HIGHTECH EUROPE

FIRST EUROPEAN FOOD PROCESSING NETWORK OF EXCELLENCE

Final Summary Report HighTech Europe

May 2009 – December 2013

SEVENTH FRAMEWORK PROGRAMME

Executive Summary

Executive Summary

The food producing sector is challenged by the fact that it is dominated by small and medium companies (SMEs, 99%), which have to survive in competition with global markets. SMEs account for nearly 50% of the annual turnover in the sector but have very few or no resources for research and development (R&D). Although Europe has a world scientific lead in the combined area of food, agriculture and fisheries, it lacks in commercialising R&D efforts. Effective and targeted knowledge and technology transfer to boost innovation is therefore key for the sector. The overall objectives of HighTech Europe were

- Identification of knowledge for innovation potential to be used by SMEs;
- Achieving a durable integration of European R&D activities into high-tech food processing;
- Establishing a sustainable network to support these objectives in a long term and deliver building blocks for the European Institute for Food Processing (EU-IFP).

HighTech Europe started as network of 22 partners from academia, research and industry. The nature of Europe's food industry paired with a fragmented scientific research infrastructure will benefit most from a virtual system. For that reason, much effort was devoted to designing and creating a knowledge portal, the **Food Tech Innovation Portal** (Food TIP, www.foodtech-portal.eu) as main part of the EU-IFP to answer industrial needs.

The MediaWiki Food TIP offers tools to overcome delays in development processes by a better understanding of **the interference of innovation sources** (e.g. from the biotech, nanotech or information and communication area), **principles** (physical, chemical, biological) and **food processing operations** (e.g. separating, stabilizing, etc.) and how this interaction can be controlled. Scientific knowledge was screened in this regard and linked with information about fields of applications and their limitation, consumer and legal issues, companies and R&D institutions with expertise in this area, accessible research facilities and explanation and practical support about innovation processes in general. All information is provided in form of linked datasheets (> 1,500) in the portal, which was opened to the public in May 2013. An ontology-supported search function guides the user to the desired result.

The database activity was complemented by additional activities: A **White Book Agenda** of European high-tech food processing was drafted for decision makers in industry and policy. Two studies were performed dealing with **consumer acceptance** of novel technologies. Knowledge transfer was boosted by an investigation of **knowledge transfer routes and their hurdles** in Europe, by conducting **feasibility studies**, by the organisation of several technology and innovation workshops and case studies and a Symposium on ethical issues in food processing. This was completed by the HighTech Europe **Implementation Award** (2010, 2012) and the attempt of a **Knowledge Auction**. The career of young researchers of the network was supported by **staff secondments**. Dissemination activities included brochures, a **Food TIP video clip** and **booths and presentations** at food fairs and conferences all over Europe. HighTech Europe was present on more than 50 events in the last five years and reached hundreds of people.

In 2010 an **Associated Membership Platform** (AMP) was set up to enlarge the network. AMP membership is free of charge. Above 100 companies and institutions joined the AMP, one third of which being SMEs. As registered users of the Food TIP they can add and edit knowledge and information on the portal and regularly receive the newsletter of the network.

Project results gave two directions of impact for the **future network of HighTech Europe**: strengthening the network itself and ensuring that the Food TIP will be maintained and further developed by in-kind contributions of network members and by using the database for dissemination and technology transfer of future R&D activities on national and European level. Most project beneficiaries signed a new Consortium Agreement to establish a sustainable network after the end of the project. 'HighTech Europe' as name for the **virtual EU-IFP** was kept for the new cooperation.

Summary project context and objectives

Project context and overall objectives

The Network of Excellence High Tech Europe has been established in 2009 with funding from the 7th Framework Program of the European Commission to develop new ways and tools to speed up technology transfer and knowledge exchange between academia and industry in the food technology area. The sector specific culture had to be taken into account and network activities were scoped by the general observations that the European food industry is fragmented, dominated by small and medium sized enterprises (SME) having very low or no capacities for research and development. Companies are driven by consumer expectations for natural, healthy and safe food and, at the same time, they are faced by a though competition on national and international food markets which are tightly regulated.

HighTech Europe activities were further scoped by the hypothesis that scientific advances in the areas of biotechnology, nanotechnology and information and communication technology (ICT) introduced in food companies lead to more innovative products and an increase in global competitiveness, both for B2B and B2C companies in the food and drink domain.

The overall objectives of HighTech Europe were

- Identification of knowledge for innovation potential to be used by SME facilitated by the Science Cube approach (Figure 3)
- Achieving a durable integration of European R&D activities into high-tech food processing
- Establishing a sustainable network to support these objectives in a long term and deliver building blocks for the European Institute for Food Processing (EU-IFP)

To achieve these aims HighTech Europe has been structured into 7 work packages (WP) which are considered to be the building blocks of the EU-IFP (Figure 1):

- WP2: Identification and evaluation of available and forthcoming technological tools
- WP3: Collecting, mapping, monitoring, linking industrial needs & knowledge
- WP4: Routes to implementation
- WP5: Knowledge Transfer Schemes
- WP6: Exploitation, dissemination and staff development
- WP7: Sustainability Action Plan for the EU-IFP
- WP1: Project Management

22 project beneficiaries from universities, applied research centers, federations and the private sector from Europe and Australia had already been successfully involved in their regional, national and European knowledge transfer chains. For the benefit of the food processing sector in Europe the knowledge and experience available in these networks should be gathered in HighTech Europe and this information had to be provided to the food industry especially small and medium size enterprises by appropriate measures.

Specific objectives of HighTech Europe are explained in the following according to the work packages of the project.

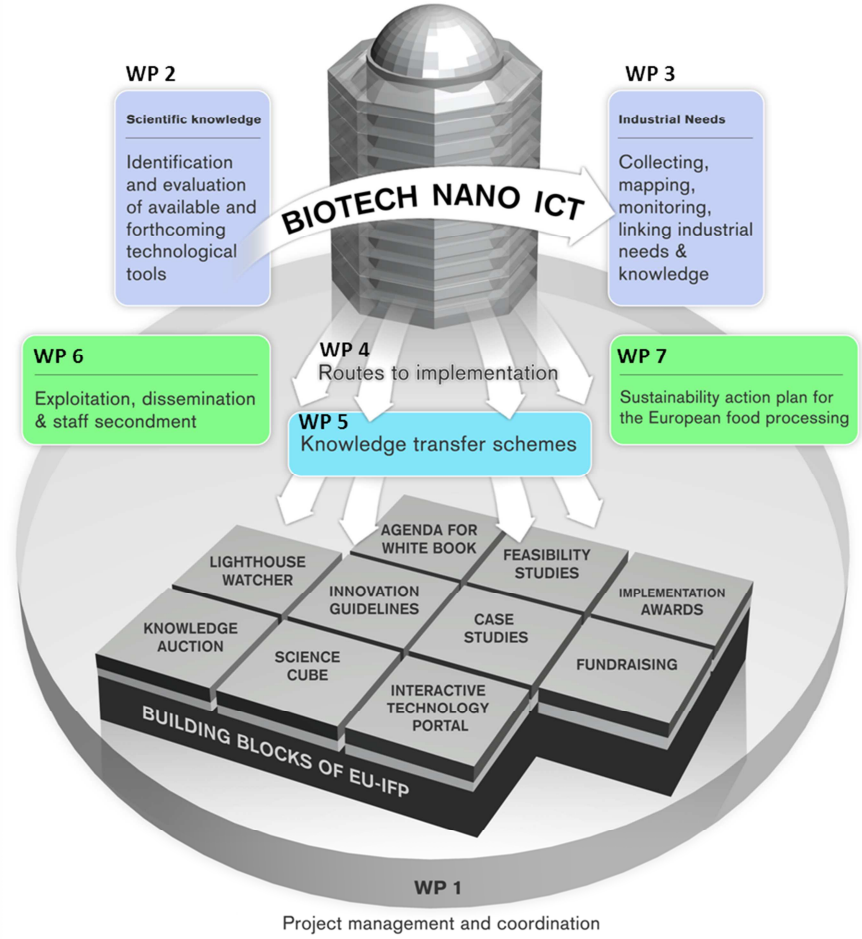

Figure 1: Work Packages HighTech Europe: The way toward the European Institute of Food Processing (EU-IFP)

Specific objectives

Identification and evaluation of available and forthcoming technological tools (WP2)

The main objective of this work packages (WP) was to identify and evaluate available scientific results and/or subjects still under investigation that have the potential to be used as novel technological tools for future food processing schemes. This work was facilitated by the Science Cube approach (Figure 2). A description of promising innovation sources and shortcomings of existing and innovative operations in plain language together with a collection of practical information was aimed for, to build up in cooperation with WP6 the new knowledge database with the initial name interactive technology portal. Practical information concerned issues regarding research infrastructure in Europe and worldwide like: Who is main expert? Which are the most important research institutions / companies in this area? etc. (Task 2.0-2.2).

The WP was intended to provide tools to overcome long development trajectories to reach real innovations by a better understanding of the interference of innovation sources, principles and food processing and how this interaction can be controlled.

To ensure the sustainability of the knowledge portal after the projects' end, a so-called 'Lighthouse Watcher concept' was to be developed, which describes how the portal will be maintained and managed on a long term (Task 2.3).

Collecting, mapping, monitoring, linking industrial needs & knowledge (WP3)

In addition to WP2, WP3 aimed to map industrial needs of the sector. This task included the interviewing of 100 industrial food companies, collecting and analysing their needs. In cooperation with the previous work package and taking into account the Science Cube approach (Figure 3), the concept concerning the content of the knowledge database should be designed by

- Identifying and evaluating scientific and evaluating scientific knowledge (WP2)
- Linking industrial needs with the outcomes of WP2 (Task 3.1/3.2)
- Exploiting the 'Lighthouse Watcher concept' (Task 3.2)
- Approaching stakeholders and setting up an Innovator Guide to help industry match their needs with R&D opportunities by applying the knowledge database (Task 3.4)

Furthermore, this work packaged intended to highlight consumer issues regarding new technologies in food processing and performed informative and quantitative consumer acceptance studies of new technologies/innovations which were objective of WP2 (Task 3.3)

Routes to implementation (WP4)

WP4 targeted at identifying and proposing new solutions for existing barriers in knowledge transfer by learning from existing implementation routes on regional and national level inside and outside Europe. Australia has been adduces as an instance (Task 4.1).

Different (novel) knowledge implementation routes should be developed and tested, such as the organization of the European Food Processing Implementation Award, a knowledge auction about food technology and food innovations, as well as presence at sectorial European exhibitions and other key events (Task 4.2).

The WP included also a link to WP 3 activities regarding consumer science and ethical, legal and social issues. Objective was to establish a Food Ethics Expert Panel at European level and utilize the interactive technology portal to exchange knowledge (Task 4.3).

Another issue concerns was access to and knowledge about available funding opportunities for research and development. Objective was to identify funding instruments for additional research activities at European level (Task 4.4).

Knowledge Transfer Schemes (WP5)

In addition to WP4 specific objective of WP 5 was to transfer identified knowledge and infrastructure by means to professional audience and broad interested public by

- Feasibility studies (Task 5.1)
- Innovation and technological workshops (Task 5.2)
- Showcases (Task 5.3)

The outcomes of these three activities were considered the basis of building up of a comprehensive overview of existing research infrastructures in the food processing sector in Europe. Objective was to provide a mean to facilitate in general the sharing of research facilities in Europe (Task 5.4).

Exploitation, dissemination and staff development (WP6)

Exploitation and dissemination comprised a diverse range of objectives in WP6.

Prime objective was to provide customized software for the later online knowledge portal. At an early project stage it was decided to use the semantic MediaWiki software as basis for the portal which

should be completed by a decision support system including a search application, additional plug-ins and input-masks. The developed portal should become a work package overarching tool and by this the backbone for content developed in the other work packages (Task 6.1).

Second purpose was the development of a brand identity for HighTech Europe in order to raise the public awareness of the project and its goals. The brand identity should include a brand identity guide, a project website, image brochures as well as exhibition booths elements and material (Task 6.2).

Next, the "Agenda for a White Book of high-tech food processing" should be compiled as information basis for decision makers (Task 6.3).

Finally, staff secondments were planned especially for young researchers in order to allow them to gain hands-on experience of discussed technologies as well as to increase the understanding between science and industry and between countries of different development level (Task 6.4).

Sustainability Action Plan for the EU-IFP (WP7)

WP 7 of the HighTech Europe project has focussed on the development of a new model for sustainable cooperation to facilitate technology transfer and knowledge-sharing in the high-tech food area, at regional level up to the European scale. More specific, the activities within this work package have contributed to setting up the foundations for a European Institute for Food Processing (EU-IFP). This EU-IFP should be considered as a part of the concept for the European Institute of Technology (the European version of the Massachusetts Institute of Technology in Boston USA). The new model for sustainable cooperation has been established via a number of activities.

First, an inventory was made of the different concepts for sustainable cooperation for an integrated European partnership (Task 7.1), including scenarios for public-private partnerships. In line with these activities, the operational issues underlying the new model for collaboration have been investigated by assessing European partnerships with respect to finances, human resource management, facility sharing, communication and legal aspects of the organization structure (Task 7.2). Following this assessment a roadmap was created for the implementation of the best cooperation model (Task 7.3), which at that time appeared to be alignment with the preparatory activities for a KIC-Food proposal by the FoodBest-consortium. On that assumption a Sustainability Action Plan (SAP) and Business plan for a virtual EU-IFP should have been developed (Task 7.4). During the course of HighTech Europe it became clear that a KIC-Food would not be launched earlier than 2016 and the Executive Board of HighTech Europe decided that the business plan would be designed as a new consortium agreement for the period 2014 – 2015. This agreement binds those beneficiaries of HighTech Europe that wish to continue a number of tools and services that have been developed in the project lifetime. The virtual EU-IFP is the name of the new cooperation with two important goals: to maintain and update the knowledge portal and to secure income for the longer term.

Project Management (WP1)

Last but not least WP 1 aimed to deliver a coherent management concept and respective resources and capabilities for the Network of Excellence which included a general coordination and operation of legal and financial issues (Task 1.1), the scientific and administrative project management (Task 1.2/1.3), the setting up of a sustainability task force (Task 1.4) and monitoring the integration of the network (Task 1.5).

The nature of this Network of Excellence demanded a strong coordination and a high level of communication at consortium level due to several overlapping activities between different work packages.

