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# RECAPT

Retailer and Consumer Acceptance of Promising Novel Technologies and Collaborative Innovation Management

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### Position paper on the role of technology in dealing with today's challenges for the food and drink industry

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# **Position paper on the role of technology in dealing with today's challenges for the food and drink industry**

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## **Introduction**

The European food and drink industry is facing a number of important and inter-related challenges that in combination make innovation a joint challenge for retailers, caterers, food manufacturers and food research.

This position paper discusses the challenges facing the European food and drink industry and the role technology can play in meeting them. The position paper is based on work done in the RECAPT project and discussed at the first workshop of the Collaborative Food Innovation Forum.

## **The RECAPT project**

RECAPT (Retailer and Consumer Acceptance of Promising Novel Technologies and Collaborative Innovation Management) aims at supporting a process that leads to closer collaborative management of innovation along the food supply chain. In order to promote information exchange, facilitate trust building and enhance cooperation between actors in the food chain, RECAPT has established the Collaborative Food Innovation Forum (CFIF). The purpose of CFIF is to be a platform for effective dialogue between food chain actors and thereby providing a solid basis for collaboratively developing and delivering innovative, novel or improved products and services to consumers.

RECAPT organises a series of four CFIF workshops where work done in the project is presented and discussed with stakeholders from the food industry, including retailers, caterers, food manufacturers and researchers.

The first CFIF Workshop, held in Paris in late October 2012, focused on the role technology has to play in dealing with the challenges facing the European food and drink industry. At the workshop, 19 representatives from food retailing, catering and the food industry listened to presentations on emerging consumer trends and promising novel technologies and together with representatives of the project partners participated in group and plenary discussions on the challenges facing the European food and drink industry and how the promising novel technologies match consumer trends.

## **Challenges facing the European food and drink industry**

The European food and drink industry are facing a number of important and inter-related challenges, which make innovation a joint challenge for retailers, caterers, food manufacturers and food research.

First and foremost, the European food and drink sector faces the challenge of identifying and satisfying fragmented and dynamic consumer demands. In addition to traditional product attributes such as high quality, convenience and value-for-money, consumers are increasingly demanding that the food products they buy and consume are healthy, authentic and sustainably produced.

Another challenge for food and drink manufacturers is the continuing concentration of the catering and retailing sectors. As retailers and caterers grow in size, they are trying to capture a larger share of the value created in the food chain, thereby putting manufacturers under growing pressure to lower prices. Along with the (re)emergence of alternative channels such as farmers markets and farm shops, as well as the growth of internet retailing in food, this means that reaching consumers is becoming more challenging for manufacturers.

Furthermore, markets are becoming more global in terms of both demand and supply. Consumers are accustomed to having access to a broad and varied assortment of food products from across the world, irrespective of time of year and seasons. This is spurred further by the liberalisation of world markets, which has increased competitive intensity along the entire food chain.

All in all, these challenges increase the need for the European food and drink industry to be innovative. Technologies exist or are emerging that can help the food industry meet these challenges in innovative ways. However, a final challenge for the European food and drink sector is that there are sometimes strong consumer concerns about new technologies being used in the production and processing of foods, as seen with the controversy surrounding genetic modification and functional foods in Europe.

Meeting the different challenges facing the food and drink industry using novel technologies in ways that meet consumer acceptance requires the involvement of actors across the entire value chain.

### **Consumer trends and promising novel technologies**

Modern food production combines process engineering and material science. In the RECAPT project, we have identified a number of promising novel technologies that can contribute to the creation of customer value in the food chain. These technologies can be divided into four main groups:<sup>1</sup>

- *Electromagnetic processes.* This group of technologies covers pulsed electric field (PEF), electron beam technology, Ohmic heating and cold plasma. These technologies deal mainly with non-thermal sterilization and pasteurisation of food products and packaging.
- *Texturizing methods.* This group of technologies covers hydrodynamic pressure technology (shock waves), ultrasonic cutting and high-pressure homogenization. These methods concern tenderization, homogenization and cut surface quality of food products.
- *Mild processing methods.* This group of technologies covers high-pressure processing, infrared heating and super critical fluid extraction. These methods relate preservation of food products, heating of food without direct contact with the heating source and extraction of fluids from food products.
- *Advanced packaging methods.* This group of technologies covers intelligent packaging, RFID, edible coatings, active packaging and

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<sup>1</sup> For details on the specific technologies and a justification of their characterization as promising, please see D3.2, D3.3 and D3.4.

biodegradable packaging film. These methods deal primarily with improving safety, quality and appearance in food products. Additionally, this group of technologies can provide retailers, food manufacturers and consumers with significant information.

