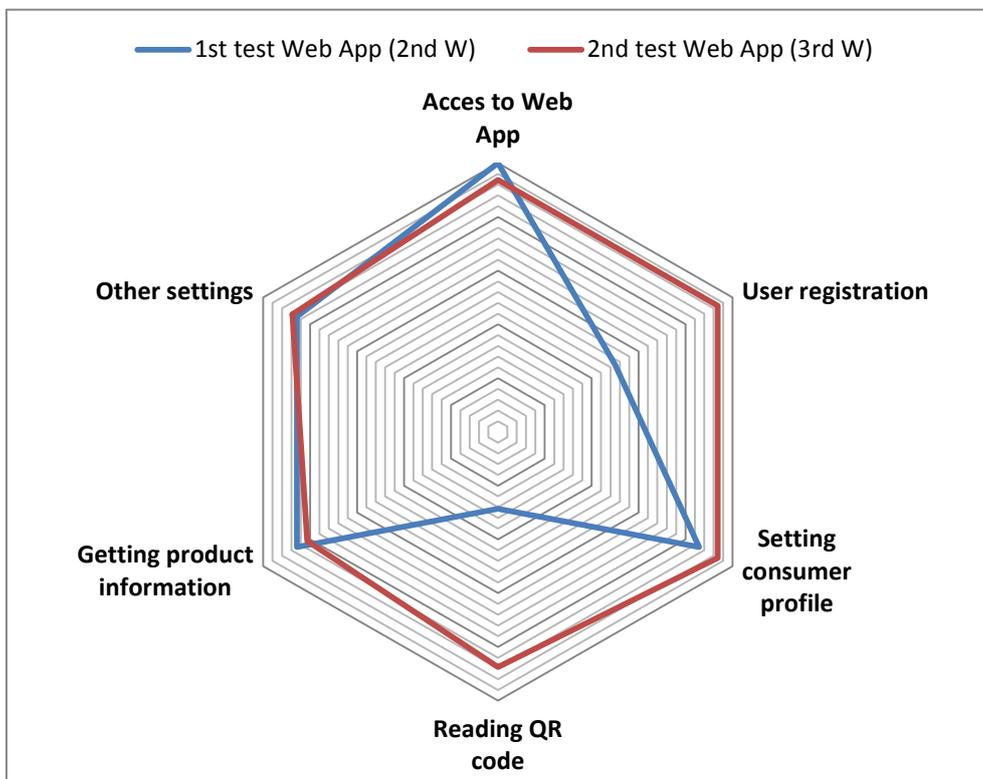
Figure 2-15:   Comparison between first and second technical evaluation of the web app.

A global evaluation of the TIC Web app regarding conceptual value for consumers was done. Figure 2-16 shows the results of the two tests with consumers.
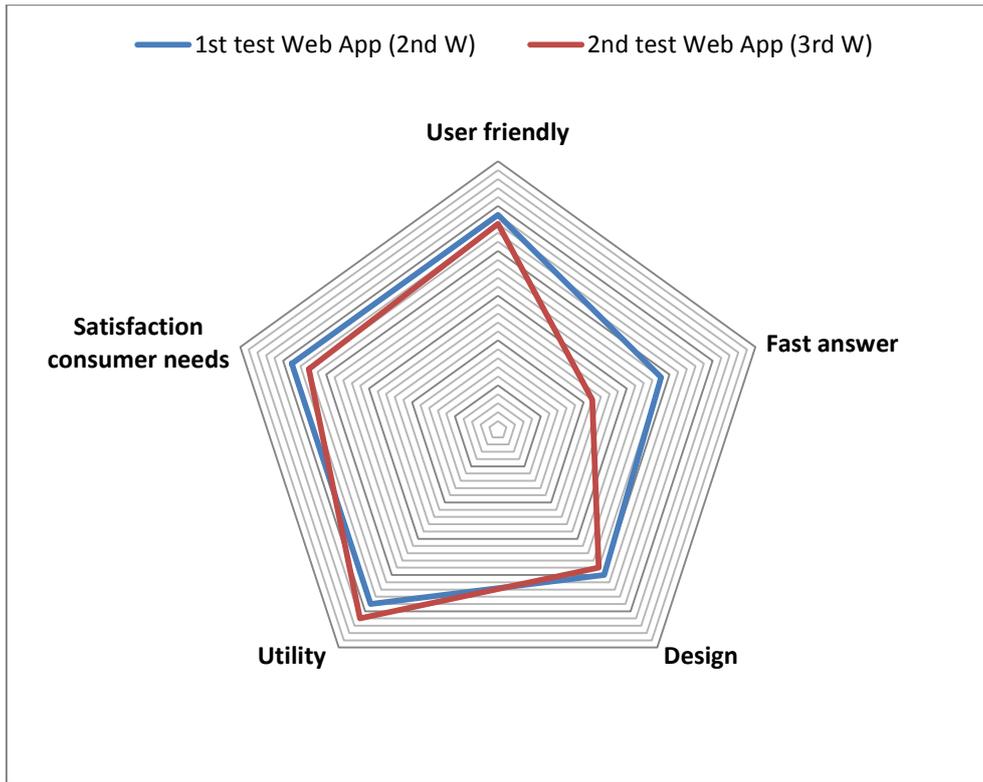
Figure 2-16:   Comparison between first and second global evaluation of the web app.

As a conclusion, we can say that consumers participating in the process for pilot evaluation were very interested and motivated in the TIC pilot and are willing to use the TIC Web app. Figure 2-17 shows the percentage of the panel of consumers that would use the TIC Web app after the first and second tests, showing a substantial increase in appreciation.

Figure 2-17:   Percentage of consumers that would use the web app while shopping

2.2   User evaluation of TTAM pilot

2.2.1   First evaluation results of TTAM pilot (Germany)

A questionnaire in the meat sector was part of the preparation for the TTAM pilot. The questionnaire itself focuses on the attachment of labels during the meat production. These labels are intended for consumers and function as labels that are visible on the meat product throughout in the retail shop.

By interviews with experts of the meat sector it was intended to get detailed insight in the source of the data on the labels of consumer meat products. Such insight is necessary to realize an improved information infrastructure in meat supply chains. The questionnaire therefore focused on two dimensions:

   a) the way of data capturing, storing and providing on the one hand and
   b) the data items (origin and approval numbers, reference numbers and best before dates) on the other hand.

Additionally, the interview partners were asked about their estimation and prospective desires related to additional product information and the way how to share them in future.

In preparation of the qualitative survey there was a list of potential interviewees covering all stages of the meat chain from slaughtering to retailers. The interviews were based on a written questionnaire with questions concerning the relevant data and the data flow and additional aspects created. All in all, five of sixteen questionnaires were sent back covering the whole value chain of beef and beef products. Three of the companies pointed out not to be interested in answering the questions due to different reasons.

The results of the sent back questionnaires were as such – see also Figure 2-18. In most cases origin related information come from physical intermediate labels – see Figure 2-19, each meat cut needs to identified by regulation (EU) 1760/2000 or accompanying documents. Otherwise, the information in the cases considered are received electronically (fax, email) but not as standardized data type, even if some of the companies use EANCOM 2002 data types for traceability data with their customers. But even in this case, all products additionally are carrying a product label with all origin and traceability data according to law.

The data of origin linked with the reference number (batch/lot) on preliminary stages are collected in the internal ERP system. From one internal process step (e.g. deboning/cutting) to the next origin data are gained by scanning the GS1-128 barcode on the intermediate label encoding the batch as access key to all electronically and product escorting information. Alternatively, the meat cuts to be produced are predefined over a fixed segmentation plan and associated labels are created at the beginning of the process. Furthermore, data from a label of the previous process stage can be taken from the label and entered into the labelling device to create a label for the next internal process stage. Figure 2-18 summarizes the labelling along the meat supply chain.

Note: In order to implement mandatory origin for beef in practice, many companies have started to market (order) only predefined origins. The correct origin then has to be checked again at goods receipt.

In case of decentralized pre-packed meat the label information are already predefined in the labelling device and accessible by entering the PLU number. This means, that origin related data for beef caused by law emerged as part of the master data in recent years and that there are several different PLU numbers used for one meat cut with several origins (e.g. origin (birth, fattening, slaughtering Germany, Argentina, US). The procedure regarding regional attributes or quality is transferable analogous to the origin.

Concerning an initial identifier there was a general attitude. The primary batch number of the supplier is stored and linked with an internal batch number at the goods receiving or at latest, a meat segment is processed (e.g. slicing and packing at the retail store). The initial ID such as the number of an individual animal or batch of slaughtered animals with same characteristics among the surveyed companies are not transported to the next process stage, although this approach may be practiced in various other process chains. At the retail level companies use to transfer the batch number of the previous labelling stage (intermediate label used for the meat cut). Here the lot number is the only variable information being entered in the label device during the packaging process manually by the employee.

Regarding the durability the surveyed companies stated the following: Mostly the minimum freshness is part of an internal specification (best before date) individually used by each company. But some companies transfer freshness dates from intermediate labels as well (note: but they are not forced to do this by law and committed to check, whether the freshness of the product can be guaranteed during this period). For the use-by date the freshness is limited by law (e.g. starting with the slaughtering date for raw material used for minced meat according to regulation (EU No. 853/2004) and linked by observing microbiological product criteria.
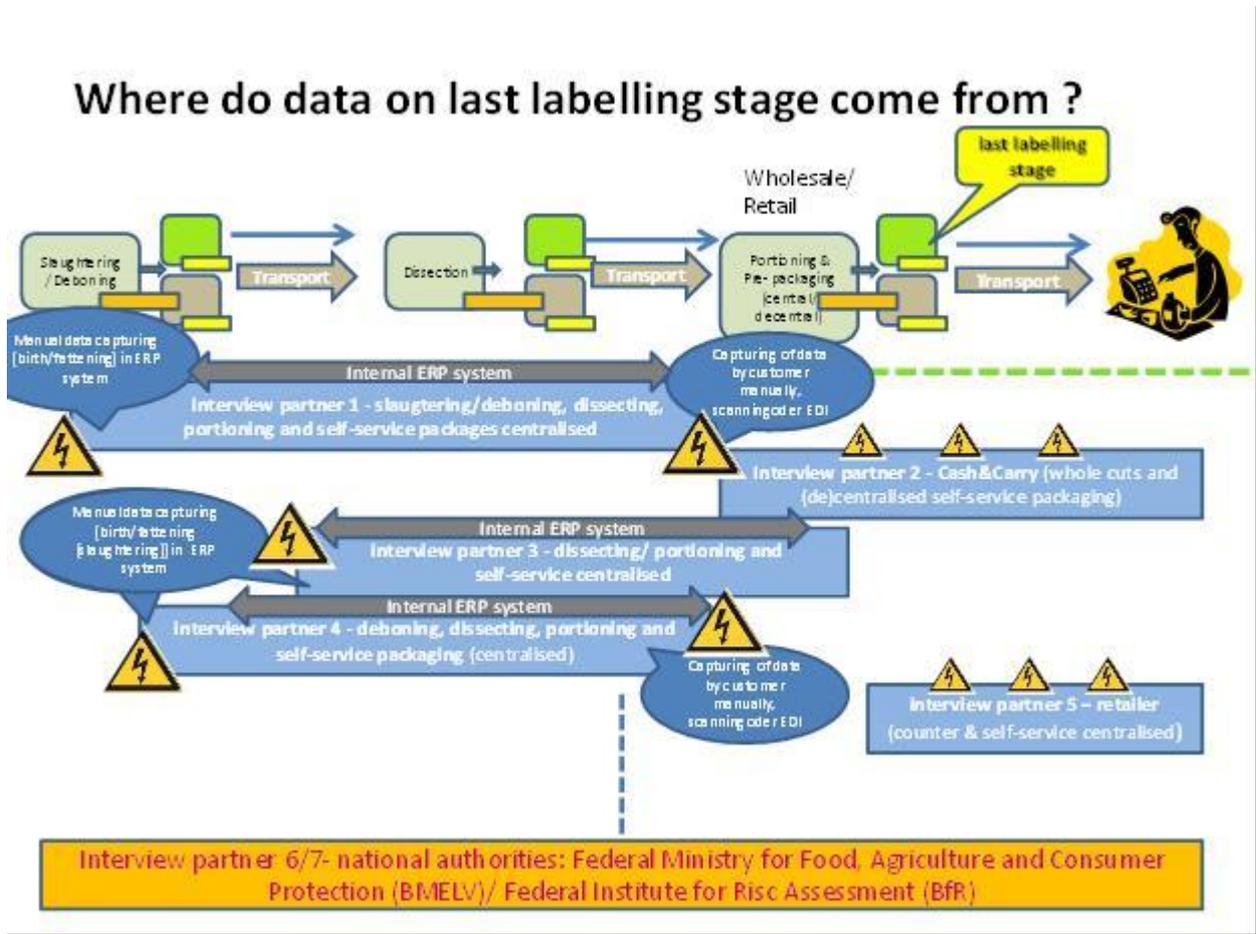
Figure 2-18:   Overview of interview partners/process stages, sources of data and breaks within data flow
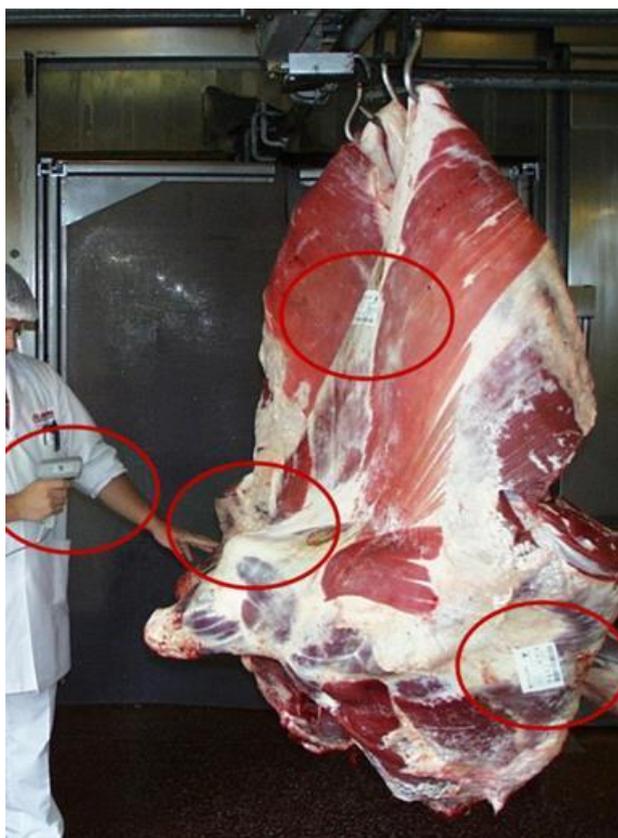
Figure 2-19: Examples of paper (printed) labels placed on an intermediate product (courtesy of GS1 Germany and Westfleisch e.G.)