Description of main project results and foreground

HighTech Europe activities were dedicated to provide a basis for the targeted European integrated partnership, the European Institute for Food Processing (EU-IFP). Tasks within HighTech Europe are therefore considered as 'building blocks' of this new partnership or as horizontal/preliminary activities to pave the way toward it. Already in the very early stage of the project it became obvious that the interactive technology portal will have a central role and will be the backbone for the new partnership envisaged as most task were directly or indirectly connected to the portal (Figure 3).

This led to joint activities overarching work packages. Whereas Chapter 2 (objectives) was structured according to the work packages of HighTech Europe, this chapter is driven by results and foreground achieved.

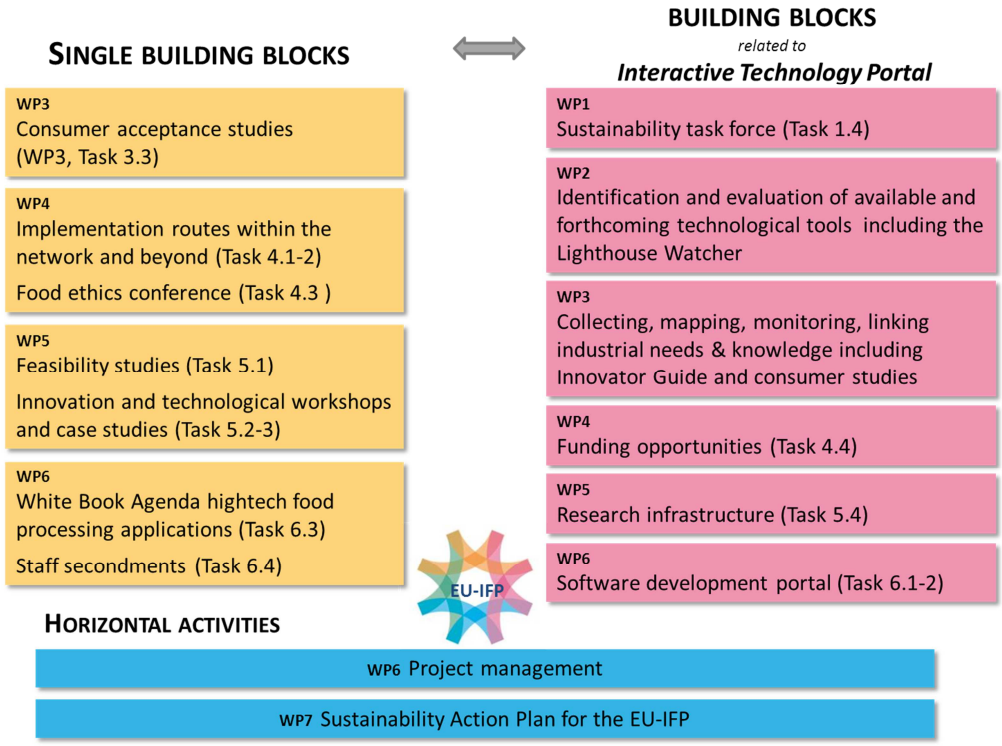

Figure 2: Contributions of different HTE activities to the European Institute of Food Processing (EU-IFP) with the interactive knowledge portal

The Food Tech Innovation Portal (Food TIP)

The Food Tech Innovation Portal, short Food TIP, is the interactive technology portal designed, created and implemented during the project lifetime of HighTech Europe.

Aim and purpose of the Food TIP is probably good describes by the following advertisement that was released in the Parliament Magazine in June 2013, when the Food TIP was launched to the public:

"Food Tech Innovation Portal is online!

Whether it be traditional or ready-to-eat products, most of our daily food is processed to make it tasty, digestible, safe, convenient, transportable or to extend its shelf life. Food processing in Europe, nowadays, goes hand in hand with innovative and advanced technologies. This is of importance especially for smaller companies to ensure their competitiveness towards global enterprises. In order to support their innovation process, the 'Food Tech Innovation Portal' has been developed within the EU-funded Network of Excellence 'HighTech Europe'. It is targeted to food producers and offers descriptions of novel food processing technologies, which are linked to corresponding experts and related open accessible infrastructure. The portal allows a continuous update and extension of entries. Content quality is guaranteed by review processes organized by the developers. Access to the portal is free of charge.

Visit us at www.foodtech-portal.eu
Contact: coordinator@hightecheurope.eu

Basis for the Food TIP is the open source wiki framework MediaWiki, which was originally created for the web-based encyclopaedia wikipedia.org. HighTech Europe used this open source software and designed a customized structure and surface for the portal which is mainly basing on different kind of data sheets provided by the portal. The MediaWiki software was extended by various technical elements for an intuitive, user-friendly interface. Now Food TIP offers the following kind of data sheets, in brackets the available numbers at project end December 2013:

- Technical data sheets (211)
- Facility data sheets (99)
- Profile data sheets (811)
- Person data sheets (324)
- Innovation Process and Practical Support data sheets (59)

Food TIP content

Results of different HighTech Europe activities contributed to the content-wise build-up the Food TIP which was mainly the scientific screening and the matching with industrial needs, the creation of technology data sheets. Furthermore, the access to research infrastructure and facilities, the Innovator Guide to support innovation processes in food processing industry, managerial and technical aspects of the portal, the approaching of stakeholders in the EU-IFP and finally the building up of a sustainable network were tasks closely related to the Food TIP.

Establishment of a systematic screening procedure

The creation of the technology data sheets started with a process to establish a systematic screening procedure.

In the first phase of the project, a systematic screening procedure, a so-called **Science Cube approach**, was set up to screen the available (scientific) information and ongoing scientific research with regard to their potential to be used as novel technological tools for future food processing schemes. The procedure identifies, evaluates, tests and classifies applicable inputs from innovation sources (biotechnology, nanotechnology and ICT) and principles (biological, (bio)chemical and/or physical) and their impact on food processing engineering operations (separation, structure-forming,

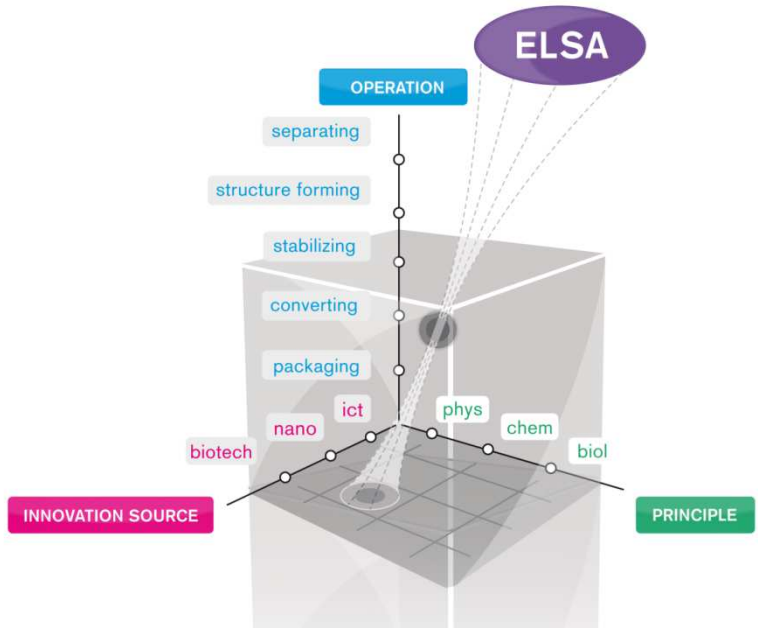

Figure 3: The Science Cube applied by HighTech Europe interlinks innovation sources with scientific principles and operations in food processing (ELSA: ethical, legal and social aspects)

stabilizing, conversion and packaging processes) under consideration of ELSA (ethical, legal and social aspects). As an example, the development of pulsed electric field technology for preservation (along the operational axis) may alleviate a current limitation in extraction processes (also along the operational axis) once the scientific principles (e.g. mass transfer phenomena) are understood and the potential of innovation sources (e.g. reactions at molecular/nano-scale) is considered (Figure 3). During the project, the screening procedure was continuously updated & optimised.

The innovation sources and food processing applications were described in technology data sheets for the Food TIP. These are intended to provide a source of information, in plain language, to the food industry in answer to their queries. Besides describing the working principle, application field, shortcomings, and ELSA of these innovation sources, the data sheets also list research groups (and their facilities, see D.5.9) and companies that are strongly involved in those areas. Furthermore, relevant scientific references are given to allow the end-user to find more detailed information. Each data sheet refers to scientific publications and is reviewed by different experts to ensure information of high quality (Figure 4 4).

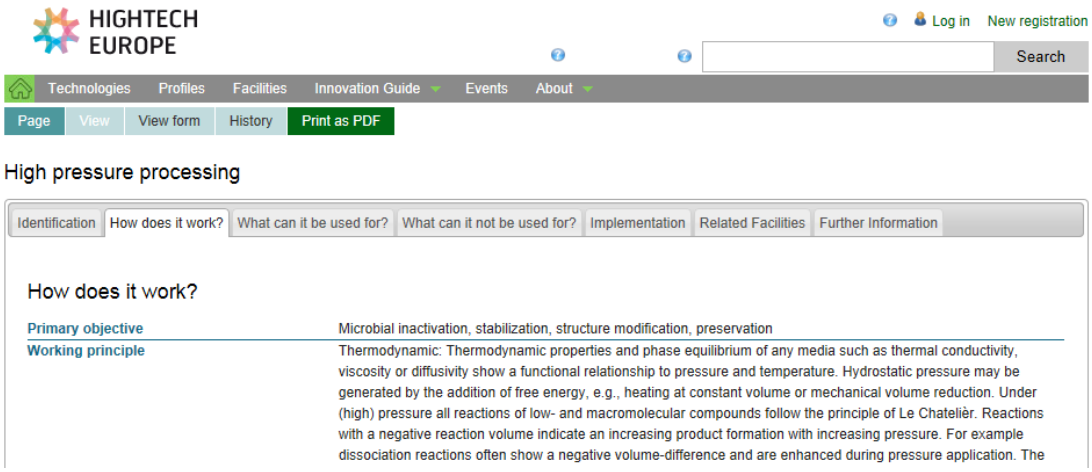

Figure 4: Example of a technology data sheet on the Food TIP

Promising innovation sources

Innovations based on physical, (bio)chemical or biological principles were looked for in scientific literature and translated into technology data sheets. By the end of the project, 90 promising innovation sources were uploaded to the Food TIP. The innovations were first categorized according to their underlying scientific principles (physical, (bio)chemical and biological principles). For each principle, a second subdivision was made according to the operations they are applicable to (separation, structure-forming, stabilizing, conversion, packaging and other operations). Thirdly, also the innovation source was indicated, according to the Science Cube categorization (biotechnology, nanotechnology, ICT and other).

All **principles** were more or less equally identified as the basis of recent innovations. The innovations described were often based on more than one principle. 53% was based on a single principle, primarily related to physical principles (32%) (Figure 5A).

The innovations described were mainly related to "other" **operations**, not defined in the Science Cube (40%) (Figure 5B). These often corresponded to innovative analytical tools. Among the operations defined in the Science Cube, stabilizing operations were best represented (35%).

Besides the Science Cube **innovation sources**, also "other" innovation sources were considered if they were relevant for food industry (**Fehler! Verweisquelle konnte nicht gefunden werden.**e 5C). Most "Science Cube" innovations described in this deliverable were coming from a biotechnology source (40%). This can probably be explained by the strong intertwining between biological and (bio)chemical principles and thus their numerical preponderance in comparison to physical principles. Nevertheless, mostly "other" innovation sources were involved (42%). Although these might be considered less high-tech than the Science Cube innovations sources, they are very relevant for food industry and perhaps have a lower threshold for implementation in SMEs.

The analysis of promising innovation sources as well as the shortcomings of existing and innovative operations described in the next paragraph contributed to the "White Book' of European high-tech food processing operations".

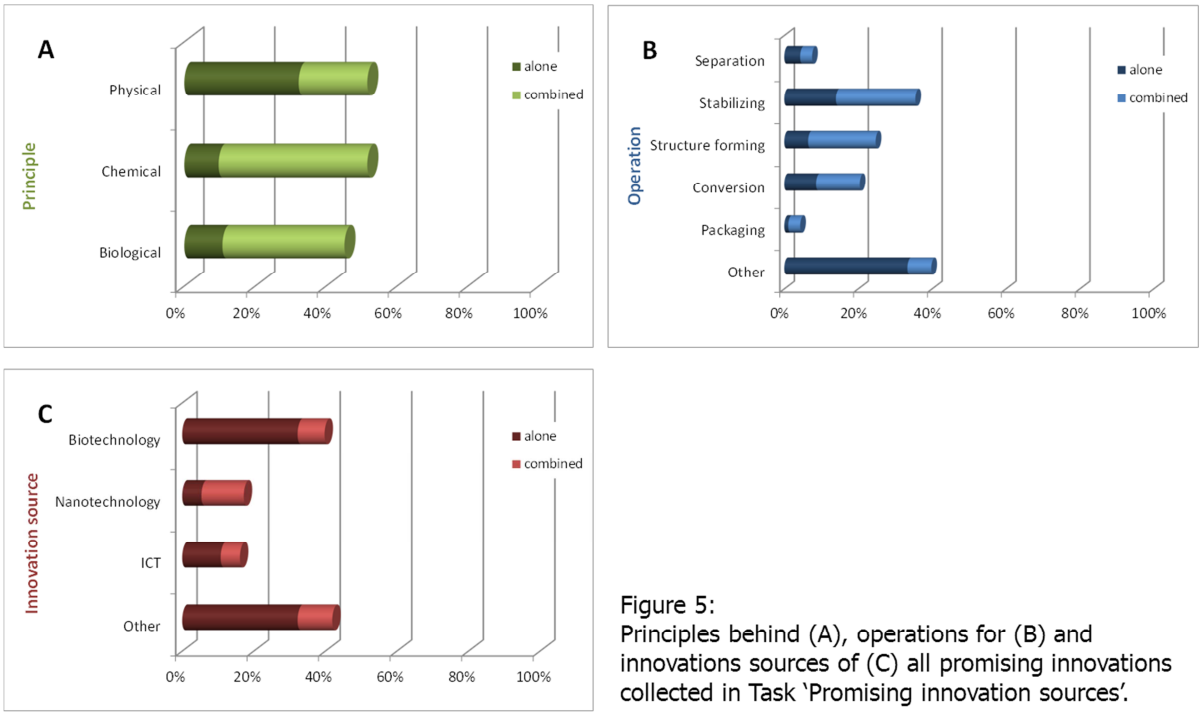

Figure 5:
Principles behind (A), operations for (B) and innovations sources of (C) all promising innovations collected in Task 'Promising innovation sources'.