While developments in production technology and biotechnology have the potential to change the setup of the food industry and offer considerable promise for meeting the challenges identified above, it is important that new technologies are applied in ways that are acceptable to consumers. Otherwise, trade and industry risk not being able to recoup the costs involved in developing new technologies, processes and products.

With regard to consumers, we see a shift in consumer demand from experience attributes to credence attributes that cannot easily be assessed by consumers before, during or even after consumption. Examples of 'credence' demands increasing in importance are the following:

- Sustainability – consumers are beginning to be more concerned about the impacts their food choices have on climate change, public health, social and economic in-equality, bio-diversity, animal welfare and the use of scarce resources (energy, soil, water).
- Authenticity – consumers are looking for foods that are natural, traditional or local because these are seen as more honest, sincere, un-mediated, healthier and better.

These credence attributes do not replace the traditional consumer demands for good taste or food safety but are “add-ons” – additional requirements that products have to meet on top on the search/experience attributes traditionally demanded by consumers: high quality, value for money and convenience. Consequently, consumers often have conflicting requirements that are difficult to reconcile and require trade-offs. Examples include: (1) maximum health and maximum taste, (2) maximum sustainability at minimum price, (3) all natural, but with negligible preparation time/effort and (4) no restrictions on culinary diversity but with minimal food miles.<sup>2</sup>

On the other hand, the economic downturn has further strengthened the price awareness of consumers. This should not only be seen as a quest for lower prices, but rather for value for money. Consumers continue to demand high quality food because pleasurable food experiences are considered small, affordable indulgences. At the same time, consumers have become more aware of the links between their food consumption and health.

Experience attributes (e.g., such as taste, price and convenience) are all verifiable, whereas the emerging credence characteristics health, sustainability (in both ecological, economic and social terms) and authenticity involve more uncertainty.

In order for new technologies to be accepted, they have to be seen as playing a role in the delivery of relevant benefits, either directly to consumers (by meeting

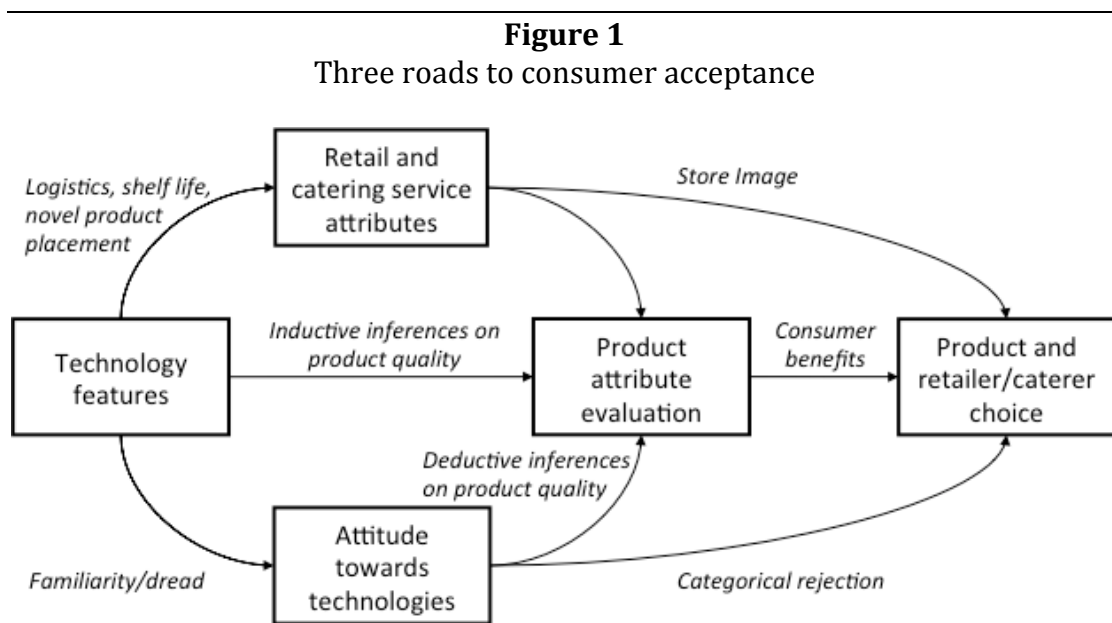
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<sup>2</sup> For a more thorough discussion of trends and trade-offs in consumer demands, please see RECAPT D2.1.