The interviewees pointed out amongst others, that more detailed information regarding special biological races, feeding material, use of medicine, salmonella status, origin (other animal species but beef), location/name of farmer/producer, transport conditions, animal welfare and the level of maturity (since slaughtering) from their point of view will become more important in future. As long-term perspective there could (should) be a well-arranged and transparent platform for consumers that shows "who, when, what" established. Furthermore it would be preferable to achieve a regular exchange with existing data bases (e.g. national data bases registering movements of cattle based on regulation (EC) No. 1760/2000, internal data bases hosted by existing quality and food safety schemes such as "Qualität und Sicherheit") and last but not least, sharing information from the veterinary authorities. All interview partners considered that a data exchange about cloud / web service will be the appropriate and forward-looking solution.

As today´s key impediments the following aspects were mentioned:

- inadequate technological upstream
- lack of standardization for integrated data exchange covering the whole chain "from farm to fork" or rather insufficient convenience, e.g. for hanging carcasses so far
- different systems between farming and meat industry
- data exchange at present limited to one step up/one step down (based on regulation (EC) No. 178/2002)
- no common and open approach ("everyone cooks his own soup")
- unbalanced cost-benefit ratio

Currently, there is a national research project going on, called SiLeBAT (Ensure food supply to the population in case of bio-and agro-terrorism (BAT) incidents) [4], parallel to the FP7 EU project SmartAgriFood under direction of the Budesinstitut für Risikobewertung or Federal Insti-

tute for Risk Assessment (BfR) [3]. The project aims at tracing of physical container handling, management of accompanying food supply chain documents, and data exchange along the chain. There are approaches to prevention, early detection and mitigation developed. One main finding of this project is, that the place of data capturing is not relevant but it is critical that they are available and to have access to them in case of food alert. For this the data have to be in a structured data format using open and worldwide accepted standards based on unique identification keys.

2.2.2 Final evaluation results of TTAM pilot (Spain)

Especially from the point of view of consumers, new IT technologies, in particular tablets and smartphones are making everyday life easier. These technologies provide access to information anywhere and anytime as smartphones are used to scan product barcodes and get instant and detailed product information in retail shops.

To meet the above mentioned requirements, a new transparency system based on the existing and proven technology of the fTRACE transparency system and mobile app was expected to demonstrate the novel approach of TTAM in gathering, processing and presenting data from the meat chain. The TTAM pilot aimed to check whether consumers also like to scan their food products at a retail shop to get detailed information about the food item they are actually buying. The need and the applicability of such an innovative transparency system in the meat sector had to be proofed and discussed with end-users.

The testing of fTRACE's mobile app , adapted to the requirements of Spanish/Catalan consumersmers , took place in Barcelona on 28th ofJanuary 2013 in a common workshop with the TIC pilot of SAF. The workshop aimed at validation of the current system and investigation of the consumers' response to it. For further details about the structure of the group and the execution of the workshop, we here refer to section **Fehler! Verweisquelle konnte nicht gefunden werden.**, where the testing at Bon Preu is described for the TIC pilot.

After having the opportunity to get familiar with the app on their own smartphones the volunteers were ask to experiment with the fTRACE app in Catalan tongue by using and scanning a physical dummy of a package of meat, illustrated in Figure 2-20.

Figure 2-20:   Physical dummy of a package of meat

Their task was then to scan the QR-code on the package and make live-experience with the offered online-information, illustrated in Figure 2-21.

Figure 2-21: Scanning with Smartphones QR-Code on a dummy-package

The displays of the Smartphone showed the different aspects of the database and the traceability service. The first view is always on the general information related to the batch wise selected meat – see Figure 2-22.

Figure 2-22: General information related to a product, as illustrated in the application

After a while the testing volunteers s then were asked to document their practical experiences from the test by answering nine short questions in a questionnaire. This page belonged to the entire survey of the two pilots TIC and TTAM, as illustrated in Figure 2-23.

Figure 2-23: Survey of the two pilots TIC and TTAM

The questions were well balanced between those to be answered in text form and those in categorized attitudes or experiences.

The questions one to nine were as followed:

1. Do you currently know the origin of the meat you buy in the supermarket?

2. Would you like to know the origin of the meat you buy?

3. Do you think that knowing the origin of the meat would lead to a better health and quality of the product?

4. What other information about meat would you like to know?

5. In what degree the Web app has allowed you to know in more detail and easy way more information about the meat?

6. Do you consider the given information trustfully enough? Or would you prefer the meat to accomplish an specific certification requirements?

7. Would you pay more for the meat if this guarantees you more information about the product? (No, 10% more, 20% more, 30% more)

8. Tell us some strength of the Web app regarding meat traceability.

9. Tell us some weakness of the Web app regarding meat traceability.

In general, the response by the volunteers is positive and very open-minded concerning the benefits of a transparency service for meat products. Although two volunteers were not able to use the mobile app on their specific communication device, they all worked concentrated on the questionnaire and answered completely and in detail. So the share of answers to be evaluated is nearly 100 per cent. The answers to the different questions don't vary much, what can indicate that the testers learned during previous sessions. Nevertheless, the results are very valuable and can give good guidance for further developments and engagements.

The answers to each of the nine questions can be summarized in the following statements:

1. Nearly three quarter of the asked individuals, represented in Figure 2-24, know currently only SOMETIMES the origin of the meat they buy in the supermarket. 20% never know anything about the origin and 7 per cent (one person) always knows.
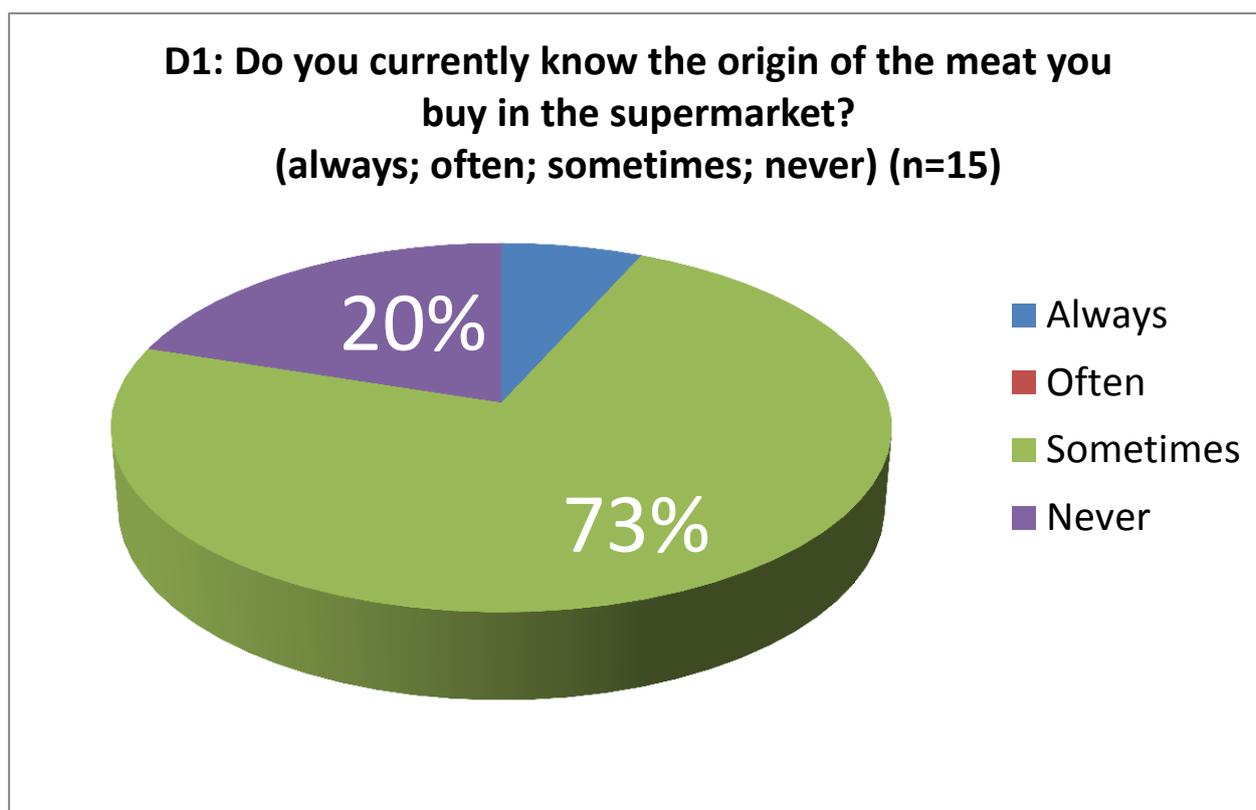
Figure 2-24: Do you currently know the origin of the meat you buy in the supermarket?

2. But asking the same people whether they would like to know more about the origin of the meat, everybody agreed. The reasons are wide spread and range from "It gives me trust" to "To know if the meat is local and to know the way animals have been treated". The testers appreciated very well to have a profound knowledge about the food they consume.

3. When asking the testing volunteers if they think that knowing the origin of the meat would lead to a better health and quality of the product, there is again full consensus. Everybody is persuaded that transparency for consumers assures high(er) quality.

