Transparency in Food Networks - where to go

Gerhard Schiefer[1] and Robert Reiche[2]

[1] University of Bonn, Germany, Schiefer@uni-bonn.de
[2] University of Bonn, Germany, robert.reiche@uni-bonn.de

Abstract

One of the core requests in assuring competitiveness and sustainability in the food value chain is transparency. The complexity of the sector, the absence of focal players in the field, the complexity in the collection, processing and communication of information, and limitations in information and network technology have made it difficult to find concepts and solutions that could solve the transparency problem at consumers' end. This is where the Future Internet provides opportunities that allowed to meet the challenge and to appropriately address the transparency problem. This paper introduces into the subject through a detailed outline of the transparency complexity of the food sector and the requirements on concepts and systems that could deal with it.

Keywords: Transparency, food networks, information technology, Future Internet

1.   Introduction

Consumers' trust in food, food production, the origin of food, and the actors involved is a core requirement for the functioning of European food markets and the competitiveness of industry involved. Transparency is a means for providing trust. It is not meant to know everything but to **create awareness** on the issues consumers are interested in, involving information on the safety and quality of products and processes, and increasingly on issues around environmental, social, and ethical aspects.

The design of appropriate transparency systems requires cooperation within the sector and a suitable IT infrastructure on which information can be collected, processed and moved towards retail and the consumer.

The baseline for such an infrastructure is the ability to clearly identify products and the link between products and the transparency information. There are many initiatives by regional or global actors towards the establishment of such tracking and tracing systems that could cover the industry. However they were all doomed to fail (Fritz and Schiefer, 2009) because of a.o. limitations in technology that required central management activities the sector was not prepared to accept, and the investment needs especially for SMEs in joining integrated IT solution networks.

With the advent of new and increasingly powerful networked technology and new internet communication opportunities, the picture changes as it opens the way for decentralized solutions building on autonomy in trade units, flexibility, and new functionalities in what is called the Future Internet (Tselentis and Galis, 2010).

The present paper deals with these developments. It builds partly on results from the EU project SmartAgriFood (www.smartagrifood.eu) partly covered in Lehmann, et al. (2011) but is being complemented by results from the projects Cuteloop (www.cuteloop.eu) partly covered in Reiche (2011), Transparent_Food (www.transparentfood.eu) partly covered in Schiefer and Deiters (2013), and the ongoing project FIspace (www.fispace.eu). It is divided into 3 parts. The *first part* (chapter 2) provides the basis for an appropriate system design. The *second part* in chapter 3 develops a design framework for a suitable system infrastructure whereas the *third part* (chapter 4) links up with implementation initiatives that employ features of the Future Internet capabilities.

2.   A Baseline View
2.1   Overview

Food chain initiatives towards reaching **awareness** are focused on serving the information needs of the final customer in the food value chain. The final customer, however,

is a complex unit. It is comprised of ***retail***, ***consumers***, and the ***interface*** between them. Retail constitutes the final stage in the food value chain which delivers goods to consumers and provides the information requested by the market, i.e. the consumers. Consumers on the other side link up with retail to receive goods and to request the information they need for making an 'informed decision' (see CIAA, 2005; FoodDrinkEurope, 2013).

Retail providing the interface between the value chain and the consumer is interested to have all information at hand the customer might want to ask for. Its strength is the ability to deliver, both in products and information. However, beyond the ability to deliver information, retail must also assure that products are safe and of the quality its customers expect. This guarantee is based on the reception and use of appropriate information from producers, suppliers, or from the product itself which allows the elimination of unsafe or unfit products from further sales.

2.2 Organization and Content

For serving the different consumer and retail perspectives, one needs to specify the content of information needs providing '***transparency***' and the structural and technological organization of business services (information services) that can provide the requested information at the time needed, where needed, and in the format needed.

Generally agreed upon under the term '***sustainability***', the content may involve information on economic (including food quality), environmental, social (incl. food safety), and ethical concerns. However, in information content the relevant and most critical issue is usually not the content as such but understanding the ability of consumers in grasping information and the perception they develop. This is the basis for discussions on transferring information into 'appropriate' ***signals*** that contain the 'message' consumers are interested in (Schiefer and Deiters, 2013). A sophisticated example for communicating content and signals is presently the focus of a branding initiative by the REWE retail group aimed at the establishment of a sustainability brand ("Pro Planet"; www.rewe.de).