either traditional or emerging consumer demands) or to caterers/retailers. A technology should be seen as a means to an end, not an end in itself.

We propose a model distinguishing between three roads to consumer acceptance for promising novel technologies (see Figure 1):

1. Along the *consumer benefit road*, technology allows the production of products with increased consumer benefits, which consumers will value, leading to consumer demand for products embodying the technology. The first road is followed when products directly address and meet either traditional or emerging consumer demands.
2. A *technology apprehension road*, where unfamiliarity and dread may lead to negative attitudes towards particular technologies. This may lead to categorical rejection (as with genetic engineering in Europe). Vice versa, positive attitudes may lead to preferences for products or deductive inferences on product attributes specifically produced with that technology because products are seen as more authentic or sustainable. This road is followed when the technology is accepted because it indirectly addresses consumer demand or helps meet societal challenges.
3. A *retail/caterer service road*, where the technology leads to improved service attributes from a retailer or caterer perspective, possibly leading to changes in how consumers perceive the image of the retailer or caterer. In addition to improving retailer and caterer services, the third road also reflects that technology benefits are sometimes ‘absorbed’ in the supply chain because they enable the reduction of operational costs. Due to competitive pressure, these costs savings will most often be transferred to end consumers, either directly through lower prices or indirectly through improved retailer/caterer services.



Source: RECAPT D2.2

The three roads to consumer acceptance identified in the model require managerial attention because, although the roads may lead to consumer adoption, they can also represent barriers.

### **Stakeholder views on the role of technology**

At the first Collaborative Food Innovation Workshop, stakeholders were presented with the emerging consumer demands and an overview over promising novel technologies.<sup>3</sup> During the workshop, participants were asked to fill out a matrix, where they were asked four questions in relation to the four groups of technologies identified above. These questions reflect the different roads to consumer acceptance shown in Figure 1. The four questions were

1. How do emerging technologies satisfy “classical” consumer needs?
2. How do emerging technologies satisfy “new” consumer needs?
3. Which technologies will elicit consumer attitudes?
4. How can emerging technologies improve retailer/caterer efficiency and effectiveness?

Answers are summarised in Table 1. In the following, we briefly summarize the answers given to these questions for the four technology types.

*Electromagnetic methods* are seen as able to satisfy classical consumer needs in several ways, particularly by enabling better value for money and improved product freshness, while maintaining good sensory experience (taste and texture). To a lesser extent, the stakeholders believe that electromagnetic methods can also help satisfy emerging consumer needs, in particular in terms of sustainability due to more energy efficient production using fewer chemicals. In addition, electromagnetic methods were seen to provide two main, but inter-related benefits to retailers and caterers in terms of longer shelf life and improved logistics. On the other hand, electromagnetic methods as a group raise the strongest concerns about how consumers will perceive them. While it is positive that electromagnetic methods to some extent represent an alternative to the use of chemicals, some stakeholders fear that consumer acceptance might be an issue. For instance, the term “electric” in pulsed electric fields is expected to trigger consumer concern.

*Texturizing methods* are perceived to be less controversial than electromagnetic methods because they are seen to be more natural. On the other hand, some stakeholders believe consumers will reject texturizing methods because their use might be perceived as an attempt to covertly sell inferior quality products. In terms of classical consumer needs, texturizing methods are mainly seen to influence sensory qualities positively. In terms of emerging consumer demands, texturizing methods are associated with sustainability and convenience and to a lesser extent authenticity and clean labelling. The main benefits for retailers and caterers are lower prices/better value for money and improved efficiency through longer shelf life.