4. Question 4, presented in Figure 2-25, was related to a preferred higher degree of information.
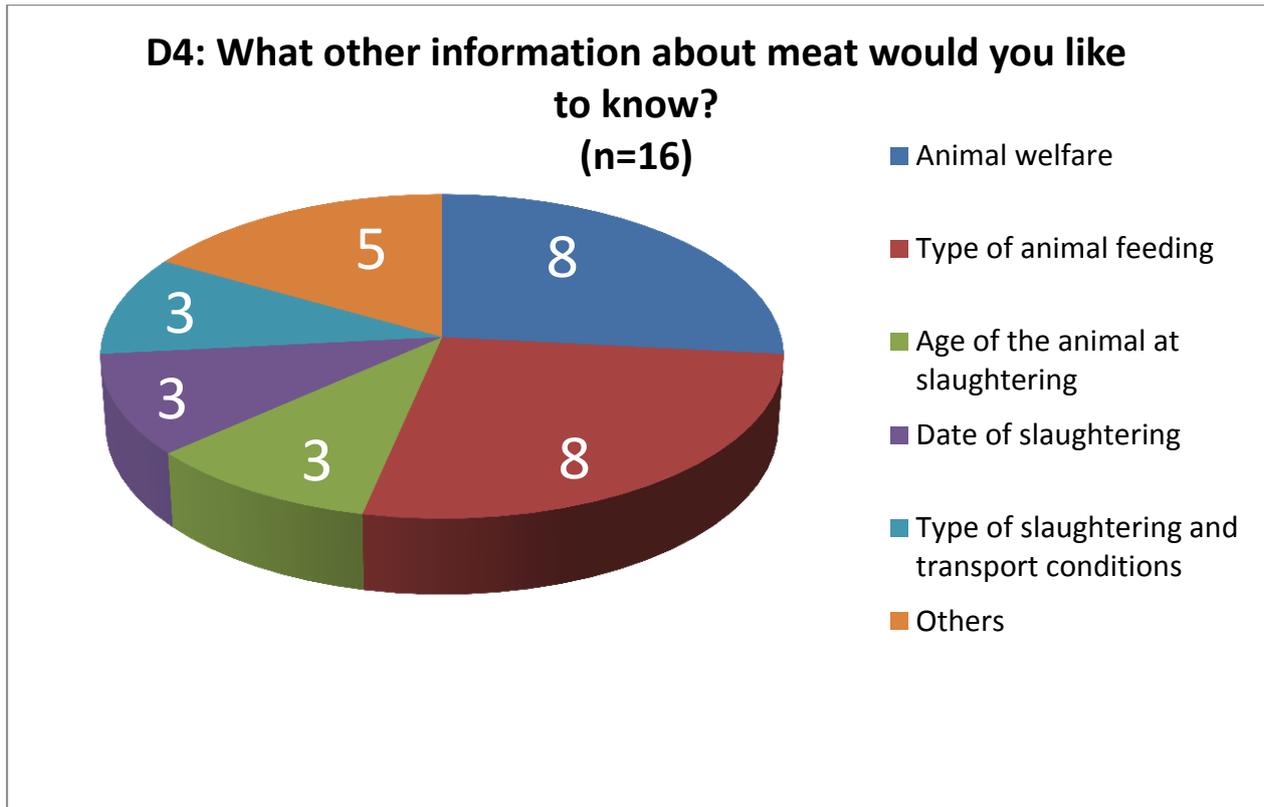
Figure 2-25: What other information about meat would you like to know?

Here 30 answers were given; among these three main categories can be distinguished. Most want to know more about the life and welfare of the animals. On the second place there is the need to have better information about the processing of the meat - starting with slaughtering to transport conditions. But the individuals are also interested in several different other aspects, depending on their personal preferences. So this is a huge area to be covered too.

5. The testers were asked now in what degree the Web app has allowed them to know more in detail and in an easy way about the meat. They should express their satisfaction from best with 10 points down to 1 point - the worst. The average points of those who were able to use their mobile device were 8.6 - meaning good to very good, as presented in Figure 2-26.

D5: In what degree from 1 to 10 (best) the Web app has allowed you to know in more detail and easy way more information about the meat?
(n=14)

- 10 (exellent)
- 9 (very good)
- 8 (good)
- 7 (quite good)
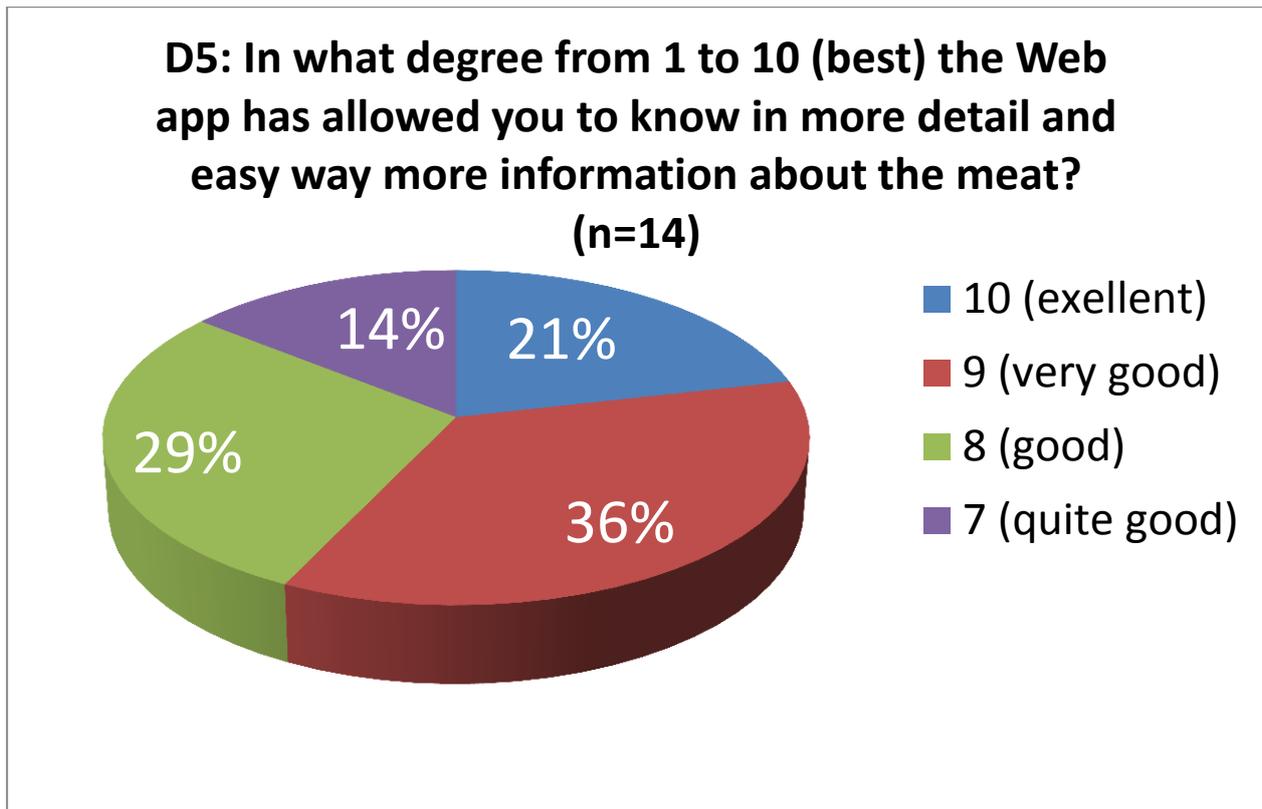
Figure 2-26: To what degree from 1 (worst) to 10 (best) the Web app has allowed you in an easy way to know more about the meat?

6. Considering the given information the testers here were asked if the information is trustfully enough for them. Apart from three absolute positive answers and one who could not decide, the other eleven testers stated that they would prefer the meat matches specific certification requirements. This shows clearly that transparency has to be ensured by formal certification enriched by some kind of official trustworthiness.

7. In question 7, represented in Figure 2-27, the main message of more than 80 per cent was that they are not willing to pay more for more information. No more payment for guaranteed meat! Only a few could imagine paying up to 10 per cent more for such a higher quality of information. Nobody could imagine paying perhaps 20 per cent or even 30 per cent more.

D7: Would you pay more for the meat if this guarantees you more information about the product - and how much?
(No, 10% more, 20% more, 30% more) (n=16)
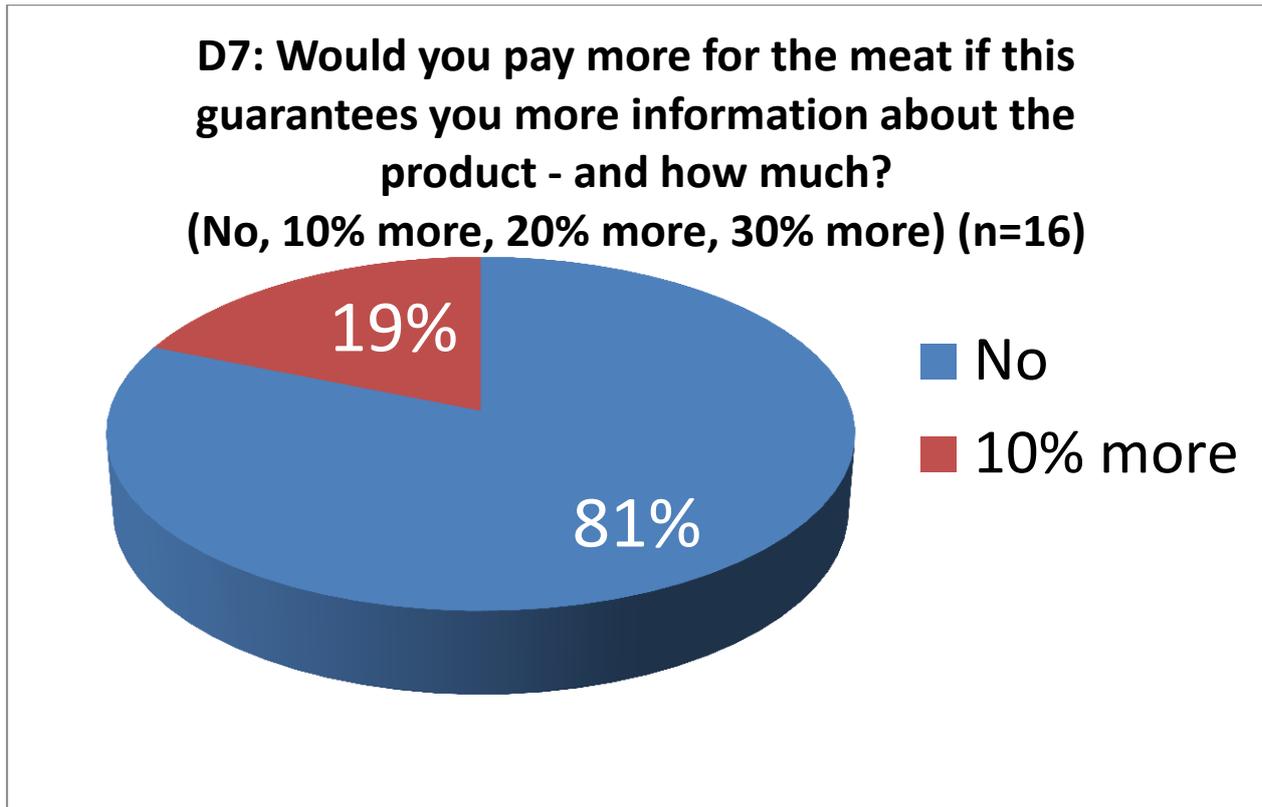
Figure 2-27: Would you pay more for the meat if this guarantees you more information about the product - and how much?

8. The last two aspects were dedicated to the potentials of such service: already achieved and not yet. So they liked very much the feeling for responsibility and aspects of animal welfare. The service itself was estimated as rapid, practical, complete and trustful. It was also even said: "Simple to use and clear". Also one tester who could not use his own device emphasized the advantage that the app "allows consumers to have access to information that is not usually given by the supermarket".