Shortcomings of existing and innovative operations

Next to promising innovation sources, a search for food processing applications with a need for improved efficiency was performed. During the project, 125 of them were translated into technology data sheets and uploaded on the Food TIP. As for the innovation sources, the operations were first classified by their underlying scientific principles (physical, (bio)chemical and biological principles), secondly by operation (separation, structure-forming, stabilizing, conversion, packaging and other operations), and thirdly by innovation source (biotechnology, nanotechnology, ICT and other).

Figure 6A shows that most of the collected operations with a need for improved efficiency are based on a physical principle, possibly combined with a chemical or biological principle. The Science Cube sources of innovation (Figure 6B) are few described in the datasheets. In Figure 6C can be seen that most of the datasheets describing a separation process, have a separation effect only. However the other processes (stabilizing, structure-forming and conversion) and packaging have mostly combined effects with these other processes and/or packaging and seldom a single effect.

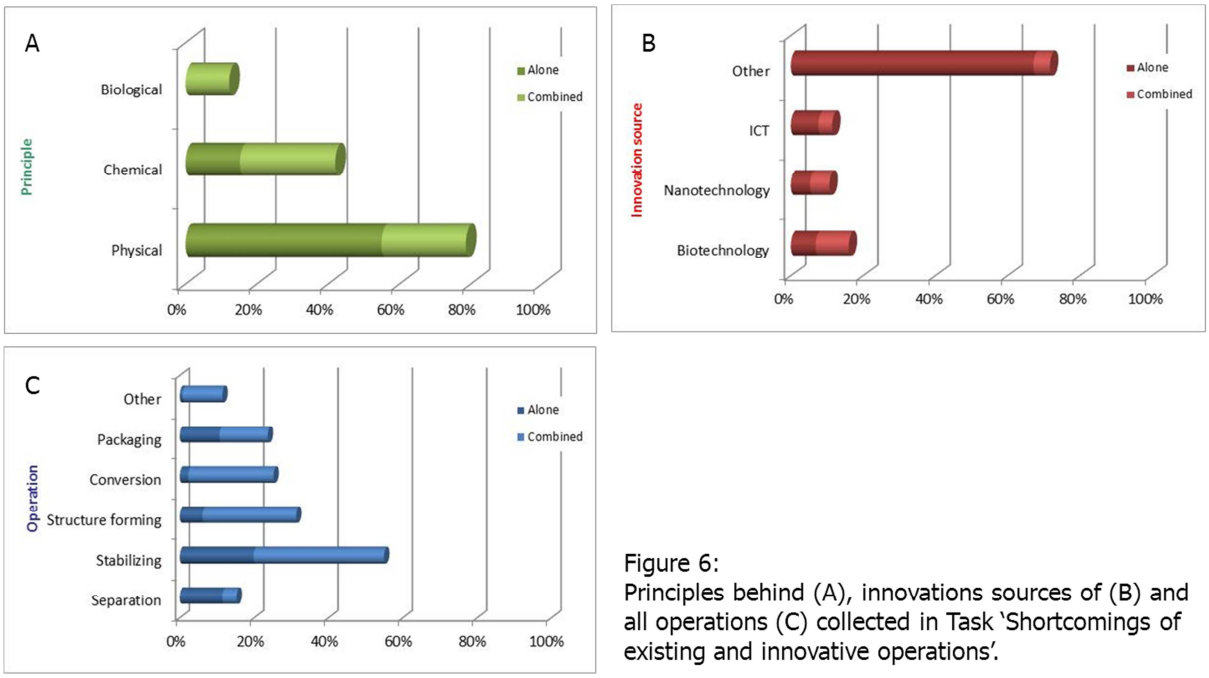

Figure 6:
Principles behind (A), innovations sources of (B) and all operations (C) collected in Task 'Shortcomings of existing and innovative operations'.

From the gathered data, the following conclusions could be drawn:

- General limitations for separation processes follow from a lack of selectivity / specificity, fouling of the system, undesired interactions between components and energy consumption.
- General limitations for stabilizing processes follow from degradation of nutritional components and texture changes, in most cases being the consequence of poor process control (e.g., overheating, overcooking, poor temperature distribution).
- General limitations for structure-forming processes are associated with the formation and stabilization of interfaces (e.g., emulsion and foam stability, undesired crystal growth during freezing), in some cases being the consequence of poor process control.
- General limitations for conversion processes follow from degradation of components, formation of undesired components and processing efficiency (time, energy consumption).
- General limitations for packaging processes follow from the necessity to sterilize packaging materials for specific applications, and the guarantee for packaging integrity.

- It is clear that ICT and biotechnology are promising innovation sources, especially for improved process control. The availability of necessary sensors might become a future bottleneck (shortcoming). Improved process control will also contribute to reducing degradation and the formation of undesired components.

Industrial Needs

Mapping industrial needs

An interview guide was used to interview 100 European companies about their food processing development needs. The identified needs were quite similar for SME companies and larger companies. Key issues in food processing are the development of processes and productions to reduce costs and developing products and assuring product quality to be competitive on the market. However, differences are found within Europe, between 'old' and 'new' member states, where 'new' member states seem to be more focused on new equipment, better trained personnel, reducing costs and a weaker intention in searching for technology improvements, while 'old' member states are more focused on developing new products, optimising processes, developing new process and reducing waste. Development needs also differ between different food sectors, where the nature of the business in each food sector influences which issues are of high priority to each sector.

Linking industrial needs and knowledge

The industrial needs were used to improve and develop the Food TIP by generating a matrix that based and go beyond the Science Cube approach (Figure 3). The matrix was characterized as all activities dedicated to improve the optimal link of industrial needs with scientific knowledge in the portal like technology data sheets connecting output of WP2 and WP3, testing the search function of the portal or any issue regarding user-friendliness of the interface. Hence, the industrial needs gathered from interviews were used as inspiration source for creating technology datasheets (TDS) of the Food TIP. Later they were also used in the first testing of the Food TIP by beneficiaries in the role of future end-users. Especially the latter was very helpful to improve the search function and to identify missing terms in the ontology (see 'Ontology' page 20) or to feedback on how the terms were formulated, like the difference between singular and plural usage and the clarification of synonyms.

Most important in this process was to address how SMEs will gain best access to the knowledge content of the portal, considering hurdles as lack of time, lack of awareness and language barriers in SME companies. In a three-step approach the accessibility to information in the Food TIP was elaborated and improved. Measured used have been workshops (ws) and regular online meetings (m), webinars (wb), online feedback buttons (fb), questionnaires (q) and presentation of Food TIP at fairs and other events (fe):

Step	Involved partners	Measures	Time
1st	Beneficiaries HighTech Europe	ws,	2009-2010
2nd	Beneficiaries HighTech Europe + associated members	ws, m, wb, fb, q, fe	2010-2013
3rd	Beneficiaries HighTech Europe + associated members + any user	ws, m, fb, fe	Since 05/2013

Access to infrastructure

Access to infrastructure or specific facilities for research, development or testing purposes is of high interests for small and medium enterprises in the food sector. Currently lacking is a comprehensive overview of these existing research infrastructures or facilities in the food processing sector in Europe. Food TIP is filling this gap by the Food TIP section 'Facilities'. Under this section Facility data sheets are listed containing multiple information of facilities offering processes, panels, databases,

laboratories, analytical and other non-processing equipment to be used by externals. Furthermore, these data sheets inform about accessibility and support services and give contact details (see Figure°7). Currently 104 Facility Data Sheets from 12 different countries classified based on the 34 existing classes are available online on the Food TIP. Additionally, under the section 'Profile' in Food TIP research institutions can be found which can be filtered by expertise to complete the picture of existing R&D infrastructure in Europe and beyond.

Facility or Profile data sheets can be added or updated at any time by any person also after the end of project on the portal (see also chapter Managerial aspects of Food TIP).

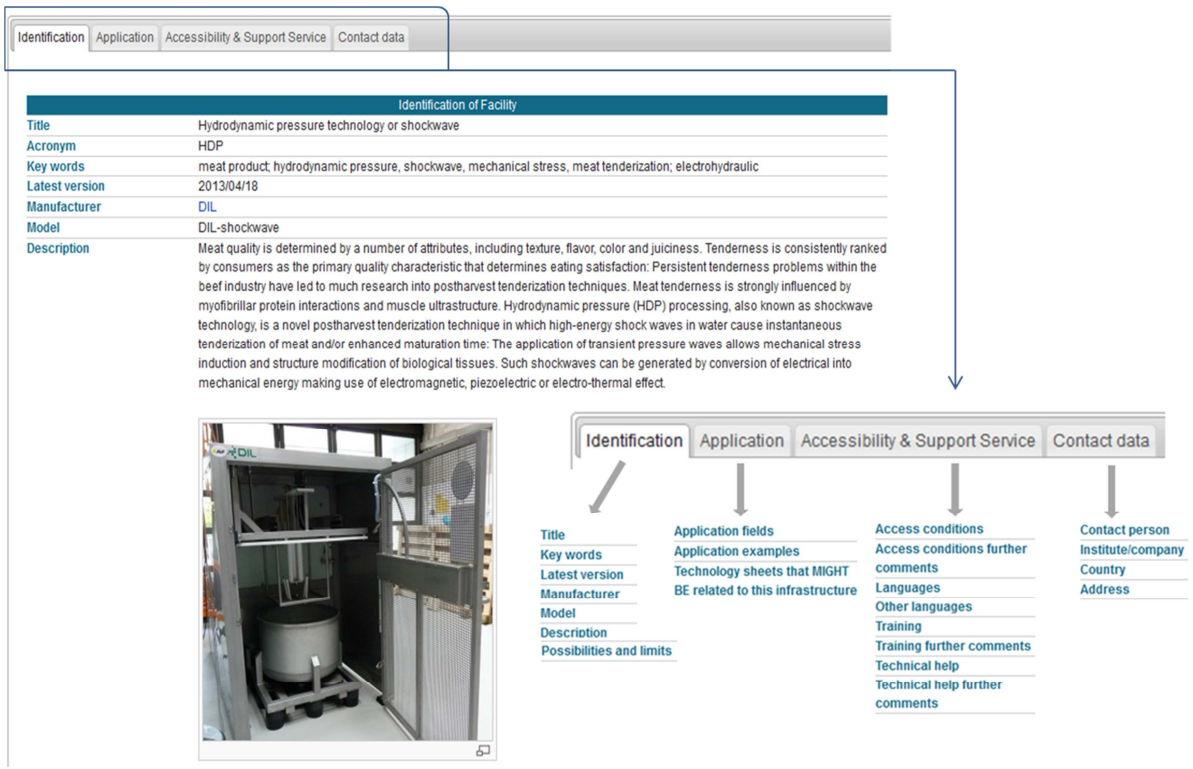

Figure 7: Example of a Facility data sheet on Food TIP and its structure

The Innovator Guide

Food TIP was completed by an Innovator Guide. The guide in matrix-form was developed as a practical tool box for industrial users. It should give guided access to information to optimize or trigger innovation processes in food companies. The guide considers innovation from two perspectives, the innovation process itself and a practical support section (Figure 8A):

A) Innovation process is giving background information on strategic aspects of the innovation process. It distinct between the time frame, starting with an idea up to the market introduction, and a set of issues connected to the different stages like technical, legal, IPR, financial, marketing, management and consumer issues. Information is given via data sheets explaining the issue itself and lists further sources for support. Figure 8B gives an overview of the innovation process matrix.

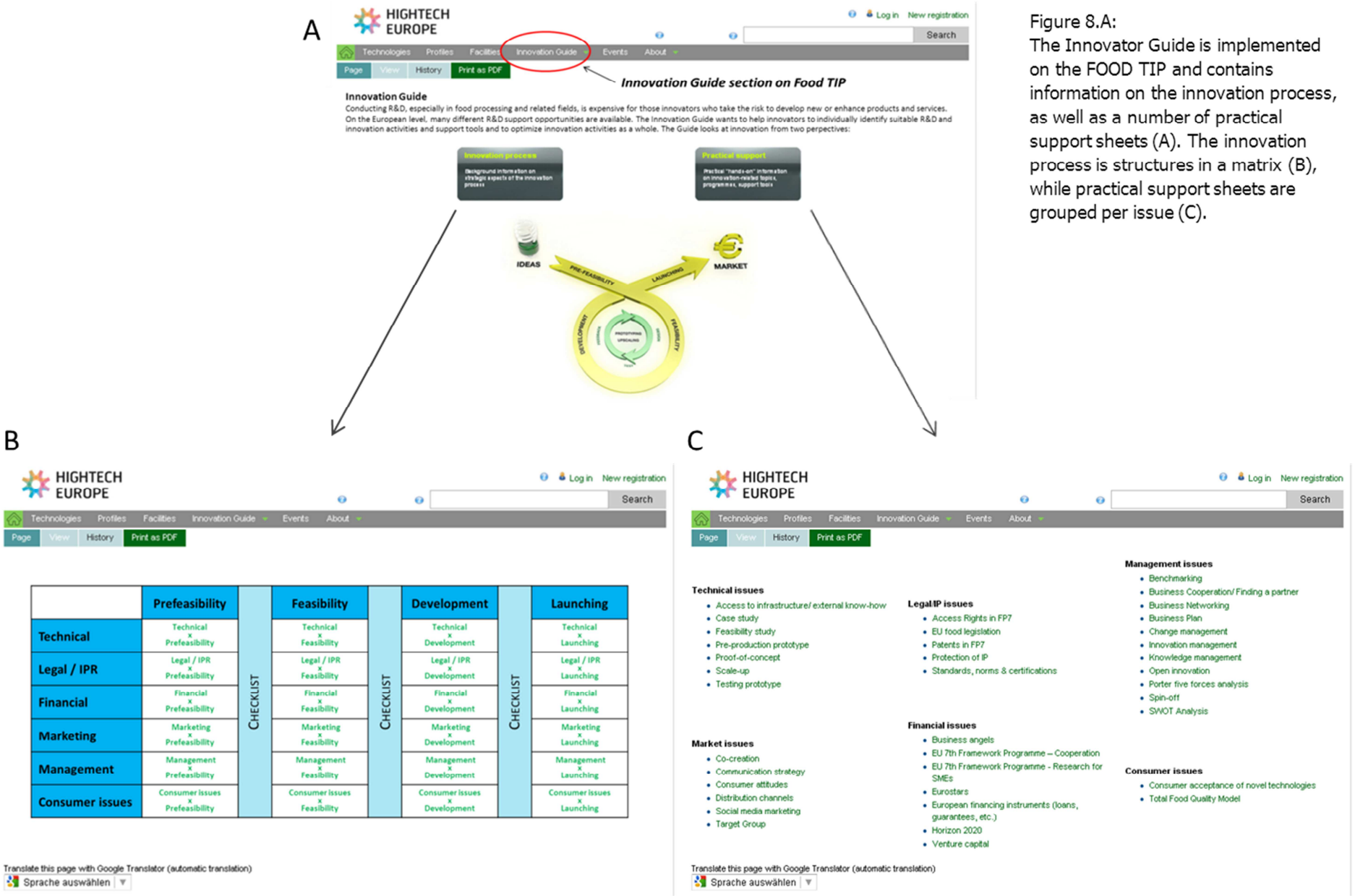

Figure 8.A:
The Innovator Guide is implemented on the FOOD TIP and contains information on the innovation process, as well as a number of practical support sheets (A). The innovation process is structures in a matrix (B), while practical support sheets are grouped per issue (C).