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<sup>3</sup> See D1.4/1.6 for details.

**Table 1**  
Stakeholder evaluations of promising novel technologies

|                                   | <b>How do emerging technologies satisfy "classical" consumer needs?</b>  | <b>How do emerging technologies satisfy "new" consumer needs?</b>  | <b>Which emerging technologies will elicit consumer attitudes?</b>   | <b>How can emerging technologies improve retailer and caterer efficiency and effectiveness?</b>   |
|-----------------------------------|--|--|--|---|
| <b>Electromagnetic methods</b>    | Lower prices/value for money (3)<br>Freshness (6)<br>Taste (4)<br>Food structure/texture<br>Food safety<br>Greater variety<br>Shelf life (2) | Authenticity<br>More natural<br>Sustainability (e.g., energy efficiency, less chemicals) 3<br>Hyper-nutritional elements (less loss)               | Electric - (4)<br>Ohmic - (2)<br>Freshness +<br>Product safety +/-<br>Environmental safety -<br>Alternative to chemicals +<br>Acceptance difficult | Shelf life (7)<br>Efficiency/logistics 6<br>Safety<br>Freshness   |
| <b>Texturizing methods</b>        | Sensory food quality (7)<br>Reliable quality<br>Freshness<br>Appearance<br>Value for money   | Authenticity<br>Clean labelling<br>Sustainability (3)<br>Convenience (4)   | Appetizing +<br>Mechanical=natural +<br>Product safety an issue<br>Just amending, not adding +<br>Acceptance difficult                             | Efficiency (2)<br>Shelf life (2)<br>Value for money/lower prices 3<br>Improved quality<br>Consumer satisfaction   |
| <b>Mild processing</b>            | Freshness (2)<br>Food safety<br>Sensory food quality (4)<br>Shelf life   | Clean labelling (2)<br>Health (3)<br>Authenticity (2)<br>Sustainability<br>Shelf life  | Risk of technology -<br>Sustainability +<br>Product safety an issue (2)<br>Acceptance less difficult (although some disagree)<br>Mild +            | Shelf life (6)<br>Less storage<br>Food safety (2)<br>Clean labelling<br>New retail concepts   |
| <b>Advanced packaging methods</b> | Freshness (2)<br>Maintain quality<br>Selection of quality<br>Taste<br>Preserve food purity<br>Convenience (9)                                | Sustainability (biodegradable) (2)<br>Food safety (3)<br>Health (2)<br>Extended shelf life<br>Effective chain<br>Less waste (3)<br>Edible coatings | Most will be accepted, although privacy concerns is an important issue with RFID<br>Consumer empowerment   | Freshness indicators (consumer information) (3)<br>Improved communication<br>Food safety<br>Convenience (2)<br>Efficiency/logistics (7)<br>Shelf space management<br>Product presentation<br>Improved quality<br>New retail concepts<br>Competition through service |

*Note: Numbers in brackets indicate the number of times a particular issue was mentioned.*

Stakeholders perceive *mild processing technologies* to satisfy the traditional consumer demand for freshness and to facilitate the production of foods with good sensory properties. Furthermore, they are seen to facilitate clean labelling and to be able to satisfy the emerging consumer demand for healthy, authentic and sustainable products. Most stakeholders expect consumer acceptability to be less of a problem for mild processing, in part because the term “mild” is considered positive, whereas some of the names of other technologies are more likely to activate strong negative consumer attitudes. The main benefit for retailers and caterers is seen to be that mild processing can help improve shelf life.

In contrast, *advanced packaging methods* are seen to provide a range of benefits to retailers and caterers. First and foremost, new packaging methods can help make chain-wide logistics operations more efficient (as is the case with RFID chips). Furthermore, new packaging can improve communication with consumers. For instance, freshness indicators can provide consumers with real-time information about the state of the product. Advanced packaging materials are also perceived to satisfy the emerging consumer need for sustainability, both by reducing waste and new packaging materials being biodegradable. Finally, new packaging methods can help maintain the quality and freshness of foods while improving convenience and are seen by some stakeholders as the most promising of the novel technologies. Advanced packaging methods are less likely to elicit negative attitudes, although the use of RFID might raise privacy issues according to some stakeholders.