9. The responses about weaknesses of the Web app regarding meat traceability can be wrapped up into three main groups, represented in Figure 2-28: one third has nothing to be desired; the next third worries about the health of the animals which still could be better reported. The last third consist of two parties which see potential for development in relation to handling and overall-benefit. This is a good final judgement by the consumers.

D9: Tell us a weakness of the Web app regarding meat traceability (n=13)

- None — 31%
- Animal related — 39%
- Easier to use — 15%
- Socio-economic benefit — 15%
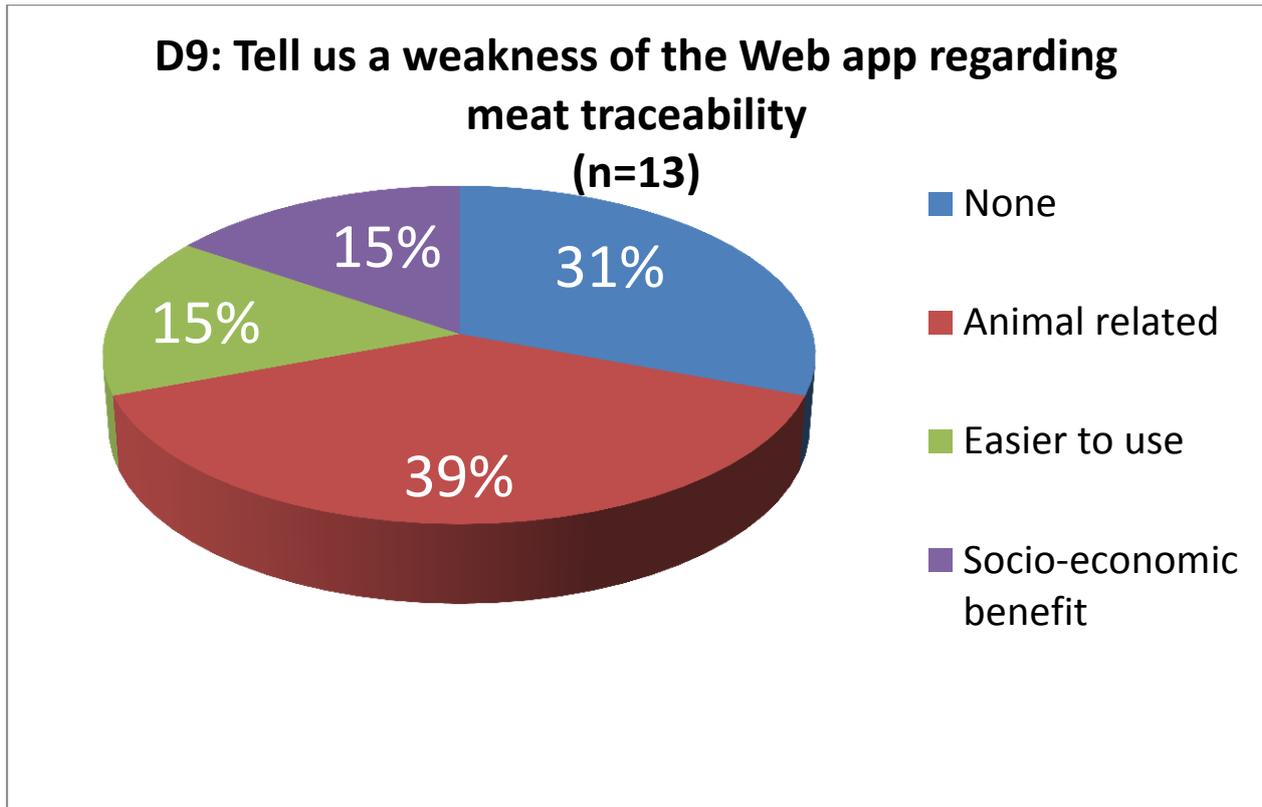
Figure 2-28: Tell us a weakness of the Web app regarding meat traceability

The conclusion of the results obtained by the volunteers during that testing in Barcelona is positive. Not only looking at the very few open issues, which are at the same time quite encouraging, there are several well-meant recommendations for further improvements. But not only specific aspects were successfully evaluated. The whole workshop was a big success. The testers were happy to contribute to research and development; therefore their judgements are honest and realistic. The recommendations and evaluations made by the testers are valuable for the progress of the SAF TIC and TTAM pilots and for cSpace (approved proposal for Phase II) too. The positive evaluation by a group of real consumers of the web-based services for transparency with fTRACE confirms the right attempt of stepping into the next phase with large-scale experimentation trials.

3 Evaluation

3.1 Economic aspects

As stated in chapter *2.5. Business Case for the TIC pilot and the TTAM pilot* of the D400.2 document [10], the storage and availability of products' data and its communication creates a significant added value to the products and attenuates the economic costs associated to health risks. As a result, this enhances the economic benefits of several stakeholders along the supply chain, from the farmer to the retailer.

In order to quantify the economic benefits of *TIC pilot* into the EU agri-food industry, several hypothesis and scenarios were analyzed from the perspective of Retailers, Software Developers, Consumers and Farmers. These economical simulations have been performed to establish the break-even point within the business case. We can say that the benefits for the supermarket (increase of clients, sales revenue...) is due to the information provision service to its customers, where meat information (TTAM) is included, so this chapter is related with both of them.

Scenarios

Table 3-1describes two scenarios were established to measure the business case of each stakeholder, as

Table 3-1:   Business case scenarios

SCENARIO 1	SCENARIO 2
Only pioneering retailers use the application. In this case, both customers and marginal purchase per client increase are expected.	The tool is wide spread among all the retailers. In this case, no customers and purchase increase are expected. The FI costs can be seen as an opportunity to reduce the enterprise risks associated to food safety alerts and hence the company absorbs the cost and the tool fee can be internalized in the products' price of the consumers.

Economical Business expectation: the Retailer case

SCENARIO 1:

BENEFITS

Concerning business value, those retailers satisfying customer expectations and needs about food information will have direct economic benefits due to a (i) gain of new customers, (ii) loyalty cultivation of the current consumers and (iii) a slightly increase of the shopping volume (marginal purchase).

As an example, the benefits and costs of a medium sized retailer in Spain were investigated (Table 3-6). Financial data of the benefits were obtained from a standard Spanish retailer experience (Table 3-3), whereas costs associated to the application were estimated for the implementation and maintenance of it in this representative retailer (Table 3-5). The following assumptions were taken into account to calculate the benefits:

Table 3-2: Assumptions for the economical calculation of benefits in a medium sized standard retailer in Spain.

Assumptions	Only products where TIC was applied were considered to calculate the expected marginal purchase increase.
	TIC was applied to all FFV and meat and 50% of prepared meat and dairy products.
	The TIC application was also available for 10% of the dry products.
	All those dry products with logos that could be recognized by the app were also taken into account

Table 3-3: Economic expectations for a medium sized standard retailer in Spain.

		BASELINE DATA		SCENARIO 1		
		without FI (current)		with FI		
			TOTAL	TOTAL	INCREASE Δ	
	units	(%)	absolute values	absolute values	(%)	absolute values
Total sales	€ / store · year		500,000,000	519,384,000	3.88	19,384,000
Net profit on sales	€ / store · year	2%	10,000,000	10,387,680	3.88	387,680
Number of annual customers per store	Customers / year · store		17,543,860	17,894,737	2.00%	350,877
Average purchase amount per client	€/ customer		28.5	29.02	1.80%	0.52
DRY PRODUCTS	€ dry products sold / € Total products sold	76%	380,000,000	381,900,000	0.50%	1,900,000
FRESH PRODUCTS	€ fresh products sold/ € Total products sold	24%	120,000,000	127,300,000	1.46%	7,300,000
	FFV	6.0%	30,000,000	33,000,000	10.00%	3,000,000
	MEAT	6.0%	30,000,000	32,250,000	7.50%	2,250,000
	FISH	3.8%	18,750,000	18,750,000	-	-
	PREPARED MEAT PRODUCT & DAIRY	8.2%	41,000,000	43,050,000	5.00%	2,050,000

Table 3-3 shows that even a minor increase of customers in parallel with a moderate augment of the shopping volume causes a noteworthy expansion of the economical retailer's outcome (3.88% per year).

COSTS

Table 3-4:   Assumptions for the economic costs calculation of a medium sized standard retailer in Spain.

Assumptions	Total product references with TIC information: 2.100 (430 for FFV, 600 for meat and 1.070 for Prepared meat and Dairy products).
	Average of Spanish population with Smartphones that use applications: 20%.
	N° of shops: 150.
	Each app user scans 5 products per shopping act.
	The Wi-Fi Access points are designed to support a minimum of 60 simultaneous users.

The technological costs related to the implementation and maintenance of the application in a medium sized retailer in Spain is presented in Table 3-5. These technological costs have been determined with the information provided from the Software Developer.

Table 3-5:   Financial costs calculation: implementation and maintenance of the FI in a medium sized standard retailer in Spain

IMPLEMENTATION COSTS			
Hardware costs	Units	€/unit	Total (€)
Store infrastructure	150	150	22,500
Wi-Fi Access Points	150	360	54,000
Software development and implementation	1		250,000
		Total	**326,500**

MAINTANANCE COSTS				
Data storage	Units	KB / unit	Total KB	Euros/year
Product references	2,100	57.46	120,666	6,033
Users	200.000	0.497	99,400	4,970
		Total	220,066	**11,003**
Data transfers	Total queries	KB/query	Total KB transferred	
	17,543,680	57.46	1,008,059,853	**120,967**
Internet connection	n° of shops	€ / year · shop		€ / year
n° of shops · annual internet cost / shop	150	480		**72,000**

Servers and application maintenance		**20,000**
TOTAL		**223,970**

Finally, the Table 3-6 illustrates the economic viability of the project:

Table 3-6:   Final economical expectations for a medium sized standard retailer in Spain.

ECONOMICAL VIABILITY	
SCENARIO 1 (with FI)	
Years	3
Investment	326,500
Maintenance cost (per year)	223,970
Cash flow	350,877.193

ROI	16.49%
Payback period	1.99 years

According to the initial hypothesis and calculations, the economic impact of the tool for three years will be 0.98K€, whereas the total selected products' sales will be 27.5%. In the worst assumption case of no sales and marginal purchase increase, the tool would represent an extra cost of 4% on selected products (FFV, meat and dairy).

SCENARIO 2

BENEFITS

From all the economic aspects of the Retailer case in Scenario 2, two different profits can be highlighted in this report: (a) the implementation of Future Internet as a tool to decrease the health risks associated to Food Safety Alerts and (b) the avoided costs to implement alternative ways to give the information in all retailers, given a widespread need for the attributes' communication to the customers. However, it is important to state that the benefits associated to the previous benefits are inherently challenging to quantify.

On one hand, authorities have found difficult to quantify all those costs associated to the recent events of Food Safety Alerts such as the horse meat in cow products in February 2013 and the *E. coli* intoxication due to germinated soybeans in 2011. The costs that retail companies could have due to food safety alerts have not been estimated here in order to preserve the real approach of the project's data.

On the other hand, considering a stable economy with no customers or purchase increase in a single retailer, the cost of implementation and maintenance can be internalised in the cost of the product.

Considering a wide spread solution for all retailers and products, the economic impact of the tool will be lower than 1% and, thus, hardware costs will remain stable (for each retailer) and only storage and data transfer will increase proportionally (see Table 3-5).

Economical Business expectation: the farmer case

SCENARIO 1

Scenario 1 implies directs benefits to those farmers supplying products to the pioneering retailers. Due to the gain of new customers and marginal purchase in these stores (2% and 1,8% out of the baseline data, respectively), the retailers' demand increase entails an opportunity to the farmers supplying FFV and meat products to them. According to the previous table (Table 3-3), the demand from the retailers to the farmers would increase 0.60% for FFV, 0.45% for meat and 0.41% for prepared meat and dairy products. This implies an increase of 1.46% of the total sales baseline for farmers.

SCENARIO 2: farmers and the economy as a whole

An increase of the consumption of products with better attributes due to the improvement of communication could imply a potential development of the EU agri-food production in front of the extra-EU27 countries production.