B) Practical support is offering practical "hands-on" information on innovation-related topics, programmes and support tools. As well, information is given via data sheets explaining the issue itself and lists further sources for support (Figure 8C).

D 3.7 First innovator guidelines
D 3.11 Innovator Guide for industry

Managerial aspects of Food TIP

Portal management: The Lighthouse Watcher

Next to filling the Food TIP with content, it was crucial to develop a tool to sustain the knowledge database in the long run. This task is described by the Lighthouse Watcher, a concept for the process management of the Food TIP during the projects' lifetime and afterwards. In the end, it describes how the portal will be maintained and managed after the projects' end, deriving from experience and recommendations of the HighTech Europe beneficiaries. The Lighthouse Watcher includes organisational, procedural and technical needs to maintain the portal and it also describes aspects of intellectual property rights and some general functions of the Food TIP. Figure 9 illustrates these tasks and work flows of the Lighthouse Watcher. The Lighthouse Watcher was elaborated by project beneficiaries in a two-step approach: Phase 1 Build-up of Food TIP; from these experiences activities and responsibilities for Phase 2 Continuation of Food TIP after project end were deduced. The final Lighthouse Watcher is documented in deliverable D2.4.

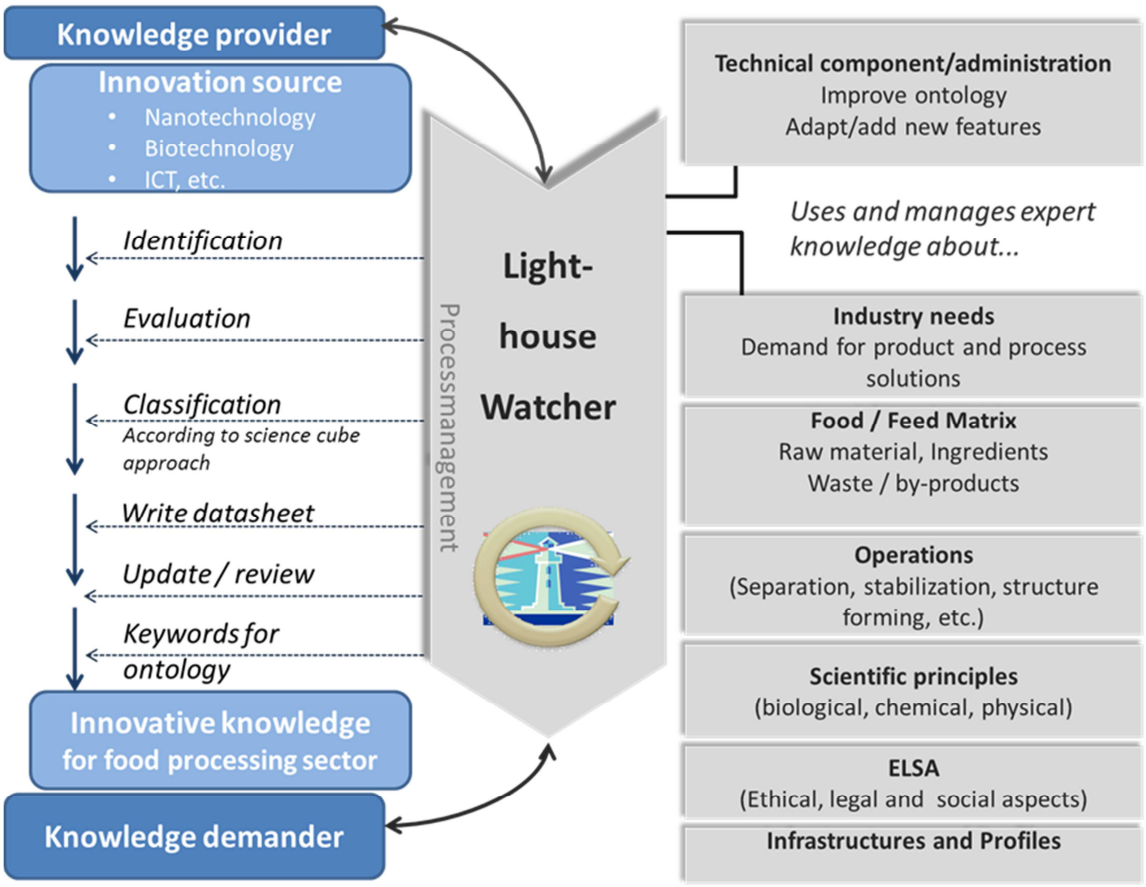

Figure 9: Process management of the Food TIP by the Lighthouse Watcher

From January 2014 project coordinator DIL will remain manager of the Food TIP and will be responsible for the content management and the technical administration of the database. Network partners who committed themselves to further build-up HighTech Europe and Food TIP will support DIL in its function (see also chapter Final cooperation model building for European integrated partnership and testing).

D 2.4 Report describing the installed Lighthouse Watcher (final version)

Quality management

Information made available on the Food TIP, especially via the technology data sheet (TDS), need be understandable for industry, have to base on reliable sources and should be current as possible. For this reason a quality management was implemented which implies that each TDS is reviewed by 2 experts before it goes online and that it is obligatory that each technology refers to 2-3 scientific references.. TDS can be created, reviewed and updated online in Food TIP. Authors of TDS are asked once a year to check the topicality of their datasheet and update the description if necessary.

An online creation and review procedure is available for main the data sheets in the portal. Review is supported by HighTech Europe partners and only if the revision procedure is completed, data sheets are made online available. By the review systems different aspects like comprehensibility, grammar and spelling, quality of content and/or completeness are checked according to the following overview:

	Comprehensibility	Grammar & spelling	Quality of content	Completeness
Technology DS	✓	✓	✓	✓
Facility DS	✓		✓	✓
Profile DS				✓

Maintenance of Food TIP

Food TIP bases on the Wikipedia concept which means the portal can be used by any user worldwide, at any time world and for free. Currently, information available in the portal can be classified into

- Food processing technologies (Technology Data Sheets)
- Description of research institutions, companies, technology transfer units or other (Profile Data Sheet)
- Description of available and accessible research facilities (Facility Data Sheets)
- Information and support regarding innovation processes (Innovation Process and Practical Support Data Sheets)
- E-business cards of experts (Person Data Sheets)
- Events

The sustainability of the Food TIP will be driven by HighTech Europe partners by applying the Lighthouse Watcher and will be supported by associated members and any user of the portal in future.

Processes have been established in Food TIP that any user is now able to give input to the Food TIP, for example he/she can write a data sheet about a new technology developed in their institution. The new technology data sheet will be automatically linked with information about the institution (profile data sheet of institution) or experts working at the institution (person data sheet). Registration is obligatory to write and edit data sheets.

As any registered user is able to change the content of any data sheets, an e-mail notification system was established that informs the author of a data sheet if any other user modified his data sheets. It is up to the author to keep and accept it or to delete the added information.

The project HighTech Europe provided resources to build up the portal, now it is up to the HighTech Europe network and any other stakeholders to maintain the portal on a long-term.

Technical aspects of Food TIP

Architecture of the portal

The Food TIP bases on a standard MediaWiki installation. "MediaWiki is a free software open source wiki package written in PHP[1], originally for use on Wikipedia. It is now also used by several other projects of the non-profit Wikimedia Foundation and by many other wikis"[2]. It offers only the most basic functions, but the functionality of Food TIP was enhanced by adding and customising MediaWiki extensions. Some of the MediaWiki extensions used for the Food TIP have already been developed by the MediaWiki community; others have been developed by HighTech Europe.

MediaWiki Extensions of Food TIP

The basic MediaWiki installation only supports full text search. The Semantic MediaWiki Extension improves search by enriching the page content with semantic information. Using the **Semantic MediaWiki extension**, terms used in page content can be annotated. An annotation is a construct of a property with a value. For example a term like New York can be annotated with the Property City. Using this extension, it is possible to search for all pages which contain, for example, this property. Some of the MediaWiki extensions used for the Food TIP have already been developed by the MediaWiki community; others have been developed by HighTech Europe.

Annotating page content is easier with the **extension Semantic Forms**. Using this extension, forms can be created that insert pre-structured information, linking content to specific properties. To organise very long forms another extension called **HeaderTabs** helps to split it into different panels. In Food TIP forms has been created to insert technologies, facilities, profiles, people and events. All of these forms have a different structure belonging to a specific MediaWiki Category. In the remaining part of this report these forms are referred to as 'data sheets' colloquially.

The handling of permissions for inserting information into the Wiki differs from the common wiki philosophy. Only registered users (=AMP members) are allowed to insert, rename, delete and edit wiki pages. To get permission a registration is needed. The form needed to formalise the **registration** is implemented by a further MediaWiki extension, developed in the HighTech Europe project. After registration, the information from the registration forms is collected in a database. An authorised person checks the registrations and confirms or deletes the registration. If the registration is accepted, a wiki user will be automatically created and the user will be informed about this step.

Apart from creating and editing data sheets, a registered user can see which people are linked to a profile, which can be an institute or company. A person can then be contacted directly within the wiki itself by email.

The **search function** is another extension that was created within the HighTech Europe project that helps searching on profile and facility datasheets by setting filter options (Figure 10). For example, with this extension it is possible to find all profiles from a certain country.

[1] PHP is a popular general-purpose scripting language that is especially suited to web development

[2] http://www.mediawiki.org

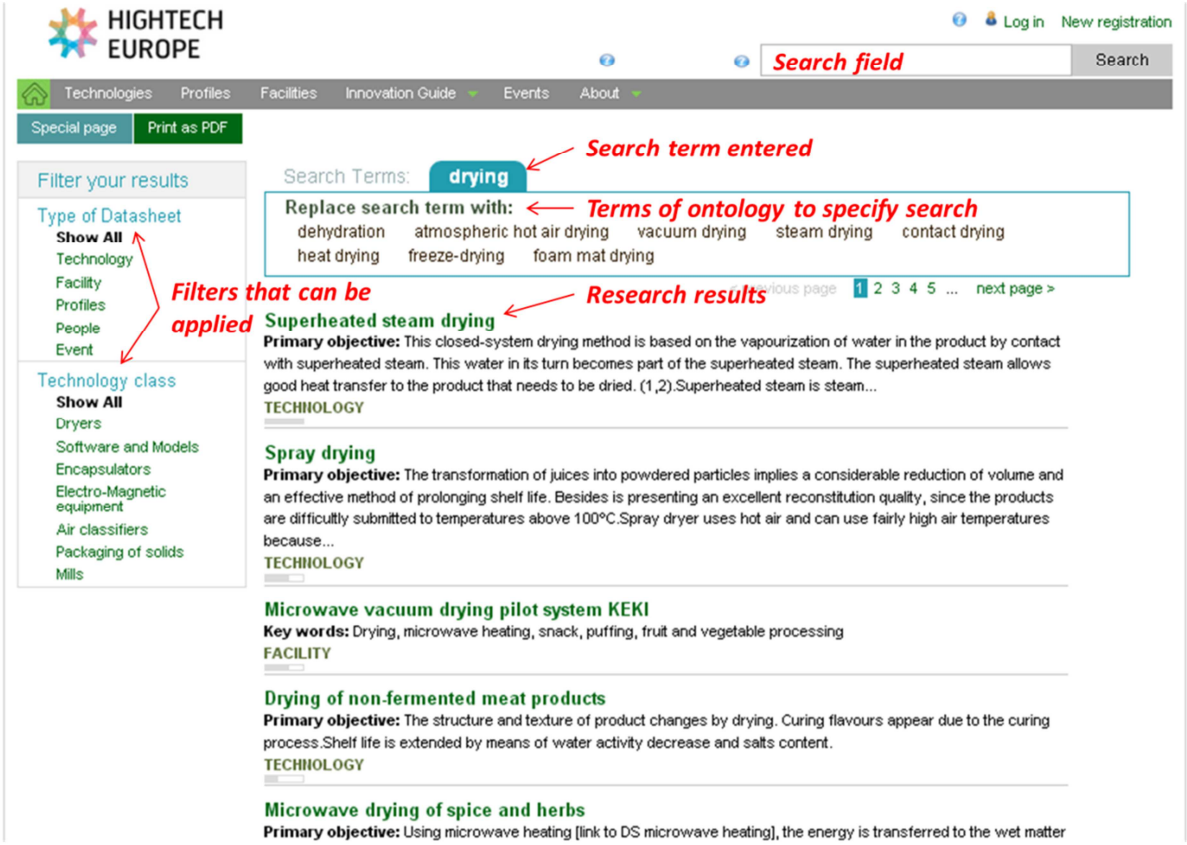

Figure 10: Search application of Food TIP

The search functionality found in MediaWiki was also replaced by a new extension developed within the project. The default search functionality in MediaWiki is severely limited. Many sites using MediaWiki commonly use third-party extensions to enhance the search capabilities within the Wiki. High-traffic sites like Wikipedia often use a search extension that makes use of the Apache SOLR framework, which uses the Apache Lucene library for creating the search index and performing the actual search queries. For the Food TIP it was decided to use a port of Lucene to PHP (ZendLucene), in order to remain in a purely PHP environment as MediaWiki itself is written in PHP. This extension enhances Lucene's **full-text search capabilities by using an ontological representation** of the food-processing domain to help the user create better search queries.

The search application makes use of the domain ontology created within the HighTech Europe project which is described in detail in the following chapter.