Because consumers are understood to be concerned about new technologies in food production and processing, many of the participants in the CFIF workshop expected most of the promising novel technologies to elicit negative consumer attitudes. In this connection, some participants mentioned that consumer attitudes towards technologies had changed over the last two decades.

In order to avoid outright consumer rejection of novel technologies, communication to consumers about technologies used for producing and processing food was a recurring theme. It was seen as important to be transparent about the technologies being used because consumers are sceptical towards modern food production and do not trust manufacturers (hence the consumer trends towards authenticity/naturalness and sustainability).

Some stakeholders view the framing of discussions about new technologies as very important. They argued that it is essential that the initial framing is positive. Otherwise the risk of consumers developing negative attitudes is too large. It is therefore seen as very important that industry take the initiative in communicating the benefits of technologies.

Transparency regarding the technologies used is important for the development of trust in consumers. It is very important that the food industry is not seen to be misleading or cheating consumers when naming and discussing technologies. There is a significant risk of consumer backlash if industry is seen to be misleading them. In this connection, technologies such as texturizing methods might be viewed with some suspicion by European consumers, who might perceive them as a means to sell inferior quality products.



Technology is seen to play less of a role when consumers buy a (food) service than when they buy a food product. Technology can support food service differentiation. One suggestion therefore is to introduce new technologies in out-of-home settings, where requirements are not as strict as in retail.

### **Discussion and concluding remarks**

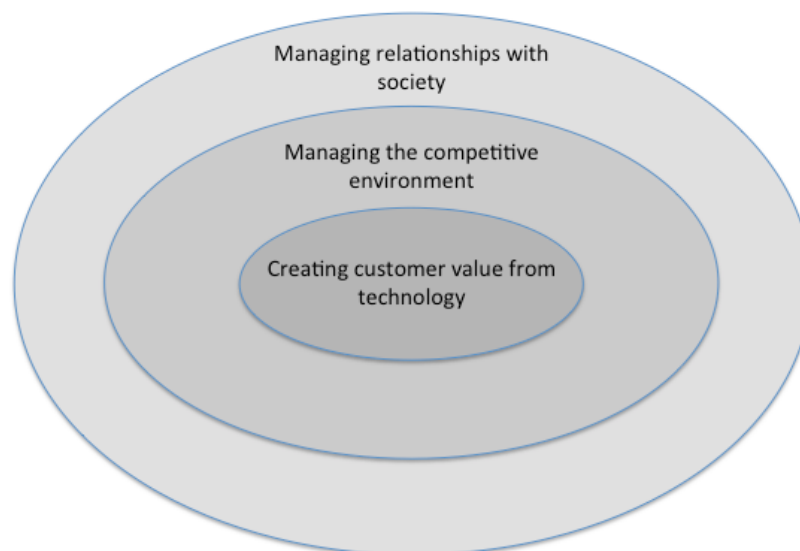
This position paper has discussed the role of technology in meeting current challenges facing the European food and drink sector. In addition, we have identified emerging trends in consumer demands and discussed three roads to consumer acceptance for novel technologies.

For managers in the food industry, the discussion in this position paper can be translated into three main tasks (see Figure 2):

1. *Creating customer value.* The immediate task for managers is to create customer value from promising novel technologies by addressing traditional and emerging consumer demands.
2. *Managing the competitive context.* Managers have to reflect on how they can influence and manage the competitive dynamics within their supply chains and on the business-to-business markets on which they operate, e.g. through collaborative innovation between manufacturers and retailers and caterers.
3. *Managing relationships with society.* It is important to manage relationships with diverse stakeholder groups and to reflect on the process of technology acceptance in society at large in order to gain acceptance for novel technologies from consumers and other stakeholder groups.

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**Figure 2**  
Three managerial tasks



Given the changing nature of consumer demand, a strong market orientation of the entire food chain is essential for successful innovation and the development of products and service that create value for consumers, while taking into account the competitive dynamics and societal concerns about the consequence of novel technologies.