Since EU agri-food is specialized in healthy, high quality and environment respectful products, the consumer could better value these characteristics and translate it into a purchase increase of EU27 agri-food products. This could influence the current agri-food trade of the European Union and balance the imports-exports.

Therefore, recalling the percentage increase from Table 3-2, a 1.46% increase of these types of products in scenario 1 can be extrapolated and also applied to Scenario 2. Considering the 2011 EUR27 imports for FFV, meat and dairy products, an approximate value of 251.576 M€[1] could be displaced from the imports of Extra-EUR27 countries. Consequently, Scenario 2 would lead to a promotion and strengthening of the European agri-food industry benefiting not only the farmers but also the European economy as a whole.

Economical Business expectation: the Software developer

Earlier in this section the economic perspective from the Retailer has been explained in detail. In this sense, the figures show a clear benefit from the investment made in the ITC infrastructure.

Where is the benefit for the Software Vendor in this global framework?

Software vendors in European countries have a difficult role: Continue selling products and services to customers that already have a complete and operative infrastructure. In this sense, it is particularly hard that a customer is willing to invest in a new service/product if the return of the investment is not clear. Obviously, the answer is to improve the offer by the introduction of innovative solutions that show a clear advantage. The figures included in the previous pages are useful to support any commercial approach.

Clearly, the benefit for the software developer is based on the added value that can be provided to the retailer. If it has some economic benefit they will be open to face new projects and to deploy these solutions.

Nevertheless, there are a number of considerations to be made here:
- A complete solution requires the integration of information from the whole production and logistic chain. This may be available or not and, therefore a "case-by-case" study will be required to clearly define solutions adapted to a Retailer according to the availability

---

[1] **EUROSTAT, 2013. Trade Statistics (Imports-exports) for 2011. EUR27 / all Partners (including EU Member States). Product description: meat and edible meat offal; dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included; edible vegetables and certain roots and tubers; edible fruit and nuts; peel of citrus fruit or melons. <*exporthelp.europa.eu*>**

of information and infrastructure. The challenge here will be to provide features that really add value in a context where some parts of the logistic information may not be available.

- Another issue is that many Retailers belong to logistic chains that expand over more than a country (Carrefour, Auchamp, Lidl, etc.). The access to these customers is difficult for an SME and only big Software Integrators have a clear access to them. The challenge here is to reach agreements between Apps developers and big Software Integrators that can provide really added value to the final customer. The benefit of SAF project is to create the ecosystem where these agreements may take place.
- Finally, the incorporation of the Future Internet's Generic Enablers is another differentiation element that in the mid-term will boost applications to an upper level. However, for the time being, they are neither in production, nor IPR and commercial conditions are in place. The clarification of these issues will be a key aspect to ensure that applications based on GE are commercially competitive when balancing features/price. In addition, maintenance and support will be key issues: A company will not include a GE in their software if there is not a clear maintenance agreement with prices and a SLA (Service Level Agreement) that is able to support their business operations.

According to these considerations, the conclusion is that there are clear business expectations as new innovative applications can be offered to customers with a more mature Information Systems. Nevertheless, there are a number of open issues (maturity, price, stability, future support) that are to be solved before a serious business plan can be defined.

Economical Business expectation: the consumer

According to Table 3-2, scenario 1 does not imply any negative impact in economic terms to the consumers, whereas Scenario 2 could involve a minor increase of the final price given the need of the retailers to compensate the initial investment and maintenance of the application.

On the other hand, the better information on (i) origin, (ii) production method, (iii) quality, (iv) safety, (v) nutrition and other aspects would lead the consumer into more conscious decisions. Since the EU agrifood main strengths are the high standards on health, quality and environment, the consumer awareness would value these attributes and consequently acquire healthier products.

It is noteworthy to state at this point the unquantifiable nature of some indirect economic benefits like health and, therefore, the unfeasibility to establish any numbers related to some economical consumer benefits.

Accordingly, the degree of health risk attenuation associated to this EU agri-food consumption increase is not a topic that can be quantified in this study and, thus, it should be addressed in further research.

Consequently, the adoption of FI TIC in a standard store results in several cost-effective benefits for the Retailers, Farmers, Software Developers, Consumers and, as a result of these economic activity increased along the supply chain, the Economy as a whole.

3.2 Environmental aspects

One of the main objectives of the TIC and the TTAM pilots is to make available and share information about the product to the consumer. The information provided to the consumer and related to environmental aspects could be, for example:

Carbon footprint

Carbon emissions, most notably CO_2, are part of a collection of gases that could negatively influence the quality of our air and increase the greenhouse effect. Greenhouse gases (GHGs) have a direct influence on the environment, causing extreme weather changes, a global temperature increase, the loss of ecosystems and potentially hazardous health effects for people. Greenhouse gases can be emitted through transport, and the production and consumption of food, fuels, manufactured goods, materials, wood, roads, buildings, and services. For simplicity of reporting, it is often expressed in terms of the amount of carbon dioxide, or its equivalent of other GHGs, emitted. So preferences to low carbon footprint lead to reduce environmental impacts associated to carbon emissions.

Use of pesticides

The environmental benefit may be seen is the ability to specify in an integrated system, those areas where certain chemicals may not be applied at all or at lower rates. For example, setbacks from surface water and ground water inlets can be specified as no spray areas and the technology of smart farming would allow them to be avoided automatically as the farmer covered the rest of the field. This setback could certainly be done visually without this new technology, but the new technology complements farmers' interest in covering ground quickly while at the same time providing environmental benefits to themselves and the public.

Tracking and tracing (transport)

In distribution and logistics of many types of products, tracking and tracing concerns a process of determining the current and past locations (and other information) of a unique item or property. So tracking and tracing information informs about the product journey (transport length) from farm to supermarket. As transport use energy resources, preferences to short product journey (small transport) lead to reduce associated environmental impacts.

Use of fuels

A controlled traffic system with GPS and sensor technologies for the agricultural machines can be reduced the use of fuels. In controlled traffic mainly fuel use could be reduced with fewer overlaps when combining, harrowing, ploughing, seeding and general improved logistics and better utilisation of the farm vehicles during tillage.

Organic production methods

The philosophy of organic food production maintains certain principles: biodiversity, ecological balance, sustainability, natural plant fertilization, natural pest management, and soil integrity by using methods and materials that minimize negative impact on the environment. So preferences to organic production methods lead to reduce associated environmental impacts.

Certifications

ISO14001 and EMAS for Environmental Management Systems, ISO50001 for Energy Management Systems, EU Organic for organic food in Europe, etc., are some of the certifications that ensure in a certain way that the companies manage to reduce environmental impacts or to prevent generating them.

In this way, the provision of this type of information about the product would enable the consumer to exert a certain kind of pressure on the food chain companies by having preferences on products which carbon footprint, transport, production methods and system managements empower the reduction of environmental impacts.

In fact, considering that the Future Internet based on the TIC and TTAM Information Systems will provide an improvement of the consumer awareness about any product information and how

it can affect the environment, and considering the higher importance environmental aspects have now and will acquire in the future, consumers would be more warned about environmental impacts and more aware of how to act in their consumption habits in order to reduce these impacts.

For example, consumer preferences for low carbon footprint or to organic production methods (with no use of pesticides, fertilizers etc...), should lead in the future to manufacturing companies to aim for production and logistics management systems, focused to a reduction of pollution within the food chain companies, and reducing in this way impacts on the environment.

In the same way, consumer preferences to low carbon footprint, local companies (or considering the shorter distance from farmer to supermarket), and product companies certified by ISO 50001 [5] for example, should lead in the future to a reduction of the use of energy within the food chain companies, reducing impacts on the environment.

So considering this market pressure by the consumer, enabled by the future internet, companies should try to take into account those environmental aspects for their products in the future, if they want to take economic advantage of it.

3.3   Social aspects

The Smart Food Awareness pilots facilitate obtaining information regarding products, content, transport and source location as well as the environmental impact of the distribution process. These values affect the user in two ways:

- First, end-users become more aware of the problems of food distribution, effects on the environment, product treatments, etc. An example of this is the logo recognition system that makes the user more aware of the quality labels, certificates of different regions.
- Second, applications for Food Awareness allow users who already know these processes, certificates, etc., to be sure that the products they are consuming meet their requirements, be either health, religion, ethics, ideologies, etc..

The user benefits is translated to a benefit for food chain stakeholders, who are rewarded by providing a better control of food safety and quality of new and current products and an increased transparency of the food chain.

The social feasibility is demonstrated by the perception of the users who have participated in each of the three workshops held in Bon Preu's facilities. These end-users, after receiving an introductory talk, tested the TIC application and their general opinion was that it was an innovative solution that was not found in any other supermarket they knew, and they certainly would use the application for their shopping process if provided by the supermarket in a real deployment.

The end-user feedback gained conveys the message that supermarket's customers are aware and concerned of the generic challenges of the food–chain, i.e. food safety, environment, ethical issues and cultural preferences, and that they see the possibilities of FI to tackle these challenges.

The possibilities of the Future Internet based technologies were connected with developments in the agricultural domain and feedback from users on the firsts steps of the food chain. These aspects appeared to have high relevance for the end-users.

Users are also described as overwhelmed by the vast amount of information on the Internet related to multiple domains, but also in agri-food domain. The information found is often wrong, impartial and incomplete while other times a lots of information make the user leave the search for information due to lack of time or motivation. The use of personal information in the ICT pilot adapted to user preferences enables to filter this information and improve the user experi-

ence in an agile environment which requires an easy and quick interaction with the mobile terminal.

Among the properties that can be personalized in the TIC application are: Food Origin, Sustainability, Expiration date, Chemical additives, Cultivation, Carbon Footprint, Raising, Welfare certification, Religion, Animal Information, Nutritional Information, Allergens and so on.

Services tailored according to user needs ensure the usefulness of the service framework for all users despite their educational background. The markets should be aware of the user needs in the present (and local) markets and react to the needs by providing appropriate services.

3.4   Evolution path

As previously described, the work within WP400 has been realized with the idea of easily deploying the final applications in a real market environment, and taking into account the feedback of both the food chain stakeholders and the consumers. Based on these principles, a study on the evolution path has been realized towards the necessities in a real deployment, focused on factors as the extensibility, flexibility, scalability, portability, etc.

3.4.1   Extensibility

Considering extensibility as the ease of providing new features and functionalities to the pilot, the architecture design of TIC and TTAM pilots into account the future needs of extensibility.

The TIC pilot was defined by providing improvements for a better shopping experience, information visualization, product identification and tailoring information:

- Regarding shopping experience the decouple between product identification and product information retrieval enables the provision of multiple device interaction, including devices with multiple sensors that detect gestures (e.g. Kinect [6]); so, a user can point at a product and the TIC can mix de information received by the device with the existing information.
- Regarding information visualization an extended shopping trolley with screens or any other human interface can also be integrated with the TIC pilot. In the same way, as the Gesture identification scenario, the trolley can interact with the mobile device for fetching information regarding shopping lists, profiles or preferences. This exchange process could be easily plug in in through NFC, Bluetooth or any other short range wireless technology, that are indeed supported by the HTML5 standard.
- Product identification extensions have been strongly considered in the TIC pilot design and implementation. Different camera software or new RFID sensors can be easily included since the abstract information model. Even the Logo Recognition Tool has been designed to accept several photos of the same logo, learn and correctly detect them (even photos with different angles). In the pilot there is also a mobile application that helps supermarket staff to take photos of logos, mark and introduce information.
- Future scenarios expect the integration of multiple information sources, especially from consumers. The TIS has been designed for accept "plug-and-play" information sources. Taking as example a mobile device that stores health information from the user (e.g. fetched from a portable glucose sensor), it could be possible (implementing all the privacy mechanism) to take this information and build an adapted shopping list at the right moment. Hence, since the TIS and SmartWebProxy are designed and implemented keeping in mind ubiquitous web technologies, these kinds of scenarios will be very straightforward at the communication level.