Ontology

When setting up the Science Cube approach, it became clear that the linking of scientific information with industrial needs through hierarchically-structured databases would not be successful, as a different vocabulary is used by academia and industry. Therefore, it was decided to use an ontology-based database to overcome this problem. In this way, terms from different domains (i.e. science and industry) can be linked through relationships. An ontology is a collection of related concepts that is used within a certain field of knowledge. These concepts relate to each other and when these relations are made explicit, the ontology can show how the concepts are situated within the context of the knowledge field. An appealing aspect of ontologies is that a single concept can have various

labels. When applying an ontology-based search, the search results will be better. The search engine does not only searches for the one concept that has been used by the end-user, but it also searches for concepts that are more specific items of the same concept (e.g. when searching for "citrus", "lemon" will also be found). Next to this, the search engine will also search for synonyms, which enlarges the amount of useful search results as well (e.g. both "MAP" and "Modified Atmosphere Packaging" will be found while pointing at the same concept) (Figure 11).

The HighTech Europe ontology aims to assist users of the Food TIP to formulate search terms (questions) regarding novel food processing technologies. The ontology can support more features when integrated with software like the Food TIP. One of these is auto-completion within the search field: the functionality to help end-users to write a term correctly and to help the end-user by showing what terms exist.

During the project a comprehensive ontology has been built up of about 5777 concepts of which 5651 are classes such as 'Meat', 'HighPressureProcessingMethod', or 'Acidity' and 126 are properties that specify relations between concepts such as 'changes' or 'isExtractedFrom'. Each concept may have several labels (often for different languages), which present a human-readable label of the concept (HighPressureProcessingMethod has labels such as 'high pressure', 'high pressure processing', 'hp' for English and 'vysoký tlak' or 'zpracování vysokém tlakem' for Czech). However, only part of these concepts, classes and properties have been defined by HighTech Europe itself, namely 2705 classes with a total of 4456 labels (translations) and 36 properties. Whereas labels per language in the ontology are: 3035 English labels, 386 Dutch labels, 380 Romanian labels, 322 Spanish labels and 317 Czech labels.

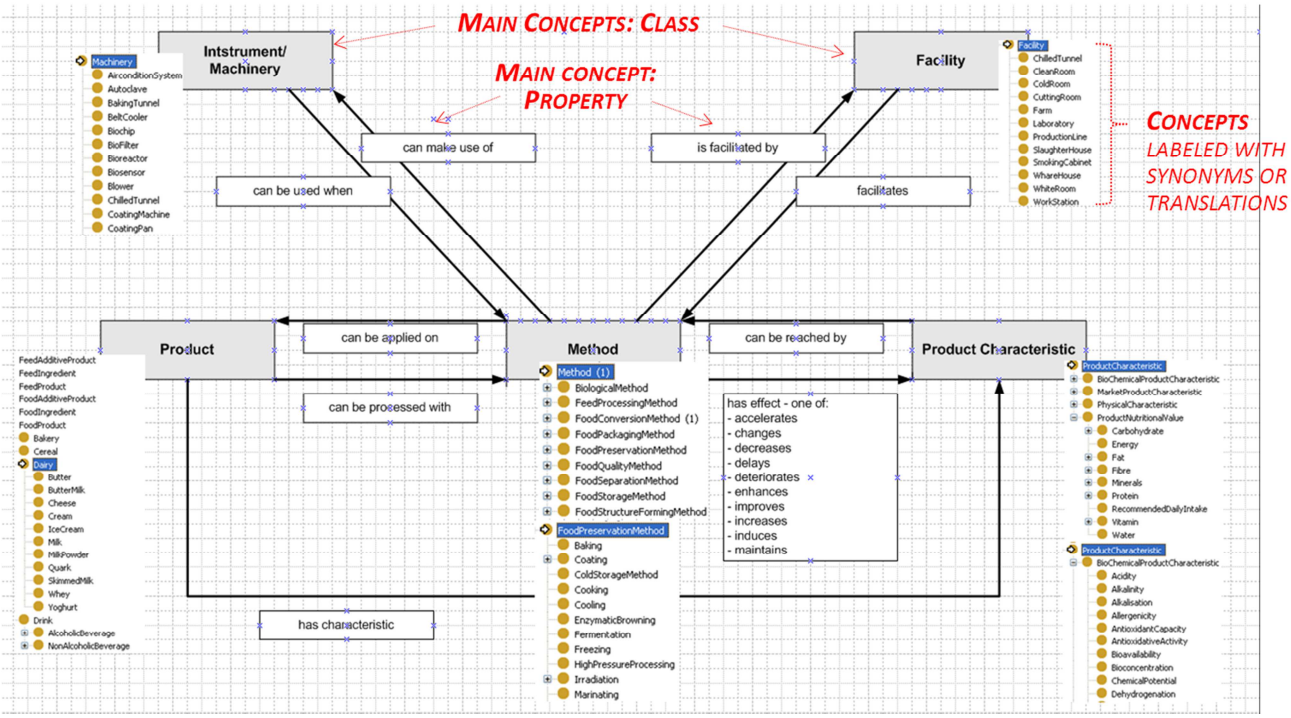

Figure 11: Example of structure of concepts in the ontology used by Food TIP

White Book agenda

A White Book agenda has been compiled describing research on high-tech food processing in the fields of separating operations, stabilising operations, structure forming operations, converting operations, and packaging. Furthermore, hurdles for implementation of high-tech food processing in food industry are identified and divided into technological hurdles, industry attitudes, consumer attitudes and ethical issues as well as legislation, cost, and training. Finally a summary highlights key agenda issues for a "White Book' of European high-tech food processing operations".

Key trusts of the Implementation Action Plan (IAP) of the European Technology Platform Food for Life (ETP Food) are addressed by the White Book agenda. The agenda serves many purposes and is targeted to policy makers, as well as to decision makers in industry and food associations:

- Providing well balanced information about pros and cons of (high-tech) food processing methodologies to decision makers (politicians, captains of industry, consumer groups, science managers, etc.)
- Identifying research needs in (high-tech) food processing
- Identifying (future) applications and perspectives of (high-tech) food processing
- Identifying hurdles in application of (high-tech) food processing
- Formulating key agenda points for a white book on high-tech processing, with a special focus on the research agenda

The White Book agenda which is a 50-page document is available in digital and printed format and can be downloaded for free from the HighTech Europe website where hard copies can be ordered for free as well (Figure 12).

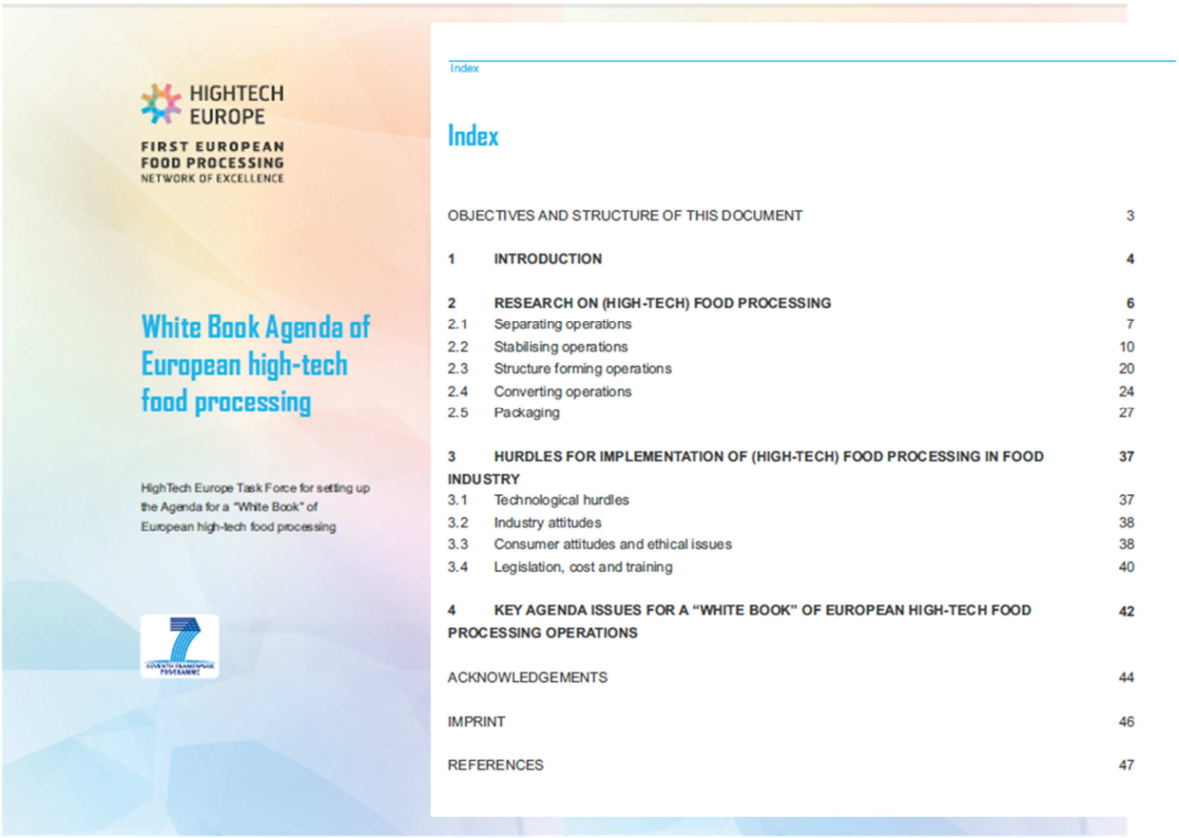

Figure 12: The White Book Agenda of European high-tech food processing operations

Consumer Acceptance Studies

Qualitative consumer studies and quantitative consumer information studies were carried out in Germany, Spain, Czech Republic and Sweden. Results demonstrated that consumers only have little associations and information about novel technologies in food processing. The impact of information on acceptance of food processed by novel technologies showed neither differences between countries nor impact by socio-demographic factors (age & gender). But written information has more impact on the acceptance than audio-visual information.

Additionally, a Choice Modelling Study was carried out in Germany, Spain, Czech Republic and Sweden. This method is able to predict with great accuracy how individuals would react in a particular situation e.g. if they are confronted with food products produced with new technologies and it is the most suitable method for estimating consumers' willingness to pay for quality improvements in multiple dimensions (Backhaus, et al., 2011).

The results from the three consumer acceptance studies are under publication. Conclusions that are of importance from an industrial perspective are that both, technology development strategy and pricing strategy have to be aligned to reasonable and feasible levels in order to avoid rejection of the technology or the product due to mere price rejection. The cost per units thus serves as an important indicator.

Next to price, risks and benefits associated with the products are also very important for consumers; some consumers are willing to pay more for a product if it has certain attributes like information about environmental issues. This is another benefit or motivation for certain consumers to buy a product even if price is higher than normally. Also, the reduction of consumers' fear is an important factor for introduction of a new technology. This can be influenced by proper and concise information which can increase acceptance and can lead to higher willingness to pay.

Media has a high impact on consumer behaviour as information about products and technologies are always available via internet. Therefore, it was decided to use Wikipedia, the free online encyclopaedia where anyone can add to or edit content (www.wikipedia.org), to provide all interested target groups with information about food technology and their acceptance. Information was added to several Wikipedia articles on: Food technology, Food preservation, Pasteurization, High pressure processing (Pascalization), Pulsed electric field electroporation, and microwaving. As Wikipedia is a dynamic, collaborative platform and different people all over the world revise articles, it could happen that content added by High Tech Europe beneficiaries will be removed, changed or even complemented.

D 3.6 Design of Consumer Acceptance Study and translation of study in German, Spanish, Swedish and Czech

D 3.5 Design of Consumer Information Research Study and translation of study in German, Spanish, Swedish and Czech

D3.9 Report on final evaluation of the quantitative information consumer research study

D 3.10 Report on final evaluation of the consumer acceptance study

D 3.13 Article on Consumer Acceptance available on Wikipedia

HighTech Europe implementation routes

One of the main objectives of HighTech Europe was to achieve a durable integration of European R&D activities into high-tech food processing. This includes efficient means, accepted by both researchers and industry, to implement knowledge. The Food TIP developed in the project is definitely a tool to be highlighted at this point, however other routes respectively possibilities have been taken into account.

Knowledge transfer routes and major bottlenecks

At the beginning a study was conducted to analyse different existing regional and national knowledge transfer routes in Europe. Representative for the different regions in Europe (Northern and Southern Europe, new Member States) the knowledge transfer routes of the countries/regions Spain/Catalonia, Germany, Romania and The Netherlands have been analysed in general. A special attention was given to the areas of nanotechnology, biotechnology and information and communication technology (ICT). The report describes the knowledge transfer activities using the terminology of Bozeman[3]: Knowledge transfer chain means the exchange of knowledge (object) by different parties (agent, receptor) in a different manner (instrument) within a given legal, institutional or market framework (context). Routes were identified and potential structural shortcomings for the food processing sector could be shown. This was enriched by case studies giving an insight in practical implementation of knowledge transfer schemes, showing the process, critical points and solutions.

In the HighTech Europe study major bottlenecks in knowledge transfer chains were identified, with conclusions relating with advanced stage countries (i.e. Germany, The Netherlands), intermediate stage countries (i.e. Spain) and initial stage countries (i.e. Romania).

D 4.1 Report on major bottlenecks in the European knowledge transfer chains
D 4.2 Concepts for regional and topic-related knowledge transfer chains (relevant to the Australian Food Industry)

European Food Processing Implementation Award

The European Food Processing Implementation Award was set up to honour food processing innovations that have been developed along a knowledge transfer chain within less than 3 years. The innovation should base on biotechnology, nanotechnology or ICT research applied to food processing and improvement of food quality. Objective was to trigger a competition for the best heads among the European food research community. The award was handed out twice.

Guidelines for the Award were described and an international evaluation panel has been established: Prof. Barbosa-Cánovas (U.S.), Prof. Windhab (CH), Prof. Iannace (IT), Prof. Grunert (DK), Prof. Hitzmann (DE).

Winners of the two HighTech Europe Implementation Awards were awarded at EFFoST Annual Conferences (Figure 12):

- 'Hop yield enhancer' by Hertel GmbH (Dublin, 2010)
- "EcothermatikTM dryer" for pasta products (Montpellier, 2012)

[3] Bozeman B. Technology transfer and public policy: a review of research and theory. *Research Policy*. 2000; 29: 627-55.

Figure 12: Winner of HighTech Europe Implementation Award 2010 (left) and 2012 (right) and the HighTech Europe Award (middle)

D 4.4 Report on guidelines for European Food Processing Implementation Award
D 4.8 Handing out of the first European Food Processing Implementation Award 2010
D 4.14 Handling out of the second European Food Processing Implementation Award 2011

Knowledge auction

Aim of the HighTech Europe Knowledge Auction was to develop a revolutionary new tool focused on presenting and exchanging knowledge in an exciting way and giving knowledge providers the opportunity to demonstrate the uniqueness of their findings to industry.