The ***organization of business services*** supports the collection and use of information content. The organization is not just a technological challenge but a challenge that has to take into account issues like data ownership, access to information, information guarantees, or the ability for interactions between actors and systems on the basis of technology, knowledge, resources, exchange rules, and standards.

3. Making the Scenario Work – an Overview of Principle
3.1 Overview

For getting the necessary information, consumers and retail have to rely on information services that provide a fitting link between the source of information and the use of information at the end. These links involve a.o. procedures for the collection of information, an information carrier from source to end, the transformation of information into signals, and the activation of information access and use.

3.2 Information Collection

Sources of necessary information linked to sustainability in a broad sense involve products, processes, and actors (sites incl. products' origins) that are engaged in production and distribution. It is apparent from the analysis of various food sub-sectors that information can be or needs to be collected at enterprise premises *before* the product leaves the enterprise

premises, at enterprise premises *after the product has left* the enterprise premises, a situation typical for laboratory testing, and on a product's path through the value chain (*monitoring*).

The collection of information may be organized on-site or *in advance*. 'In advance' fits information items that are stable during some time or do not significantly change over time independent of the actual product batch produced. They could be collected any time and with any product batch before use and stored in data bases for later use with subsequent product batches. Examples are e.g. studies on carbon emissions in the distribution of products which would not change as long as the distribution channel remains unchanged. This is an approach presently commonly applied in environmental issues where information is complex to collect.

3.3   Information Carrier – the Tracking and Tracing Backbone

The move of information from information providers to information users along the food value chain requires carriers. State-of-the-art approaches build on the utilization of communication networks (as, e.g., internet, GSM, or satellite networks) and centrally managed data bases.

In principle, communication systems based on this technology can serve a broad range of communication needs. However, they face resistance in the market place because of their requirements on centrally managed communication systems which requires agreements on system features, finances, and investments across the whole sector and food value chain on a regional and *global scale* to be successful (Schiefer and Fritz, 2008). Actual developments in technology have the potential to change the scenario dramatically in the future. RFID chips involving the capability of computers combined with sensor and communication technology (receiving/sending) allow to attaching information to products. This allowed decentralized communication systems where transparency could be realized without general sector management agreements (CuteLoop, www.cuteloop.eu).

The communication between enterprises for tracking and tracing activities depends on the universal acceptance of organizational and technical communication *standards* and on agreements for information exchange. For the identification of trade units (product batches) as the very basic tracking and tracing requirement, solution proposals have been formulated by the universal standard committee GS1 ('General Standard One'; www.gs1.org) with its specification of Global Location Numbers (GLN), a universal trade unit identification scheme with the Global Trade Item Number (GTIN), and the development of Electronic Product Codes (EPC) that facilitate the use of electronic identification devices like RFIDs and others. Such agreements have to be complemented by a number of additional agreements (Transparent_Food, www.transparentfood.eu) dealing with *communication protocols, Syntax and Semantics*.

3.4   Transformation of Information for Use

The information available at the end develops through communication and transformation of information throughout the chain. It is communicated as 'backpack' on the information carrier as all information is directly or indirectly linked to products, their production or origin. In linking information with possible signals, there is a great variety of alternatives that guide the transformation of information on its way through the value chain. However, they all follow a few principle schemes:

Scheme 1: Information is being collected and communicated unchanged throughout the value chain towards the end (*static information scheme*). Examples are information about 'animal welfare' at farm level or the origin of products.

Scheme 2: Information is being collected and changed along the value chain with each actor involved (*dynamic information scheme*). Examples are information about 'food miles' which integrates information related to CO_2 emissions in the production and distribution process or information from monitoring activities of product quality involving e.g. continuous measurements of product temperature.

Scheme 3: Information is being collected from various domains and aggregated into a 'label' that might or might not be part of a certification scheme, in the first case referred to as 'certificate'. The communication item is the label and not the individual information contained. While 'scheme 3' information activities restrict communication to the label, it is evident, that the information used in the composition of a certificate would be available at user's end for individual evaluation and use independently of the label used as 'carrier'. Building on this argument, there is already a multitude of information in the value chain that might be suitable for the formulation of signals at user's end.