3.4.2 Flexibility

In the field of Smart Food Awareness in a real deployment the opportunities towards flexibility are restricted - for the transparency services (TTAM pilot) in the meat sector as well as for tailored information to consumers (TIC pilot). This is because in both cases numerous private data and individual information schemes have to be exchanged very spontaneously and with a high demand on reliability – often in an n-to-m-relationship (many with many).

In the TIC pilot the retailer or especially a point-of-sale is the place of intense contact with the customers. There both partners maintain a very close relationship: customer to retailer and vice versa. Loyalty programs, promotional activities and a close neighbourhood are the reason or only a long lasting good shopping/ vending experience each with the other. In the TIC pilot this kind of familiar relationship is raised again on a higher level because personal and confidential information are provided electronically by the consumers to the retailer. And in return customers expect that these information are stored and handled safely and confidentially – quite right .

Here flexibility would cause the opposite: disturbation and irritation. Beyond that a mixture of different data formats, sources and levels of granularity would not improve the quality fo the data or their validity. In contrast, the consequences of such flexible management could cause higher costs and perhaps also frustration – thus deterioration of the whole system. Finally also legal aspects and actual law against data fraud avoid or hinder at least flexibility. On the other hand if flexibility is understood as openness for new sectors, groups of products, other retailers or other countries, nobody should deny to bring in use the new concepts developed in the TIC pilot.

In the TTAM pilot the ability for flexibility is limited because of the fact that the fTRACE service is a running system relying to a great extent on standards. In addition one has to take into account that idea of easy access to the system and the data inside prerequisite clear structures and open interfaces. Changes within this system would threaten and obstruct other users. That has to be avoided for the sake of each user and the community of potential new users in the future. The same applies for interpretation of data; they must be kept to a minimum. So far standardization and flexibility are contradictory.

Summarizing, to change processes are subjected to a certain standardized change process itself, while modifications and additional input are always possible – even wanted. The service would benefit from additional participants, products and data sets. Changing basic technology as identifiers and ways or languages of communication have to be applied for and registered. So in the end flexibility here is more a question of compatibility and interoperability and there no longer an issue than an advantage of using standards and approved processes.

For showing customers information about a product two kinds of data need to be delivered:

1. Static data:

Data like product number, fixed product text, videos or pictures that need to be stored first. All static data is administrated by a sophisticated web based CMS (**C**ontent **M**anagement **S**ystem).

It has a so-called WYSIWYG (**w**hat **y**ou **s**ee **i**s **w**hat **y**ou **g**et) editor, which gives the administrator the opportunity, while editing the content, to see a preview of the future output of the content. Administrating the static data can be done at any time. There is no "downtime" and is online directly after the administrator has confirmed all changes.

2. Dynamic data:

Those are data like date of production, date of processing, best before date, etc. to put it simply: all data which changes with every new production batch. The data needs to be provided by the producers.

All dynamic data will be stored into a GS1-XML based file. This XML-File is developed by the GS1 Germany and is already wide-spread in the food-sector. The main advantage of this XML-file is that it can be verified in run-time by using so-called XSD-Files. Such XSD-Files are just like data blueprints. It indicates how the XML-File has to look like and which elements needs to be filled. If some elements are filled with wrong data or weren't even filled with data, an exception will be raised and the corrupt XML-File will not be processed.

There is already much information that can be transported and verified by the GS1-XML-based file, but it may happen that a new element has to be added or a new branch needs other information. In that case all new elements will be added by the GS1 Germany to the XSD-Files, will be distributed and can be integrated in runtime into the relevant systems.

Even dynamic data can be changed, after they have been sent to the receiver. In the XML-File is a flag called "documentActionCode", this flag indicates the system whether this is a dataset creating, updating (changing) or deleting message. The only information that can't be changed without permission of a third person is the best before date.

3.4.3 Scalability

With the paradigm of cloud computing embedded into our WP pilots, scalability issues related to server availability, data and communication load, multitenancy, federation, are more of a factor from the economic point of view than for the technical domain. Cloud computing allows companies to easily upscale or downscale IT requirements as and when required. For example, most cloud service providers will allow for quick and easy allocation of resources in a monitored environment where overloading is never a concern as long as the system is managed properly. This will allow business growth without expensive changes to your existing IT systems.

The use of the fTrace [1] platform as the tracking and tracing framework within our TTAM pilot, to exchange and store data from the supply chains, is also aligned for the scalability of the project. fTrace is envisioned for the near future as a decentralized and distributed system, where each stakeholder has its own instance of the EPCIS [7], used to retrieve and publish data about the products. This information is accessed via the Internet with simple and standardized requests (after a name resolution service, which returns a pointer to the resource requested, "a la" the DNS of the Internet) to the source of information. This provides an optimal scenario for dealing with scalability as new stakeholders can become part of the tracing system:

- Without affecting the demand of computing and storage resources of the platform.
- Easily implementing and deploying a standard system with open source implementations, reducing the costs and interoperability issues.

In our TIC scenario, the retail-domain partner, Bon Preu , operates exclusively in Catalonia so, taking the step from 1 supermarket to more than 1 won't require any special treatment from the scalability point of view, as they all share a common warehouse/logistic centre, which is where the great majority of the information of the products is retrieved (from the previous stakeholders of the supply chain) and added (with internal processes information) and stored. Real time adjustments due to increase (or decrease) demand of processing power, service responsiveness and data storage capacity, are automatically provided by the cloud infrastructure. In our pilots we make use of FI-WARE's cloud infrastructure, thou same configurability is provided by almost any cloud provider, and would be enough to give service for the all Bon Preu's supermarket network.

For the cases that the operation is carried out within different regions or countries, or the workload of the server is huge, distributed and federated systems and databases shall be considered in order to provide best QoS, availability, autonomy and support for the region. For the case of an implementation on a single and big retailer, who operates at a national level, and the stakeholders

of their supply chain, all of them resulting in hundreds of warehouses, hundreds of thousands of products' movements along the supply chain, hundreds of thousands of customers per day, existing system and communication infrastructure is more than enough, and its development and deployment is notably eased by the use of the Cloud. Deliverable D200.4 [8] deeply analyses the data and communication load generated by the producers (farmers), identifying how, even though the amount of data and process demand is huge, current systems are prepared to deal with it. Hence, apart from the development tasks needed to link systems and databases, scalability of the system becomes more of an economical aspect than a technical challenge.

3.4.4 Portability

Most of the functionalities developed in the pilots have been designed and implemented following the principles and methodologies of SOA architecture. This provides the added value of interoperable services, understood as small/medium software components which can be reused for different purposes.

Following this architectural approach, theoretically there would not be a mass of developers using whatever tool sets might please them. But rather there would be a coding to a standard that is set within the business. Neither a SOA implementation of the pilots built on SOA require a particular programming language.

Moreover, having implemented the mobile application using HTML5, future developments won't have to deal with different version of different devices

Related to the GEs used in the product, these are stand alone embedded pieces of software, so no need to redevelop them when integrating in other future systems.

The specifications and requirements (both functional and non-functional) have been carefully elicited just by two main reasons:

1 - It elicits feedback early, which can help avoiding problems and misunderstandings later on. It is especially important that future developers are able to identify any missing functionality in the design, for example.

2 - An effective set of requirements and specifications ensures that the final implementation and coding of the pilot stays in line with the original idea as it's built. In other words, the more precise are the specifications and requirements, the easier will be that a competent developer will implement any component as it was designed.

Finally, the layer-model paradigm has been highlighted during all the design process. A strong differentiation between layers gives us the opportunity of working independently with the concrete services we need at each certain time of the development process. In the portability scope, this provides a total abstraction between the design and implementation phases that allows the use of the technology more suitable to other requirements.

3.5 Responsibilities and organization

The development, deployment and merge of the two pilots of WP400 resulted in a traceability system throughout the complete food supply chain which was used by the retailers' customers to retrieve trustful, enriched and personalized information in their mobile terminals. As for the analysis of the organizational aspects involved in operating this system in a production domain, a division in technical and business independent components has been made:

- ID & Traceability of goods
- Generic Enablers

- Internal services
- External services
- Public bodies' services

The biggest issue arises from the generation, codification and transmission of information along the whole supply chain, as each stakeholder must capture and publish information about the processing of the food carried out in their domain. In the case of the initial stakeholder, the farmer, it can be the region, fertilizers used, breeding procedures, animal welfare, etc.; in the case of the warehousing or logistic entities the information provided could be time spent in transportation or in refrigerators, sanitizing processes and products and other manipulation procedures. And in the case of retailers, they should add supermarket-specific information about the internal flows in which products are involved (storage, transportation).

This information is gathered by each stakeholder and forwarded or published to the rest of the chain via a common information system. For this interconnection of systems all the parties involved should share a common technological infrastructure, meaning in most cases a huge investment in software and hardware and a notable change in their actual processes.

Another important aspect to take into consideration it that currently, the companies are commonly connected only with the previous and the subsequent stakeholder of the chain in an ad-hoc schema (that is, one-to-one communication protocol exclusively implemented for the participating parties) and each of them having their own infrastructure (Information System)

To reach interoperability along the supply chain, standardised procedures and technologies have to be established that are adopted by each stakeholder in the supply chain.

Although this may seem like a big challenge, and indeed it is, we must take into consideration the recent history that shows us how similar transcendental changes have been achieved, being mostly motivated by both 1) local or international regulation, (generally) for the purpose of a better management and control of the products that are generated, imported and/or exported, and 2) internal business strategies. Along the past decades there have been lots of advancements in the direction of worldwide interoperability of information exchange through the supply chain: the inclusion of standard coding mechanisms, in the form of the EAN/GS1 barcodes, international agreements that oblige stakeholders to follow specific procedures and processes (fertilizing, sanitization, manipulation, storage…)and to provide reliable information about the products (composition, perishability, nutritional aspects,) certification bodies in charge of providing quality assurance of the information, etc.

More specifically, the incorporation of this traceability system involves, from a technical point of view:

- Hardware in the form of replacement or addition of new devices in multiple steps of the (enterprise-internal) chain, as the tools to identify the products or logical business steps related to products. As of the telecommunication and server infrastructure required to make use of internet within the stakeholders' facilities its of their own responsibility to deploy it. With the popularization of broadband mobile communication infrastructure and the cloud paradigm this seems very likely to be easily achievable, both from the economic and technical point of view

- Front and backend software to manage the whole system, which will in many cases come to replace or complement the existing ones. The investment needed in this case is dependent on the specific system of each stakeholder and

- Procedural changes in their daily workflows related to product manipulation, to support the retrieval and publishing of product information. The replacement of old technologies

or the addition of new ones should also help companies to achieve internal productivity improvements by automatizing and accelerating daily work. Additionally the availability of new sources of traceability information should provide a useful tool to manage their internal resources more efficiently

To obtain true traceability these changes are mandatory for each of the organizations involved in the supply chain, though partial (poorer) traceability is still achievable if one or more stakeholders do not comply with the system.

For this part of the system, stakeholders and their associations are therefore responsible to decide to embrace the change and invest resources; public bodies can play the role of motivator, facilitator and investor to fasten and ease the change.

Some more business aspects to be considered are that the nearer the stakeholder is to the beginning of the supply chain, the less value they are receiving from implementing the system; further steps will retrieve more and more information to be used to improve the management and the quality of their products and procedures, being the final user the primary beneficiary in terms of investment vs. services obtained

Organizational issues surrounding the in-production use of GEs

Within WP400, the last release of the pilots implemented several GEs that provided important functionalities to the platform. The Data Centre Resource Management GE was used as our server infrastructure where the whole system was deployed and from where all the services were accessed. The Identity Management GE provided the system with an external establishment and management of the users' login lifecycle within the application. The Data Handling GE was used to externalize the storage and retrieval of the users' data as well as providing the means to allow the users and the supermarket to define their privacy policies concerning the usage of personal information.