It was decided to dedicate this first knowledge auction to food packaging innovations. The event was planned to take place at the interpack fair (17 May 2011, Düsseldorf, Germany). Interpack is the world's most important trade fair for packaging and processes. The application for the auction was organized in a two-stage procedure. Application templates were elaborated for the knowledge owners and the bidders.

Upon receiving the knowledge offers, a Knowledge Auction Expert Panel carefully evaluated the offers in conformity with the Guidelines and the relevant content-related specifications issued by a Knowledge profile evaluation form. Since only four applications were submitted, the second application stage was cancelled.

Since there was also a lack of response by companies' side (no registration to bid on offers), the knowledge auction didn't take place. Instead, a HTE Networking event on food packaging at interpack (Düsseldorf, Germany) has been organized while keeping in mind the idea of connecting researchers and industry.

The knowledge owners registered present their knowledge in a 10min presentation. Afterwards participants discussed the ideas presented in small groups or bilaterally. More detail about the documents prepared for the knowledge auction and the networking session procedure can be found in D 4.5.

In spite of intense promotion, feedback was really rare. In some countries several researchers and journalists showed interest, while in others response could be considered as "distant". In general terms, companies were more sceptic than researchers to the idea of an auction for knowledge. Therefore, lack of successful response to Knowledge Auction concept is unlikely to be due to a deficient promotion of event. Further causes are discussed in D 4.5.

D 4.5 Description of the processes and the results of the knowledge auction

Symposium on ethical issues of high-tech applications in food processing

Ethical aspects in food production are an issue for food producers as well as for the consumers. HighTech Europe set up a Food Ethics Expert Panel and organized the 'Symposium on the Ethical Issues of the high-tech Application in Food Processing'. The symposium was associated to the EFFoST Annual Meeting 2011 on the pre-conference day at November 8, 2011 in Berlin.

Members of the Food Ethics Expert Panel and speakers at the symposium were:

- Prof. Dr. Diána Bánáti (Chair, EFSA, Hungary)
- Prof. Göran Hermerén (Professor of BioEthics, University of Lund, Sweden)
- Prof. Dr. Herbert J. Buckenhüskes (EFFoST, Germany)
- Dr. András Sebők (Campden & Chorleywood Ltd., Hungary)
- Prof. Dr. Peter Raspor (Biotechnical Faculty, University of Ljubljana, Slovenia)
- Prof. Klaus G. Grunert (Director, MAPP Aarhus School of Business, Denmark)
- Richard Shepherd (Department of Psychology Faculty of Arts and Human Sciences, University of Surrey, UK)

The symposium highlighted food ethics, consumer science, and ethical aspects of the major innovation sources and food processing. The symposium brought together the most reputated international food scientists and professionals to provide an interdisciplinary approach in food ethical issues and a very lively, substantial and profound discussion complemented the event.

The symposium addressed in speeches and in a panel discussion the ethical issues in connection with the following main themes: bioethics, biotechnology, food technology, quality assurance, consumer science, legislative issues and risk management. A video clip of this event was produced which is available on www.youtube.org and on the projects' website.

Knowledge transfer schemes

Feasibility studies

Feasibility studies look at the viability of an idea, knowledge or technology with an emphasis on identifying potential problems and attempts to answer one main question: Will the idea work and should you proceed with it?

The aim of the HighTech Europe feasibility studies were the investigation of technologies identified for the scientific areas biotechnology, nanotechnology and ICT in WP2 with respect to their potential applicability and marketability in the food processing industry.

Firstly a general guide was developed how to conduct feasibility studies planned for the second stage. The guide describes a standard methodology to identify the potential applicability of novel technologies (questionnaire and ranking criteria). To benchmark potential opportunities related to novel technologies it was necessary to adapt with the support of experts the questionnaire to particularities of each scientific area (biotechnology, nanotechnology and ICT). The specified questionnaires are including next to other points questions regarding the specific added value of a technology for industry, as well as questions regarding legal issues and ethical considerations.

Secondly the questionnaires were applied to five selected technologies per scientific area. Technologies chosen included pilot tested and industrial phase technologies. The most promising technical approaches were ranked, and the most promising technical approaches identified per each scientific area were juice preparation technology (biotechnology area), nanofiltration technology (nanotechnology area) and oxygen sensor technology (ICT area). The promising technical approaches

identified were recommended to the consortium to be taken up during the innovation & technology workshops and the showcases.

D 5.5 Ranking list of selected technological approaches

Innovation & technology transfer workshops

Thematic workshops for industry are probably belonging to the best established and well accepted possibilities to transfer knowledge from science to industry. HighTech Europe organized in total nine innovation and technology workshops dealing with the latest technologies or general innovation aspects in the food processing area. These workshops were organized at different central places alongside exhibitions and conferences:

- 1st Workshop Novel Packaging organized together with an EEN brokerage event, at SALIMA Food Fair and EMBAX Packing Fair 2010 with an EEN brokerage event, Brno, Czech Republic
- 2nd Innovation & Technology Transfer Workshop on Smart Process Control and Automation organized together with an EEN brokerage event, at Food Factory for the Future Conference 2010, Gothenburg, Sweden
- 3rd Innovation & Technology Transfer Workshop on Novel Food Processing Technologies, at International „Students for Students" Conference 2011, Cluj-Napoca, Romania
- 4th Innovation & Technology Transfer Workshop "Open Innovation in Food Processing", at International Congress on Engineering and Food (ICEF11) 2011, Athens, Greece
- 5th Innovation & Technology Transfer Workshop "Less for more – Novel processing technologies for a changing society", iFood 2011, Osnabrück, Germany
- 6th Workshop on 'Consumer perception of novel food processing technologies' organized together with an EEN brokerage event, at Anuga FoodTec 2012, Köln, Germany
- 7th Workshop on 'The Seafood of Tomorrow - Novel Technologies in Seafood Processing and Preservation', Conxemar 2012, Vigo, Spain
- 8th Workshop on 'Food innovation from labs to market: Future European organisation for knowledge and technology transfer', EFFoST Meeting 2012, Montpellier, France
- 9th Workshop on 'Inspiration for Innovation', iFood 2013, Hannover, Germany

In general it was a one-day event, focusing on a scientific and a technological part, very attractive for SMEs and industry. Beneficiary ZENIT, member of the European Enterprise Network (EEN), organized three brokerage events in combination with the workshops. This collaboration was quite successful and raised the value of the respective workshops. Participants were asked to fill out a questionnaire after each event to give feedback on the quality of the workshop that was used to improve following events. In total more than 250 participants have been attracted by these innovation & transfer workshops.

D 5.6 a/b/c Reports on the innovation & transfer workshops
D 5.7 Questionnaire for the innovation & technology transfer workshops

Case studies

HighTech Europe organized eight technology or process related case studies which included a theoretical introduction combined with practical demonstration by means of a prototype or by the demonstration of a technology in an industrial environment. The workshops were performed at different central places, alongside exhibitions such as CARNEXPO International Conference "Future

Meat Evolution" in Romania, or in collaboration with prestigious organizations such as NZO Dutch Dairy Association in The Netherlands or the Flanders' Food Technology Day in Belgium.

Case studies gave a theoretical and practical insight to new and innovative food processing technologies. Topics of case studies were chosen from the perspective of the expected participating SMEs in the different events and to some extent based on experiences from the organising research organizations. The following case studies were organized:

- 1st Case Study: High Pressure Processing (HPP), Bucharest, Romania
- 2nd Case Study: Success stories in microwave heating technologies, Gothenburg, Sweden
- 3rd Case Study: High Pressure Homogenization, Affligem, Belgium
- 4th Case Study: Modern packaging technologies for conserving meat product characteristics during their shelf life, Bucharest, Romania
- 5th Case Study: Innovations in Infrared heating, Gothenburg, Sweden - This case study was however cancelled one week before the event as the main speaker cancelled its attendance.
- 6th Case Study: RAPIDOJET: A new technology for wetting, dissolution and emulsification – high-speed mixing in a new dimension, Bremerhaven, Germany
- 7th Case Study: Innovative Solutions for Reducing the Fat and Salt content of Meat Products, Bucharest, Romania
- 8th Case Study: Benefits for your company from new technologies in nano and microtechnology, ICT and biotechnology, Wageningen, The Netherlands

Additionally, a pre-case study 'Innovative Processes and Analysis Methods for the Dairy Industry' was organized in Wageningen, The Netherlands.

In total more than 300 participants have been attracted by these events.

Staff secondments

Researcher mobility, especially of young researcher, is a core concern of the European Union. Many activities on European level foster this issue and facilitate researcher mobility by various means. HighTech Europe contributed to this by supporting short staff secondments of researchers within the network. All secondees supported were young researchers and eight out of nine were women. Thus, the aim to encourage women to become involved in the area of food technology and to offer them hands-on experience, giving them a better understanding of the sector and supporting their career, was definitely reached.

Eight out of nine secondees went to another country and in six out of nine staff secondments SMEs were involved. Thus, also the goal of promoting international collaboration as well as exchange between science and industry was achieved. Secondments last 1-2 weeks on an average and all secondees described their staff secondment as helpful to get further insight into new technologies, research approaches, and industry needs compared to their day-to-day work. Thus, it helped them in developing their competences and in promoting their career development. Furthermore, they mentioned the added value of getting to know another culture, profiting from the advantages of collaboration within an international team and making new contacts.

Main obstacle for participating in staff secondments seemed to be that most employees are too busy with their daily work to go out for one or even two weeks. However, after the positive feedback from the staff secondments, it is highly recommended to employees and their bosses to enable a short downtime from daily work, in order to collect new experiences in another surrounding. The performed staff secondments have shown how manifold the gained benefits are, reaching from new scientific

knowledge to practical experience, understanding of sector's needs and cultural differences as well as to generation of valuable new contacts.

Sustainability concept HighTech Europe

The activities in WP7 are dedicated to setting up the foundations for a European Institute for Food Processing (EU-IFP). This EU-IFP should be considered as a part of the concept for the European Institute of Technology (The European version of the Massachusetts Institute of Technology in Boston USA). To achieve sustainability on a long term HighTech Europe investigated different cooperation models for an integrated partnership, assessed operational issues for this institute and considered the road map for implementation of the best cooperation model. These activities have been the basis to decide on a final cooperation model for a European Integrated Partnership, including a Sustainability Action Plan and a business plan for the EU-IFP.

Concepts for sustainable cooperation for an integrated European partnership

The different concepts for sustainable cooperation were assessed via a scenario study around two axes: public/private financing as a predominant driver for food (technology) R&D and regional/global orientation as predominant driver in the agro-food business. The choice for these axes was the outcome of an intensive discussion with several European working groups that have already been actively engaged in the future of Europe's food production and consumption systems, such as the Forward Look from the European Science Foundation (ESF), Foodforce, ETP Food for Life and the High Level Group on the Competitiveness of the Agro-Food Industry.

Using these two axes, four different scenarios were developed to identify key questions, the most important uncertainties and driving forces for an integrated partnership:

- the "agricultural scenario"
- the "knowledge communities scenario"
- the "big bucks scenario"
- the "family owned business"

The characteristics of these four potential extreme futures for the European Union to the establishment and nature of the EU-IFP were further developed in a number of brainstorm sessions. Using a process called wind tunnelling, the match between specific key issues (relating to EU-IFP, bio- and nanotechnology and ICT) and the four scenarios was reviewed. The results of the scenario study were discussed with involved beneficiaries during a meeting (Barcelona, March 2010). The main outcome of these discussions was that there is a need for an EU-IFP in all four future scenarios, despite the significant differences in focus on various innovation sources, funding schemes, type of research and knowledge transfer. The scenarios derived were not fully satisfying for Central East Europe countries and probably reflected some Western Europe bias. This was partially updated in a next step, based on several discussions with researchers from Czech beneficiaries Technologies and Innovation o.s and Food Research Institute Prague including the insights from a study of the current state of affairs of the food industry in Balkan countries and technology transfer schemes in the Czech Republic. All recommendations that were gathered during the course of the scenario evaluation were included into the list of key questions which required answering in the process of establishing the business plan for the EU-IFP (Table 1).

The first characteristics of the new integrated partnership were defined in a study and the first part of this study comprised an evaluation of existing partnerships in the European context via a questionnaire that was sent to all beneficiaries participating in HighTech Europe. Additional information about existing partnerships was collected from the HighTech Europe report D4.1 (Report

on major bottlenecks in the European knowledge transfer chains). Despite the heterogeneity of the answers on this questionnaire, some general trends could be derived which are important for the establishment of the EU-IFP:

- Public funding is vital for long-term relationships
- Geographical distance is not an important factor in the success of a collaboration
- Beneficiaries have a clear view about the elements that should be considered beneficial or a risk to building a successful partnership (e.g., human factors, labour factors and logistical factors). Speaking the mother tongue is not considered a key point for success.
- Key points to be considered for a successful innovation-oriented partnership are: skills of the members, mutual comprehension, funding & funding-related issues, and management issues

In the second part of the study the characteristics of the new integrated partnership were described along two schematic views:

- The "vicious circle", which is the old and well-established scheme of relationships between the different actors involved in an innovation-oriented partnership
- The "virtuous circle", which is the ideal scheme for the new relationships.

In the virtuous circle companies are interested in collaborating with research institutes and universities, and the latest produce results responding to market needs. This is reinforced by the fact that the local authorities, i.e. the state (or region, or other), provide funds for the innovation projects with concrete return: a better promotion of the scientific results through marketable products/services and consequently an increased GDP.

Table 1: List of key questions for the establishment of the EU-IFP (April 2010)

List of key questions for the establishment of an EU-IFP (April 2010)	
1	What will be the scientific focus of the EU-IFP ?
2	Who are the primary clients or target groups of the EU-IFP ? Who are members and who are contributors ? How essential is innovation for industry (and the other way around) ? What is the role of equipment suppliers ?
3	What will be the physical form of the EU-IFP ?
4	What level of leadership and governance structure of the research organization is necessary ? Embedded in other national and European scientific networks and funding schemes (e.g., ESFRI, ERA, ETP, Joint Programming) ?
5	How can the continuity of the basic funding for EU-IFP be arranged ?
6	What criteria can be used to determine success of the EU-IFP ? Number and quality of the partners Scientific output Level of integration (e.g., joint programming in scientific programs and projects) Number of company members Financial continuity
7	What stimulus is possible to gradually change from public-private to private-public funding ? Incentive structure (e.g., bonus on multiplier of funds) Company membership

8	What can we learn from successes and failures for similar partnerships in the European context ? Facility sharing, like CERN Cooperative research, like ESA Other existing EU networks and project, like Nutri-Genomics

Operational issues underlying collaboration

Via a joint questionnaire 25 organisations, mainly business-oriented R&D organisations, were contacted and interviewed with the purpose to gather information on the following operational aspects of European partnerships:

- Options for financing public-private partnerships
- Issues within Human Resource Management
- Pro's and con's of facility sharing
- Communication within European partnerships
- Legal issues regarding the organization of the EU-IFP

The selection of the number and type of organizations that were interviewed guaranteed a wide distribution regarding type of financing and geographic location.