3.5   Activation of Access

In the delivery of information in support of transparency one can distinguish between three alternatives for activating (*activation patterns*) the necessary information flow (CuteLoop, www.cuteloop.eu), 'regular delivery', where information is delivered with the product (in whatever form), 'on demand', where information is delivered on a case by case basis if asked for, and 'exception reporting', where information is delivered, if certain characteristics of products already shipped do not match requested requirements (e.g., in food safety).

Regular information delivery might be linked to legal requirements but also to predefined customer needs within a controlled information environment. *Information on demand* deals with irregular information needs, sampling activities at the users' end, or users' interest in checking the validity of information received. *Exception reporting* is a service that routinely checks if there are irregularities with incoming products that require specific attention by the customer.

4.   Implementation concept

Newly emerging implementation concepts are being modelled along the line of the '*app store*' philosophy employing features of today's internet capabilities (Future Internet). One of these concepts is being dealt with in the EU project FIspace (www.fispace.eu). Its basic approach is to cut down complex systems (information services) into smaller system elements (sub-services) that (if used together) model the complex system. As an example, an information service that aims at serving information needs of e.g. retail could build on a sequence of sub-services such as 'request for information', 'identification of information source', 'provision of information at source', delivery of information from source to requesting party, etc.

All of these sub-services could be implemented as limited in scope stand-alone '*apps*'. The challenges are to activate the apps in an appropriate order and to assure that the outputs and inputs of the different apps match. The concept employs an internet-based platform where the linkage of apps and the order of their activation is being modelled so as to mirror the information service to be implemented. Whenever an app is being activated it consults with the platform on which app to activate upon its completion.

With the platform approach, apps could be arranged for serving different information services depending on the process design implemented in the platform. The approach is attractive because of its flexibility and its ability to get many different development groups

engaged in developing apps of limited scope but with the potential of becoming part of a complex information service. This reduces investment risks and opens the doors for SMEs with limited development capacity.

5.   Conclusion

The discussion on reaching transparency in the food sector has been going on for a long time. Deficiencies are less due to limited engagements of actors in the food sector but in limitations in technology, difficulties in reaching sector agreements on a European and global scale, and major differences in the E-readiness of enterprises in the field.

New technologies in system development, internet capabilities and network devices open opportunities that could change the situation. They provide flexibility, are suitable for being used within the open network approach of the food system and allow the utilization of development capacities available in the development community and especially the capacities available at SMEs. A cluster of European projects has dealt with this situation and provides a framework on which the new developments could build. The paper summarizes core features of the framework and relates them to the problems inherent in reaching transparency in the sector.

References

CIAA (2007). Strategic Research Agenda. European Technology Platform 'Food for Life', Brussels

FoodDrinkEurope (2013). Strategic Research and Innovation Agenda. European Technology Platform 'Food for Life', Brussels.

Lehmann, R. J. (2011). Sustainability Information Services for Agri-Food Supply Networks – Closing Gaps in Information Infrastructures. Doctoral dissertation, University of Bonn, Germany. http://hss.ulb.uni-bonn.de/2011/2574/2574.pdf [August 23, 2011].

Fritz, M., Schiefer, G. (2009). Tracking and tracing in food networks. International Journal of Production Economics 117 (2): 317-329.

Lehmann, R.; Reiche, R.; Schiefer, G. (2011). Smart Food Awareness - Specification for Experimentation, Report 400.1, EU project SmartAgriFood. European Commission.

Reiche, R. (2011). Information Logistics in Agri-Food Supply Networks – Integrated Framework for Business Information Services. Doctoral dissertation, University of Bonn, Germany.

Schiefer, G., Deiters, J. (2013). Transparency for Sustainability in Food Chains. Elesevier.

Schiefer, G., Fritz, M. (2008). Food chain management for sustainable food system development: A European research agenda. In: Agribusiness. An International Journal 24(4), pp 440-452.

Tselentis, G., Galis, A. (2010). Towards the Future Internet: Emerging Trends from European Research. IOS Press, Amsterdam.