As of the utilization of these GEs, the responsibilities and organizational issues are directly linked to the FI-WARE Business Ecosystem and the intellectual properties policies established in the FI-PPP Collaboration Agreement, which applies to all the FI-PPP participants, and in the Consortium Agreement, specific to our SmartAgriFood project. The first one establishes different roles in the IS value chain around FI-WARE.:

- FI-WARE GE Provider. Implementer of a FI-WARE GE. The nature of the GE specifications will allow other companies other than FI-WARE partners to develop products that are in compliance with FI-WARE GE specification.
- FI-WARE Instance Provider. The company which deploys and operates a FI-WARE Instance and establishes some sort of business model around that particular instance.
- FI-WARE Application or service (GE-compliant) Provider. A company that develops FI applications/services based on FI-WARE GE APIs and deploys those applications on top of a FI-WARE Instance.

All of them shall be considered as foreseeable important entities at the termination of the FI-PPP programme in which those roles are currently fulfilled by FIWARE and the Use Cases partners. During the FI-PPP and within the Collaboration Agreement framework, technological transfer and access to the knowledge and use of GE are granted in a Fair, Reasonable and not Discriminatory (FRAND) basis, or even as an open source software depending on the characteristics of the GE and its owner/s. In that context Access Rights to the background and foreground knowledge and software is based on bilateral agreements between the GE owners and the 3rd party interested in using them as an Instance Provider or App Provider.

In the context of the project and its relation with the GEs, some technical issues arise to undertake the change from a pilot environment to a production one. First of all is the provision of Quality of Service and Quality Assurance from the (current and only) FI-WARE instance, as, at the time being, nothing in this direction has been stated. Hence, reliability, stability and robustness of the current technical framework where the GEs are deployed is still undefined, something that a system in production cannot afford to have. Also, and not being the case for WP400's pilots, the fact that all the GEs are exclusively accessed via Internet and don't have the option to locally deploy them, could bring some problems where other communication architecture is wanted or needed.

Internal services/components. IPR in the project's context

As for the IPR inside the Use Case project, every partner is the owner of the back and foreground knowledge and software used/generated within the scope of the project. Hence, to jump from a pilot system to a one in a production and business framework (inside or outside the project), commercial agreements between the WP parties are required. The following chart shows, in a general view, the ownership of the system components.

- UPM: mobile application, almost entirely
- ASI: integration of Identity management, integration of Data Handling
- GS1: fTrace platform
- ATOS: server side software components, web server and data bases
- ATB: logo recognition system
- Bon Preu: design of the UI & business model

Integration with external services

Apart from traceability information, different information related to a product or category of product can be obtained through external Internet services such us, information about the chemicals, intrinsic properties of a specific ingredient or component, recipe service, users' opinion about products, etc. For the integration of those external sources in the current system a joint effort from the Use Case technical partners and the external service providers shall be carried out. If the source has open interfaces and the service provided is aligned with what our system requires, then this collaboration or negotiation is not needed.

Integration with public bodies' systems

The integration with public or regulatory entities, which provides already envisioned functionalities such as receiving sanitary alerts from contaminated products and forwarding the information of which retails acquired those products and to what customer have they been sold, etc., requires an organizational framework similar to the external sources' one, that is, the development of an interface and the deploy of the necessary infrastructure to communicate both parts.

As for the user terminal and telecommunication infrastructure needed to make use of the TIC services in the supermarket, the approach is utterly dependant on the business model embraced by the retailers. Retailers can provide the users with terminals and/or local Internet connection or can delegate these requirements on behalf of the users.

4 Conclusions

As explained in the introduction, the main objective of this deliverable is to expose and analyse the feedback provided by the final user related to the Smart Food Awareness sub-domain within the food chain, and also to evaluate the conclusions obtained during the project within the Retail sector. During the different chapters of this document all these matters have been explained and deeply analysed.

Chapter 2 has shown the feedback of both the supermarket customer and the food chain stakeholders, analysing the received information. The conclusions are different for these food chain players:

- Consumers: along the three workshops in the supermarket the same group of people was involved in it, and these are their main conclusions:
    - There is a lack of information related to products for the costumer in the supermarket. And if the information is available it is difficult to understand it
    - Not all the currently provided information is useful or interesting for the consumer
    - The food awareness activity is useful and very interesting, and can help end-user to gather information that is interesting for them
    - But they disagree with raising the product price or paying any money to gather the tailored information
    - They are willing to start using a real market application with the same characteristics that the ones offered by the proofs of concept
    - They are receptive use the new technologies while shopping, and they prefer them to the classical supermarket communications, as SMS or old-fashion mailing.
- Food chain stakeholders:
    - There are many problems in the meat chain that hinder correct tracing and tracking of meat products nowadays
    - The project addresses those problems in the right way, and from a technical point of view it is possible to solve them
    - The reliability of the tracking & tracing information, which can only evolve from an intense usage of such systems, therefore cannot be guaranteed by the project itself
    - So it is necessary to better involve the stakeholders within the meat chain and a change of mind in the way these companies share their data is needed; and also from the side of the customers public stated requirements may support a development of increased transparency in food chains

After analysing the feedback of the consumer, in chapter 3 a first requirement analysis and a costs benefit analysis of developing the proof of concept applications of pilots into real market software tools has been realized:

- The cost and revenues of these applications in a real market software tools have been estimated by simulation. The main conclusions are that a significant increment in the benefits for the retailers and supermarkets would be achieved. But not only these companies will enhance their working methodologies, and therefore their revenues, but also farmers, producers and food-processors that will be able to produce better products based on the feedback got from different sources, and the logistics companies, improving the transport and maintenance of the products in the food chain. These actors also can improve their businesses using all the gathered information. Not only looking at higher turnover by increased sales and distributions, at the same time each participant in the value chain would be able to realize benefits on ameliorating his purchases and procurements.

- The modifications that would be necessary to be done in the structure of the food chain would imply an environmental improvement in the transport of the food products. It will provide an improvement of the consumer awareness about any product information and how it can affect the environment. Therefore, a consumer would be more sensitized about environmental impacts and more aware of how to act in their consumption habits in order to reduce them.
- From a technical point of view, the improvements to be done in the applications and their deployment into the real market would be easy to be performed. Mainly due to the cloud oriented definition of the architecture of the backend of the applications, and the service oriented definition of their functionalities, what boost the addition or modification of new functionalities in the software solutions to be deployed. Also, the use of new technologies, as HTML5, enables a more easy and general access for a consumer using any kind of gadget with access to the internet, as computers, tablets, smartphones, etc.

All these conclusions envisage an optimistic future for the Food Awareness products in the next years, helping to improve the buying of more health and less environmental-injurious products by the consumer.

The first need to make of this future a real one is the development of a food chain environment, where all the involved players are connected and know each other. This idea has been further elaborated in the Phase 2 project called cSpace, where a collaborative space has been defined, not including B2B functionalities to ease the links between the stakeholders, but also a common data model, to improve the data exchange, and a market place where final users and SMEs can provide new applications with new functionalities and open new markets.

5   References

[1] fTrace website: http://www.ftrace.de/en/gb

[2] FI-PPP SmartAgriFood Project, Deliverable D400.3, "Smart Food Awareness Report on Validation activities and Detailed Specification Revision".

[3] http://www.bmbf.de/pub/Securing_the_Supply_Chains.pdf

[4] Website: www.SiLeBAT.de

[5] www.iso.org/iso/iso_50001_energy.pdf

[6] Kinect website: www.xbox.com/kinect

[7] Electronic Product Code Information Services: http://www.gs1.org/gsmp/kc/epcglobal/epcis

[8] FI-PPP SmartAgriFood Project, Deliverable D200.4, "Smart Farming: Final Assessment Report".

[9] BfR website: http://www.bfr.bund.de/en/home.html

[10]   FI-PPP SmartAgriFood Project, Deliverable D400.2, "Smart Food Awareness Generic Enabler and Architectural Requirements".

6 Appendix A - Material used in the workshops with consumers (TIC pilot)

6.1 Material used in the Pre-workshop

An outline was prepared and delivered to the consumers participating in the pre-workshop, who had to discuss about it and then answer each question individually.

Outline:

o *How do you imagine the future supermarket? [Example shown to the participants in Figure 6-1]*

Figure 6-1: Example of a smart shopping screen in a future supermarket.

o *How do you organize your shopping?*

o *Do you like going to the supermarket? Or do you prefer to buy using the Internet, from home?*

- *Imagine a change in the way of shopping, that using a personal shopping appliance you could scan the products from our shopping list, then you could pay on-line and the same system could send you the goods at home, without carrying it.*
- *What do you think about this idea? What would you change of it? Suggestions.*

o *How is customer service in the supermarket? Do you miss a more personalized customer service?*

- *Imagine that, using your fidelity card, an intelligent system installed on the shopping cart could identify you as a regular consumer and could allow to:*
  - *Identify your shopping list*
  - *Inform you about new day offers*
  - *Guide you through the shop depending of the products you are interested in*
  - *Etc.*

- *Do you do your shopping list before going to the supermarket?*

- *Do you imagine that you fridge could find out automatically what food do you need to buy?*

- *Are you interested in special offers from the supermarket?*

- *Do you have a fidelity card?*

- *How would you improve the personal shopping aspect?*

o *Do you miss any information on product label? Would you like to know more information about the products you find in the supermarket? What kind of information would you like to know?*

- *Would you be interested to know the origin of the fruit and vegetables you may buy? Would you like to know the environmental impact of products?*

- *Would that affect your shopping behaviour/habits?*

- *Would you like to be able to compare information between different products in situ?*

o *How would you like to receive product information from the supermarket?*

- *Imagine that in the future supermarket you could find information points where you could look up product information related to quality, health, environment, etc.*

- *Would you like to be able to do this from home?*

o *Do you think that you can define your shopping habits and interests in a specific consumer profile? How could supermarket detect your profile? Is it a changing profile?*

- *Imagine that you could create your consumer profile on the Internet, and that the super-market itself could define it more specifically according to your hu-mor/interests/allergies, etc. Do you think that would be a good idea if supermarket de-tected your humor using a camera?*

6.2   Material used in the 1st workshop with consumers

A PowerPoint [*Workshop 1 Bon Preu – 25th April 2012.ppt*] presentation was shown to the participants with an introduction to the SAF project and it objective. Then three games where performed in groups letting consumers to discuss about information needs, current knowledge about logos and ways to receive product information. Each consumer individually and each group answered a survey regarding each discussion.

Outline:

We invite you to collaborate in a pioneer European project to reach a better traceability of food products, by participating to "SmartFood" workshops organized by Bon Preu.

- *Be the first to experience the new concept of "tailored shopping experience" where you can test our prototype to purchase consciously: What am I buying? Where does it come from? Is it good quality? What does it means this logo? Can I eat it if I am allergic to gluten?*

- *Do I want this information by means of a label? Or through a technological device?*

- *Tell us which questions would you like to make to a tomato, a fillet of beef or any kind of food, your opinion is a key point!*

1. *Welcome (2 min)*

2. *Project presentation (PowerPoint or video) (5 min)*

    2.1. What is SmartAgriFood?

    2.2. Pilot test program at Bon Preu

3. *Consumers participation process (PowerPoint and activities) (15-20 min in total)*

    3.1. Participation process planning (objective of each workshop, schedule)

    3.2. Objectives of the first smart food workshop

    3.3. Analysis of the current situation and needs of each consumer

    > *3.3.1. Do you know when a product is local? Do you know the meaning of all this labels? Do you know what the carbon footprint of a product is?*

    > *3.3.2. What are you interested in to purchase, that is to say, what's going to make you choose a product over another? Doing so, what do you look at the product sticker when you are buying?*

4. *Per group of 3 persons, discuss the following questions: (35 min in total)*

    4.1. Logos game - Identify products information that we currently find at the supermarket (10 min)

    4.2. Attributes game - Identify the main attributes that you would like to know or deepen (10-15 min)

    > *4.2.1. Closed list with proposals (each group evaluate the list and make additional proposals)*

    > *4.2.2. Pooling*

    4.3. Communication medias game: Ideas of how to access to this information (15-20 min)

    > *4.3.1. Closed list with proposals (each group evaluate the list and make additional proposals)*

    > *4.3.2. Pooling*

5. *Define the expectations about the pilot test program (15 min)*

    > *5.1.1. What do you expect from the "tailored shopping experience"?*

> 5.1.2. *Initial indicators (must meet the indicators proposed by Bon Preu, e.g. time spend to choose a product, minutes)*

6. *Conclusions (5 min)*

7. *Call for 2nd workshop (5 min)*

The following slides where presented during this first workshop with consumers [*Figures from 6-2 to 6-12*].