For each of the above-mentioned aspects a separate report has been written, which served as a basis for a full report that summarises the operational issues that should be taken care of when building an EU-IFP. The main conclusion of the full report was that many of the operational issues that might arise have already been solved, regardless of the model that will be chosen for the new European partnership. Best practices are available both on national or regional level, which make it possible to overcome the details of issues such as funding, legal matters and communication in any of the physical and organisational forms of the EU-IFP.

Implementation routes, testing and benchmarking the new cooperation model

Implementing, testing and benchmarking of the new cooperation model started with a first synthesis of relevant results achieved in the different Work Packages of the HighTech Europe project. Some deliverable reports were assessed in detail to identify the potential missions and activities of the future European Institute for Food Processing (EU-IFP). The results of this assessment were gathered and served as the basis for next project steps.

First a workshop has been organised alongside the 2nd Consortium meeting in Prague to discuss the vision, mission, goals, deliverables, target group, do's and don'ts of the EU-IFP. Beneficiaries and AMP members were divided in three different groups:

- Representatives of universities
- Representatives of contract research organisations
- Representatives from companies and knowledge transfer centres

These 3 groups discussed the success criteria and key services of the EU-IFP and provided recommendations for the implementation of the EU-IFP. As a result of this discussion three possible partnership models were suggested:

- The Mission-driven model. This model needs hard commitments by the partners for a long-term involvement and requires legal steps for its formalisation
- The Subsidy-driven model. This model considers the EU-IFP as one of the co-location centres of a Food-KIC (*Knowledge and Innovation Communities*) and requires commitments by national governments and companies.
- The Inclusion model. This model is the easiest but least ambitious model and considers the EU-IFP as an activity within the framework of an already existing international organisation (e.g. EFFoST, IFT)

There was a general consensus on the fact that, irrespective of the specific partnership model, the EU-IFP should be a public-private partnership with both public and private goals (and funds). Furthermore, the EU-IFP should have both a physical and a virtual representation.

Additionally to the results of the Prague workshop a roadmap with milestones was drafted to manage the decision making process towards the EU-IFP. One of the milestones in this roadmap was a stakeholder consultation to allow for external reflection on the vision and results for the implementation of the EU-IFP. To identify the different stakeholders a list of centres of excellence in food processing in Europe was compiled and their representatives were approached. From this list 87 respondents, including 26 industrial representatives, gave their input to a series of questions.

The stakeholder consultation resulted in general and specific missions the new partnership should and should not undertake. The results of this consultation were communicated and validated in a well-attended workshop at the Anuga FoodTec (Cologne, February 2012). Both, the stakeholder consultation and the public workshop clearly demonstrated the wish for coherence and cooperation: to many people respondents. It was essential that the new partnership would not take on missions that would duplicate activities that were already taken care of. At that time, alignment with the preparatory activities for a KIC-Food proposal by the FoodBest-consortium appeared to be the most promising route for sustainable cooperation in the high-tech food area. Furthermore, this approach would ensure continuity of the services and tools of HighTech Europe to its stakeholders beyond the EU funding period. The success of this approach, however, was depending on whether a call for a Food KIC would be opened in 2014 or later, and a successful evaluation of the proposal of the FoodBest consortium.

The workshops, interviews and questionnaires were also used to attract further members for the Associated Membership Platform (AMP).

Associated Membership Platform HighTech Europe

In order to facilitate the main project goal – establishment of the European Institute for Food Processing – stakeholders were approached already in the proposal phase to become a founding member of such an Institute. In the 1st project year the Executive Board of HighTech Europe decided to set up an Associated Membership Platform (AMP) in order to identify qualified stakeholders for the network. The AMP was launched in July 2010, one year after project start, and members were requested to sign a Memorandum of Understanding (MoU) to become AMP members.

Potential stakeholders have been encouraged to join the AMP via:

- Direct invitation to join AMP (disseminated by HTE partners among their own contacts)
- HTE public events (presentations, workshops, exhibitions)
- HTE website and other communication channels such as press releases, publications
- Via the Food Tech Innovation Portal

Beneficiary Food & Biobased Research Wageningen (FBR) runs the AMP contact point, coordinates the registrations and acceptance of new members with the Executive Board, sends out newsletters regularly informing about activities and events and updates the AMP member area on the HTE website. In return AMP member agree that their profile is made public on the Food TIP.

Information about AMP membership is provided online (HTE website, Food TIP) and via flyers (AMP flyer, Food TIP flyer). Since April 2013 an online registration for an AMP membership is possible via Food TIP. A registration at Food TIP is automatically connected to a request to become AMP member. AMP membership is accepted when the party created and finalised their Profile data sheet on the portal.

At project end, the AMP has grown up to 98 members of which are almost one third are SMEs (31%).

Final cooperation model building for European integrated partnership and testing

Based on previous activities of WP7 the Executive Board of HighTech Europe decided on a limited number of key activities which are worthwhile to pursue in the post-project period, the most important ones being the Food TIP (including the information on technologies, profile and infrastructure datasheets, innovator guidelines etc.) and the HighTech Europe network (beneficiaries, AMP members). Given the fact that it would last to at least 2016 before these elements can be included into a KIC-Food structure, two other viable choices were assessed for their continuation: a **project organisation** vs. a **legal entity**.

With much experience amongst the HighTech Europe consortium with project organisation and to have a better understanding of the pros and cons of a legal entity, a series of interviews was conducted with researchers that have been involved in the transformation of Networks of Excellence (NoE) to legal entities, and who also had a Europe-wide database as one of the project outcomes. The primary reason for them to choose for a legal entity, was that this structure enabled financial transactions to and from the consortium to be transparent and accountable. All new entities asked membership fees, to be paid to the legal entity, which – in turn – was able to allocate budget to several tasks, including communication to stakeholders, maintenance of the database and representation of the science community in new FP7 proposals. From these interviews it also became clear that (1) the prospected clients of those new networks and thereby of the database were scientist from academia and from national authorities (i.e. not companies), (2) setting up the legal entity took much time while there are also additional yearly costs involved in having such a legal entity and (3) being the representation of many scientific institutes for new FP7 calls turns out to be quite difficult.

The first items had the largest impact on the ultimate choice for continuation, since the Food TIP is primarily aimed at SME's in food industry and technology supplying industry. Based on the outcome of the stakeholder meeting, it is realistic to doubt their willingness to pay a substantial membership fee at this point in time. For this reason the Executive Board has chosen for a project based organisation as a vehicle for continued activities in the period after the NoE formally ends.

The business plan for a virtual EU-IFP is designed as a new consortium agreement for the period 2014 – 2015, which binds those beneficiaries of HighTech Europe that wish to continue a number of tools and services we have developed in the course of the project. HighTech Europe as name for virtual EU-IFP was kept for the new cooperation with two important goals, to maintain and update the portal (Food TIP) and to secure income for the longer term. The new activities will start on January 1, 2014, right after the project ends. It will last for 1.5 year and include an option for another 1 year. The timeframe was chosen as the Food KIC call has been postponed to 2016. The activities are described in the official work plan which is an annex to the Consortium Agreement. All parties signing the new Consortium Agreement thereby commit themselves to delivering the output. The resources needed for that task have been estimated in several sessions of the Executive Board, but the parties are free to

spend resources as they see fit, as long as the deliverables are met (within reasonable limits of course and with a new Board as an escalation platform).

The status in December 2013 is that the following HighTech Europe members will sign the Consortium Agreement: DIL, TTZ, FBR, IRTA, KUL, Centiv, AGRI, INRA, SIK, NS, TTC, BZ, FRIP, TEIN, PTECH and ZENIT.

The current beneficiaries KEKI, UTCN, QLIME, CSIRO, ARC and DLG will become Associated Member.

The Consortium Agreement includes three annexes, the project plan with key activities, the updated Memorandum of Understanding for the Associated Membership Platform (effective from 01.2014) and the description of the background knowledge of HighTech Europe.

Key activities of the future virtual EU-IFP are:

1. Provide overall coordination of the network
2. FOOD TIP Content Management
3. FOOD TIP Technical Management
4. FOOD TIP communication and advertising
5. Establish national contact points HighTech Europe offering support especially for SMEs in getting access to research facilities and find the right contact person.
6. Running the AMP Office

Potential impact, exploitation results and main dissemination activities

Potential impact and exploitation results

Compared with the U.S. and Asia, the EU has a world scientific lead in the combined area of food, agriculture and fisheries. And, in the field of environment and science for new production technologies and for construction the scientific quality in the EU is almost on a par with that in the world-leading United States (Innovation Union Competitiveness report 2013). However, the food industry sector is divided: SMEs have a very low degree of R&D expenditure (< 0.4%) and internationalisation but account for 99% of the European food industry. Food SMEs are traditional and oriented to regional, national and European markets. They account for 63% employment and nearly 50% of the annual turnover in the sector. Only very few of the larger companies, the multinationals, having R&D facilities and capabilities and can fall back to widely decentralised R&D networks worldwide.

In view of these underlying conditions it is obvious that there is a gap between available knowledge and economically utilized knowledge. Commercialise R&D efforts of the scientific community is extremely challenging for the sector. Various initiatives were pushed in recent years to realize an effective knowledge exchange in the field of high-tech technologies to food markets to have impact on the competitiveness and innovation culture of the European food industry. For sure, this aim can only be achieved by broad and continuous activities which are not only approaching industry but also science, policy and society. Thus, HighTech Europe and its activities are a means to an end: To overcome a lack of technological progress in the food industry in general, partially based on lack of information on new technologies, benefits and hurdles, available experts and facilities.

"**Networks of excellence** are designed to strengthen scientific and technological excellence on a particular research topic by integrating at European level the critical mass of resources and expertise needed to provide European leadership and to be a world force in that topic. This expertise will be networked around a joint program of activities aimed principally at creating a progressive and durable integration of the research capacities of the network partners while, of course, at the same time advancing knowledge on the topic.

Networks of excellence are therefore an instrument designed primarily to overcome the fragmentation of European research where the main deliverable consists of a durable structuring and shaping of the way that research in Europe is carried out on particular research topic. It is important that these networks do not act as "closed clubs", concentrating only on strengthening the excellence of the partners inside the network.

Each network will therefore also be given a mission to spread excellence beyond the boundaries of its partnership" [European Commission].

Specific expectations are linked with a Network of Excellence funded by the European Commission as described in the box above. HighTech Europe met these expectations by

- **Integrating critical mass** in the (scientific) food processing sector including leading universities and research institutions in Europe, namely universities FBR, KUL and UTCN, research institutes CSIRO, DIL, FRIP, INRA, IRTA, KEKI, SIK and TTZ, institutes and associations dealing with technology transfer AGRI, ARC, CENTIV, DLG, QLIME, TEIN, TTC, ZENIT and industry /SMEs BZN, NS and PTECH (list of acronyms in Annex).

- **Acting as an open network** by setting up an Associated Membership Platform at the very beginning of the project that is open to everyone in the food processing and technology sector. The AMP associated 99 companies, research institutions and others at the end of the project funded phase of HighTech Europe.
- **Implementing a joint programme of activities** as basis for a sustainable network, whereby the Food Tech Innovation Portal (Food TIP) is the most important outcome of these joint activities. The open-minded screening of innovations with relevance for the food industry and SMEs in particular was completed by further information. This has resulted in the knowledge database Food TIP with vast amounts of information than can offer solutions according to the needs of the food industry and might facilitate the innovation process in companies.
- **Spreading excellence beyond the HighTech Europe network** by opening the Food TIP to the public; any user worldwide has now access to the food knowledge database. Furthermore, links to FP7 funded projects FoodManufuture, RECAPT, TRADEIT and TRAFOON were established to enable these consortia to utilize Food TIP for their purposes.

The implementation of a sustainable network of research and development in form of the European Institute for Food Processing (EU-IFP) was intended to be one of the final results of the project HighTech Europe. Based on several activities especially of work package 7 dealing with the sustainability of the EU-IFP it was realized that the fragmented and small-scale nature of Europe's food industry and technology suppliers would benefit most from a virtual system. This allows free movement of relevant information with a strong regional focus. For that reason, much effort was devoted to designing and creating the Food Tech Innovation Portal (www.foodtech-portal.eu) as main part of the EU--IFP.

Project results gave two directions of impact for the future network of HighTech Europe:

- Strengthening the HighTech Europe network itself by involving current beneficiaries and associated members
- Ensuring that the Food TIP will be maintained and further developed by in-kind contributions of network members and by using the database for dissemination and technology transfer of future R&D activities on national and European level

Impact and exploitation Food TIP

The Food TIP as main activity of HighTech Europe serves as an information exchange platform between technology & knowledge providers and (potential) users.

The Food TIP is a "wiki" which is a collection of Web pages designed to enable anyone with access to contribute or modify content by using a simplified markup language (Wiki, 2009). The attractiveness and the potential of the portal are the openness and the possibility for any user worldwide to add and update information. A quality management process established by HighTech Europe partners will guarantee the quality of the Food TIP on a long term. However, the portals potential is far from exhausted, regarding content but also regarding functionality, e.g. a map function is desired but could not been installed until now.

The Food TIP was opened to the public on May 2013. Until the project end in December 2013 on average 1650 persons visited the portal per months. This interest could be kept for the next months (01/14 – 04/14 on average 1330 person visited the portal per months). However to keep the attractiveness and quality of the portal on a long term substantial efforts are necessary.

Food TIP, in this way a unique knowledge database, could be a starting point for a long-term source of information for the entire food processing sector and beyond. A single, online available entry point,

gives access to a plethora of knowledge, mainly for industry but also for any other interested user. Compared to databases containing publications on a high scientific level the Food TIP gives concise information about novel technologies for food production which are directed to industry especially to small and medium enterprises. Additionally the technology datasheets are connected with further information regarding institutes and companies having expertise or facilities related to these technologies. During the course of the project it was realized that the Food TIP has three main user groups in focus showing highest interest in the database: 1-food industry, 2-technology transfer centers and 3-applied R&D centers.

Food TIP advantages for these user groups are:

- The complexity of food matrices – in terms of structure, formation and functionality (dynamical changes) – often leads to long development trajectories to reach real innovations. The Food TIP provides tools to overcome delays by a better understanding of the interference of innovation sources, principles and food processing and how this interaction can be controlled.
- The Food TIP is well in the scope of SME and industry needs in the food sector and can be an important tool in matching industrial needs, scientific knowledge and R&D opportunities
- A user-friendly interface of the Food TIP allows an easy finding of desired information and easy-understandable content allows non-scientific users to extract valuable information about innovative technologies
- Automatic linkage of technologies, open-accessible facilities and related experts connects relevant information. It leads the user through the content and enables the contact to the right people to obtain more detailed information and personal advice
- Language support (Ontology terms in different language support search, Google translate can be applied) helps user with little to no knowledge of English to use the database
- The Innovator Guideline is giving additional support in shaping development and innovation processes in companies

Food TIP bases on Wikipedia principles which include free content that anyone can edit, use, modify, and distribute; it is an encyclopaedia that is written from a neutral point of view. Project beneficiaries decided to keep the nature of their database, open and independent, and not to commercialize it. For that reason HighTech Europe has already started and will continue to establish close contacts to running or upcoming projects or other initiative to discuss with them the opportunity to use Food TIP for their knowledge transfer activities. This has already been done with FP7 funded projects FoodManufuture, RECAPT, TRADEIT, TRAFOON and Connect4Action as well as with the partners from outside Europe (CTT - Canada's Technology Triangle, Ontario).

The outcome of HighTech Europe's project activities will remain visible in the coming years through the following activities for Food TIP:

- Updating and reviewing (new) partner profiles;
- Updating and reviewing (new) infrastructure datasheets;
- Active communication to increase traffic on the portal and stimulate its use
- Improving user-friendliness of the portal

HighTech Europe – the EU-IFP

HighTech Europe beneficiaries have described a number of options for the continuation of the services and activities in the post-project phase. Initially the construction of a virtual/physical European Institute for Food Processing (EU-IFP) was the preferred end point of the project-funded Network of

Excellence. During the preparation of the framework programme Horizon 2020 the possibility of a Knowledge and Innovation Community on Food (Food KIC) under the umbrella of the EIT came up. HighTech Europe as part of this activity seems attractive for a long term future of the network. The strategy of joining forces is supported by most of the project beneficiaries. However, the European Parliament and the European Council decided on a Food KIC call only in 2016 and it was and still is necessary to identify other public or private sources to continue the network activities in the meantime.

The Executive Board of HighTech Europe decided on a limited number of key activities which are worthwhile to pursue in the post-project period, the most important ones being the Food TIP and the HighTech Europe network (beneficiaries, AMP members). This was established in a Consortium Agreement that came into force on 1st of January 2014. 'HighTech Europe' as name for the virtual EU-IFP was kept for the new cooperation. The 'new' HighTech Europe members in the post project phase are universities (2 – FBR,KUL), other R&D institution mainly focussing on applied research and having demonstration facilities (7 – AGRI, DIL, FRIP, INRA, IRTA, SIK, TTZ), technology transfer centers (3 – TEIN, TTC, ZENIT) and industry (4 - NS, thereof 3 SMEs – BZN, Centiv, PTECH,) from 8 countries in Europe. They are contributing to the network by own resources which are mainly personnel expenses.

The involvement of other contributing members is realized by the Associated Membership Platform (AMP). AMP members have full access to the Food TIP, and provide information to the platform, minimum is the description of their profile and the signing of a Memorandum of Understanding. The HighTech Europe network decided to give free and open access to all information. Therefore, AMP membership is free of charge as well as the use of the Food TIP.

The current 103 AMP members originate from 25 different countries, of which 6 are from outside Europe. 46 industrial members have joined the AMP, of which 33 SME's. The number of universities and research institutes among the AMP-members is 16 and 22, respectively. 19 others parties (technology transfer centers, federations, associations, etc.) have joined the AMP as well.

The outcome of HighTech Europe's project activities will remain visible in the coming years through the following activities:

- Continuation of the Associated Membership Platform (AMP):
- Make and distribute a periodical newsletter to the existing and new AMP-members;
- Advertise through networking, fairs, social media, etc. the existence of the AMP.
- Organisation of periodic meetings of the Project Board
- The active role of the Members of the Project Board:
- Act as national contact points for the Food TIP and AMP
- Ensure communication and networking activities to promote the new consortium and the AMP membership

The network HighTech Europe itself will increase the awareness of the necessity for research, development and innovation in the food processing sector.

Despite several evident uncertainties (e.g. future developments in the European economic zone, EU budgets), we are convinced that the HTE-results provide a solid foundation for increased interaction between industry, academia as well as government in research and higher education (triple helix), to assist companies in accessing technology offers and needs, for academia to strive for science for impact, and to brand "European excellence" to the food & drink & manufacturing industry as a binding factor.

Dissemination and public relation activities

Dissemination on food fairs and conferences

HighTech Europe was present with a booth at several events to disseminate the idea of the EU-IFP, to build up its AMP network, to spread results and especially to demonstrate the knowledge platform Food TIP. Selected fairs and conferences had a focus on food processing and technologies. HighTech Europe was present with a booth at:

- **at food fairs** IFT Food Expo (Anaheim,2009; Chicago; 2010); Anuga FoodTec (Cologne, 2009 and 2012); IndAgra Food (Bucharest, 2010), BTA (Barcelona, 2012); IPA – The Global Food Factory at SIAL (Paris, 2012) and Biotechnica (Hannover 2013). In these exhibitions main target group was industry (60-75% of contacts established)
- **at conferences** ICEF11 (Athens, 2011); iFood11 (Osnabrück, 2011), FIESTA (Melbourne, 2012) and EFFoST (Bologna, 2013)

Figure 14: Impressions HighTech Europe booth at Anuga FoodTech 2012.

D 4.7 and 4.10 Booth at IFT Food Expo 2009, 2010
D 4.9 Booth at IFT Food Expo 2009
D 4.11 Booth at ICEF11
D 4.12.a Booth at BTA 2012
D 4.12.b Booth at IPA / SIAL 2012
D 4.17 Booth at IndagraFood, Bucharest 2010

Publications

Peer-reviewed publications

Schmidt, A.; Lienemann, K.; Ay, N.: HighTech Europe - Interactive Technology Portal für das Innovationsmanagement in der Lebensmittelindustrie. Vorausschau und Technologieplanung, 285-299, ISBN 978-3-942647-19-9 (2011)

Presentations at EFFost, IUFOST and IFT meetings

Annika Gering: Food Tech Innovation Portal. EFFoST Annual Meeting 2013, Bologna (oral presentation)

Imke Matullat: Consumer information effect on new food technologies - consumers' knowledge gaps and ways of communication. EFFoST Annual Meeting 2012, Montpellier (oral presentation).

Annika Gering: HighTech Europe – Catalyst for transfer of advanced but underexploited knowledge from research to food industry. EFFoST Annual Meeting 2012, Montpellier (oral presentation)

Christof Kunert: HighTech Europe – First European Network for Integrating Novel Technologies for Food Processing. EFFoST Annual Meeting 2011, Berlin (poster presentation)

Herbert Buckenhueskes: HighTech Europe – First European Food Processing Network of Excellence. IFT Annual Meeting and Food Expo 2011, New Orleans, USA

Volker Heinz: HighTech Europe - First European Food Processing Network of Excellence. 15th World Congress of Food Science and Technology (IUFoST 2010), Capetown, South Africa (oral presentation)

Kolja Knof: HighTech Europe - First European Network for integrating novel technologies for food processing. EFFoST Annual Meeting 2009, Budapest (oral presentation)

Other publications

Kerstin Lienemann: Food Tech Innovation Portal is online. The Quarterly, Research Review Policy Focus, Parliament Magazine, issue June 2013

Costa, S.: Nuevo portal online gratuito sobre nuevas technologias de procesamiento alimentario. Alimentaria #442, April 2013, p.108

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Paula Calianu, Mihai Visan, Monica Trif, Kerstin Lienemann: Tehnici de ambalare moderne pentru pastrarea caracteristicilor produselor din carne pe durata termenului de valabilitate. INDUSTRIA CARNII. RO, 27, 2013, p. 62-67, ISSN 2066-7043

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Ariette Matser, Charon Zondervan and Andrea Seleljova (Wageningen UR); Fabien Boulier (Agropolis International); Emma Holtz (SIK): Cooperation in Europe to enhance technology transfer. New Food 1, 2012, p 64-65.

Lienemann, K., Ay, N., Groeneveld, R., Willems, D., Van der Plancken, I. (2011): HighTech Europe Interactive Technology Portal–new tool for innovation in food processing. In: ICEF11 Proceedings 2011

Bianca Pop, Paula Calianu, Mihai Visan, Monica Trif: Conferinta international a "Future meat evolution" Seminar HighTech Europe. INDUSTRIA CARNII.RO, 4, 2011. Revista INDUSTRIA CARNII.RO, Romania

Lienemann, K., Van der Plancken, I., Gering, A. (2010): Hightech Europe: A network fostering innovation in food processing. In: New Food 2010 (3), 24-26

Marine Dromard (2010): Hightech Europe. Le nouveau réseau de transfert de technologie. Process Alimentaire (1), Éditions du Boisbaudry, France

Heinz, V. (2010) Networks of Knowledge. In: International Innovation 2010, 15-17, Research Media Ltd.

Documents and dissemination material

- The White Book Agenda of European high-tech food processing is an extraction of knowledge available on Food TIP and is intended for policy makers and interested society. White Book Agenda of European high-tech food processing, download here
- Food TIP Flyer; download here
- Image brochure HighTech Europe, download here
- Food TIP video clip, visit www.hightecheurope.eu or youtube

Hard copies of all material can be ordered. Please contact coordinator@hightecheurope.eu

Public available deliverables

The following deliverables are available under www.hightecheurope.eu

Name of deliverable		Referring to chapter… of this final report
D 2.4	Report describing the installed Lighthouse Watcher (final version)	Managerial aspects of Food TIP
D 3.6	Design of Consumer Acceptance Study and translation of study in German, Spanish, Swedish and Czech	Consumer Acceptance Studies
D 3.5	Design of Consumer Information Research Study and translation of study in German, Spanish, Swedish and Czech	
D3.9	Report on final evaluation of the quantitative information consumer research study	
D 3.10	Report on final evaluation of the consumer acceptance study	
D 3.13	Article on Consumer Acceptance available on Wikipedia	
D 3.7	First innovator guidelines	The Innovator Guide
D 3.11	Innovator Guide for industry	
D 4.1	Report on major bottlenecks in the European knowledge transfer chains	Knowledge transfer routes and major bottlenecks
D 4.2	Concepts for regional and topic-related knowledge transfer chains (relevant to the Australian Food Industry)	

D 4.4 Report on guidelines for European Food Processing Implementation Award D 4.8 Handing out of the first European Food Processing Implementation Award 2010 D 4.14 Handling out of the second European Food Processing Implementation Award 2012	European Food Processing Implementation Award
D 4.5 Description of the processes and the results of the knowledge auction	Knowledge auction
D 4.7 and 4.10 Booth at IFT Food Expo 2009, 2010 D 4.9 Booth at IFT Food Expo 2009 D 4.11 Booth at ICEF11 D 4.12.a Booth at BTA 2012 D 4.12.b Booth at IPA / SIAL 2012 D 4.17 Booth at IndagraFood, Bucharest 2010	Dissemination and public relation activities
D 4.15 Panel discussion about ethical aspects related to the implementation routes of new technologies *(dissemination level of report is restricted; please contact coordinator to request report).*	Symposium on ethical issues of high-tech applications in food processing
D 5.5 Ranking list of selected technological approaches	Feasibility studies
D 5.6 a/b/c Reports on the innovation & transfer workshops D 5.7 Questionnaire for the innovation & technology transfer workshops	Innovation & technology transfer workshops
D 5.8 a/b Case study reports *(dissemination level of reports is restricted; please contact coordinator to request report).*	Case studies
D 5.9 Overview Report on accessible infrastructure	Access to infrastructure

Annex

Acronyms

AMP	Associated Membership Platform
B2B	Business to business
B2C	Business to consumer
BTA	Barcelona Tecnologías de la Alimentación
D	Deliverable
DS	Data sheet
EFFoST	The European Federation of Food Science & Technology
ELSA	Ethical, legal and social aspects
EU-IFP	European Institute for Food Processing
Food TIP	Food Tech Innovation Portal
GDP	Gross domestic product
HTE	HighTech Europe
ICEF	The International Congress on Engineering and Food
ICT	Information and communication technology
IPR	Intellectual property right
KBBE	Knowledge based bio-economy
MoU	Memorandum of Understanding
R&D	Research and technology
SIAL	Salon international de l'alimentation
SME	Small and medium size enterprises
TDS	Technology data sheet
WP	Work package

Acronyms project beneficiaries

AGRI	Agropolis International, France
ARC	Romanian Meat Association, Romania
BZN	biozoon food innovations gmbh, Germany
CENTIV	Centre for Innovative Process Engineering, Germany
CSIRO	Food and Nutritional Sciences, Australia
DIL	German Institute of Food Technologies, Germany
DLG	German Agricultural Society e.V., Germany
FBR	Wageningen UR Food and Biobased Research, The Netherlands
FRIP	Food Research Institute Prague, Czech Republic
INRA	Institut National de la Recherche Agronomique, France
IRTA	Institute of Agro-Food Research and Technology, Spain
KEKI	Central Food Research Institute, Hungary
KUL	KU Leuven, Belgium
NS	Nutrition Sciences N.V., Belgium
PTECH	Pervatech BV, The Netherlands
QLIME	Pôle de compétitivité Qualiméditerranée, France
SIK	The Swedish Institute for Food and Technology, Sweden
TEIN	Technologies and Innovation o.s, Czech Republic
TTC	Transilvanian Innovation and Technologies Centre, Romania
TTZ	Centre for Technology Transfer Bremerhaven, Germany
UTCN	Technical University of Cluj Napoca, Romania
ZENIT	Centre for Innovation and Technology in North Rhine Westphalia GmbH, Germany

Project websites and contact details

Project homepage: www.hightecheurope.eu

Food Tech Innovation Portal: www.foodtech-portal.eu

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