Figure 6-2:   Outline of the workshop.
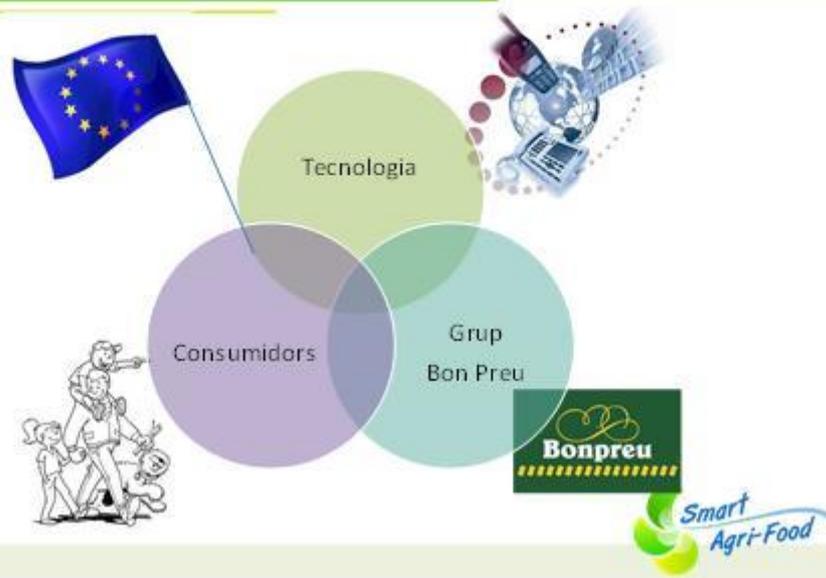
Figure 6-3:   Introduction to the SAF project

Figure 6-4:   Workshops planning and objectives.

Figure 6-5: Objectives of the 1st workshop with consumers. Analysis of the current situation and needs.

Figure 6-6: Presentation of the activities (games) that will be developed during the workshop.

Figure 6-7: Logos Game

Figure 6-8:   Product attributes Game

Figure 6-9:   Communication media Game

Figure 6-10: Presentation of the first outline of the conceptual prototype.

Figure 6-11: Instructions for the activities (individually and in group)

Figure 6-12: Invitation to the 2nd workshop with consumers

6.3 Material used in the 2nd workshop with consumers

The survey used for the evaluation of the Web app is shown below. This survey was filled individually by each participant.

Survey used for the Web app evaluation

1. EVALUATION OF THE TECHNICAL ASPECTS

a) *Did you need to install any program or set the configuration on your phone in order to use the application? Specify it.*

b) *Do you think you need advanced technical knowledge in order to use the application or do you think anyone with Smartphone experience could use it?*

c) *How long did it take from the initialization of the application until you could consult the information of a product?*

Punctuate from 0 to 3, where 0 is the worse punctuation and 3 the best one, the next characteristics related to the functioning of the TIC application

	Does it work? (circle Yes or No)	Ease of use (clear, intuitive, easy to use)	Speed (quick answer)	Image and text quality (size of texts big enough and clear images)	Comments
Connection to Bon-Preu WIFI	YES / NO				
Access to the initial website	YES / NO				
User registration	YES / NO				
Profile creation (definition of the user preferences)	YES / NO				
QR code scanning	YES / NO				
Application feedback (information received about the products)	YES / NO				
Other options of the application (language, project information…)	YES / NO				

2. GENERAL EVALUATION OF THE APPLICATION

From 0 to 3, where 0 is the worst punctuation and 3 the best one, evaluate in general the application TIC?

	Evaluation (0-3)	Comments
Do you think the application is intuitive and easy to use?		
Do you think the application is quick enough considering the time you dedicate to buy?		

Do you like the design (structure, colours ...)?		
Do you find the information provided of the products useful?		
At what degree does the application satisfy your needs of information as a consumer?		
Would you use this application when shopping?	YES/NO	
Would you stop buying any product that you currently acquire after having used this application?	YES/NO	
Would you add any product to your shopping after knowing some information through this application?	YES/NO	

In general terms, and in a scale from 0 to 10, where 0 is "I completely dislike it" and 10 "I totally like it" evaluate the application TIC:

Global evaluation	
Specify one virtue of the application	
Specify one defect of the application	

3. ASPECTS TO BE IMPROVED IN THE APPLICATION

Do you have any comment or suggestion of improvement on any other aspect that needs to be enhanced in the first phase of the TIC application?

About the interface en general (design, structure, etc.):

About the consumer's profile:
- Would you add any other question related to the shopping interests of the consumer? (YES/NO) _____
- Which one?
- Would you like that the supermarket had your profile available in order to facilitate additional information (daily offers, new products that can interest you, food alerts) (YES/NO)? _____

About the tool to scan the QR code:
- What alternative to identify the product and obtain information would you prefer to use?

About the information that the application gives about the products:
- Would you add any others aspects of information (for example: "amount of cholesterol in the food")? (YES/NO) _____
- Which ones?
- Do you like the way the application gives you the information of the products? (YES/NO)
_____
- Do you have any ideas on how to improve it?

A presentation in PowerPoint [Workshop 2 Bon Preu – 6th November 2012.ppt] was used in order to present the Web app and show the instruction of how to use it to the participants.

The slides are shown in Figures 6-13 to 6-22.

Figure 6-13: Outline of the 2nd workshop with consumers

Figure 6-14: Summary of the previous workshop

Figure 6-15: Results of the 1st workshop with consumers

Figure 6-16: Objectives of the 2nd workshop with consumers

Figure 6-17: Presentation of the TIC Web app

Figure 6-18: Instructions previous to the test.

Figure 6-19: Instructions for the TIC Web app test

Figure 6-20: How to fill in the surveys.

Figure 6-21: Next steps

Figure 6-22: Invitation to the 3rd workshop with consumers

6.4   Material used in the 3rd workshop with consumers

The survey used for the evaluation of the Web app is shown below. This survey was filled individually by each participant.

Survey used for the Web app evaluation

1. EVALUATION OF THE TECHNICAL ASPECTS

a)   *Did you need to install any program or set the configuration on your phone in order to use the application? Specify it.*

b)   *Do you think you need advanced technical knowledge in order to use the application or do you think anyone with Smartphone experience could use it?*

c)   *How long did it take from the initialization of the application until you could consult the information of a product?*

Punctuate from 0 to 3, where 0 is the worse punctuation and 3 the best one, the next characteristics related to the functioning of the TIC application

	Does it work? (circle Yes or No)	Ease of use (clear, intuitive, easy to use)	Speed (quick answer)	Image and text quality (size of texts big enough and clear images)	Comments
Connection to Bon-Preu WIFI	YES / NO				
Access to the initial website	YES / NO				
User registration	YES / NO				
Profile creation (definition of the	YES / NO				

user preferences)				
QR code scanning	YES / NO			
Application feed-back (information received about the products)	YES / NO			
Other options of the application (language, project information…)	YES / NO			

2. GENERAL EVALUATION OF THE APPLICATION

From 0 to 3, where 0 is the worst punctuation and 3 the best one, evaluate in general the application TIC?

	Evaluation (0-3)	Comments
Do you think the application is intuitive and easy to use?		
Do you think the application is quick enough considering the time you dedicate to buy?		
Do you like the design (structure, colours ...)?		
Do you find the information provided of the products useful?		
At what degree does the application satisfy your needs of information as a consumer?		
Would you use this application when shopping?	YES/NO	
Would you stop buying any product that you currently acquire after having used this application?	YES/NO	
Would you add any product to your shopping after knowing some information through this application?	YES/NO	

In general terms, and in a scale from 0 to 10, where 0 is "I completely dislike it" and 10 "I totally like it" evaluate the application TIC:

Global evaluation	
Specify one virtue of the application	
Specify one defect of the application	

3. ASPECTS TO BE IMPROVED IN THE APPLICATION

Do you have any comment or suggestion of improvement on any other aspect that needs to be enhanced in the first phase of the TIC application?

About the consumer profile:

Currently, the Web app allows you to select the following preferences:

☐	Origin
☐	Product traceability
☐	Durability
☐	Origin denomination
☐	Presence of chemicals
☐	Highlighted by its quality
☐	Best before date
☐	Allergens and intolerances
☐	OGM
☐	Kosher product
☐	Halal product
☐	Production date
☐	Nutritional information

Fruit

☐	Season

Eggs

☐	Hens breeding

Meat

☐	Animal welfare certificate

Wine

☐	Pairing
☐	Variety
☐	Tasting
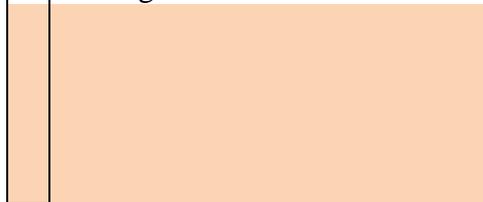
- *Would you like to add any other preference to the list? (YES/NO) _____*

Please, add it to the previous table.

About the product information that provides you the Web app:

Currently, the information provided by the Web app is the following:

Selected preference:	**Attribute:**
Origin	Provider

	Origin
	Local product
Traceability	Trip from farm to consumer
Durability	Organic farming
	Recyclable packaging
	Carbon footprint
Denomination of origin	PDO
	PGI
Presence of chemicals	Pesticides content
	Additives content
	Preservatives content
Highlighted by its quality	Product of highlighted quality (S selection Bon Preu label)
	Q quality label
Best before date	Best before date
Allergens and intolerances	Egg
	Dry fruits
	Lactose
	Gluten
OGM	OGM
Kosher product	Kosher product
Halal product	Halal product
Production date	Production date
Nutritional information	kcal
	fats
	carbohydrates
	sugar
	proteins

Fruit	Season

Eggs	Hens breeding

Meat	Animal welfare certificate

Wine	Pairing
	Variety
	Tasting

- *Would you like to add any other attribute? (YES/NO) _____*

Please add it to the previous table.

4. MEAT TRACEABILITY

Do you currently know the origin of the meat you buy in the supermarket? (under-line your choice)	Never	Sometimes	Often	Always
Would you like to know the origin of the meat you buy?	YES/NO Why?:			
Do you think that knowing the origin of the meat would lead to a better health and quality of the product?	YES/NO Raison:		YES/NO Raison:	
What other information about meat would you like to know?	- - - -			
In what degree the Web app has allowed you to know in more detail and easy way more information about the meat? (from 0 to 10)				
Do you consider the given information trustfully enough? Or would you pre-fer the meat to accomplish an specific				

certification requirements? Why?				
Would you pay more for the meat if this guarantees you more information about the product? (No, 10% more, 20% more, 30% more) *(underline your choice)*	_NO_	*Yes, I would pay 10% more*	*Yes, I would pay 20% more*	*Yes, I would pay 30% more*
Tell us a strength of the Web app regarding meat traceability				
Tell us a weakness of the Web app regarding meat traceability				
APP used for QR reading:				

A presentation in PowerPoint [Workshop 3 Bon Preu – 28th January 2013.ppt] was used in order to present the Web app and show the instruction of how to use it to the participants.

The slides are shown in Figure 6-23 to Figure 6-32.

Figure 6-23: Outline of the workshop

Figure 6-24: Summary of the previous workshops

Figure 6-25: Results of the previous workshop

Figure 6-26: Objective of the 3rd workshop with consumers

Figure 6-27: Presentation of the TIC Web app.

Figure 6-28: Functionalities of the TIC Web app

Figure 6-29: Instructions previous to the test of the Web app

Figure 6-30: Instructions for the test of the Web app

Figure 6-31: How to fill in the surveys

Figure 6-32: Next steps.