

## **How open is food innovation? – The crispbread case**

### **Abstract**

**Purpose** - How does the cereal industry innovate in selective partnerships? This paper has studied the cereal industry and the crispbread success in terms of how different forms of openness jointly shape new product development.

**Design/methodology/approach** – A multiphase mixed methods design was used to combine three sets of data; a case study, sales figures, and interviews with ten major actors in the Norwegian cereal industry.

**Findings** - Transparency and interaction with machinery suppliers appear to result in a more successful type of innovation. In practice, companies are more open than, perhaps, they realize. Factors such as mutual trust, asset control and distribution are positive for openness in innovation processes with suppliers.

**Practical implications** - Future actors such as suppliers, producers, distributors and policy makers in the food industry will benefit from trust and an open innovation mind-set during new product development.

**Originality/value** - Prior to 2011, Norway had no large-scale commercial crispbread production. Six years later, Norwegian production nears the sales figures of the leading Swedish brand Wasa. Is this due to Open Innovation? Understanding various forms of selective partnership, collaboration and trust among actors in the food industry is valuable for future growth.

## 1. Introduction

There is a need for a better understanding of Open Innovation (OI) in the food industry which, in regard to the type of innovations it introduces to the market, is typically described as a relatively conservative, mature and slow-growing business area (Costa and Jongen, 2006, Bigliardi and Galati, 2013). Teaming up with customers, suppliers or other actors inside and outside the value chain to explore OI potential is an effective way for actors to achieve metamorphosis and better innovation pay-off in markets (Sarkar and Costa, 2008). Open Innovation studies in the food sector would benefit from in-depth analysis and longitudinal case studies to identify adopted practices and cross-industry partnerships (Procopio Schoen, 2017).

Interplay and forms of vertical integration in the food industry appear to follow well-known Schumpeterian patterns (Breschi et al., 2000) as implementation of innovation leads to non-competitive behaviours or new market structures. Traditional market transactions in the food industry may be challenged by vertical integration resulting in new product innovations, but research is lacking on the interaction of the food supply chains and their link to innovation (Zilberman et al., 2017). Existing patterns appear to demonstrate that exporting sections of the food industry may be more innovative than production only for domestic markets (Alarcón and Sánchez, 2016, Bojnec and Fertó, 2017). The positive effect of international competition has been measured as the share of exports over sales, and as having foreign partners.

How does the cereal industry innovate in selective partnerships? This study has investigated how OI is applied during New Product Development (NPD) in a context with varying dimensions of

OI, co-creation, sharing and trust. In addition, the study explains how some innovation management tools are applied in simple and pragmatic ways by the food industry. Patterns of OI for the food industry will be exemplified by the crispbread case. Management systems could be designed and managed differently to stimulate more openness for OI, and to generate more dimensions in inter-organizational networks, organizational structures, evaluation processes and knowledge. Little is known about how NPD ideas are distributed in the Norwegian food industry. More insight was acquired by studying the cereal segment, which should be representative of most of the domestic food industry. Companies might not feel comfortable in these OI scenarios, in which return depends on the partner and value is co-produced (Teece, 1986). Companies often rely on the extent to which partners are willing to share and invest in shared assets, while sharing must be effectively managed to ensure trust and a willingness to divide the desired resources (Katila et al., 2008, Beckeman et al., 2013). During partner selection for OI, companies preferentially deal with partners they know and trust, rather than seeking new partners in an open market (Solesvik and Gulbrandsen, 2013). The power balance in distribution in the food industry, with three major players all with ambitions of increased shares of private label products (Olsen, 2012), undoubtedly influences the level of trust.

Norwegian export of crispbread has quintupled in three years, from NOK 15 million in 2013 to NOK 72 million in 2016. A further increase is expected. Dry crispbread containing rye as the main ingredient originated in Scandinavia. Crispbread is low in fat, high in fibre and contains less than 10% water, giving a long shelf life and valuable distribution opportunities. The present innovation study has analysed possible explanations for this new crispbread success. Sales of domestic crispbread have also increased significantly in Norway, and demand has increased in

particular for the higher-end exclusive varieties. The added value for this type of crispbread is higher than for ordinary crispbread. While the value of Norwegian crispbread sales has doubled, volume has increased by only 50%. An increased willingness to pay for a product and the export of an agricultural product are good indicators of innovation (Bojnec and Fertő, 2017). Prior to 2011, there were almost no Norwegian crispbreads in domestic grocery stores.

This paper is organized in six sections. Section 2 establishes the theoretical framework with OI literature relevant to the food domain. Section 3 presents the empirical aspect and background provided by an industrial project called OI Cereal that ran from 2010–2011. In Section 4, multiphase mixed methods are used to combine three sets of data. The data consist of the OI Cereal Scheme, ten years of crispbread sales, and interviews with ten important actors. Section 5 presents the results and, in Section 6, policy implications of the findings are discussed in terms of OI.

## 2. Literature, OI and food

OI is more broadly defined in this literature review but is still placed in the food domain.

Relevant dimensions of OI, such as closed innovation, inbound search, selective collaborator and how trust may replace intellectual property rights (IPR) instruments for the food industry, are discussed.

### *2.1 Broad definition of OI*

*“One challenge in the use of the OI concept has been the broad definition introduced by the many turning the definition of everything into a definition of nothing”* (Chesbrough, 2016). The opposite of OI would be closed innovation, where companies might invest too much energy in resolving problems by themselves, not pass them on to others, or not pick up ideas from the outside world (Chesbrough, 2014). Closed innovation driven by ad hoc processes using internal capabilities persists as a culture of innovation for the food industry (Kratzer et al., 2017). Open Innovation has been studied over the last decade using quantitative and qualitative measures, and the original concept has matured through other frameworks and theories in innovation, strategy and economics (West et al., 2014). However, most types of collaboration in a network for innovation can be understood and studied by using other innovation paradigms; OI has illustrated network theory in an understandable way for many companies and scholars.

## *2.2 Dimensions of OI*

In NPD projects, most companies will rely on the contributions of a broad range of external players in addition to internal R&D functions. The mix of collaboration breadth and depth dimensions for the search strategy during NPD will vary in the different stages. Clusters of search mode have been identified varying from limited collaboration with traditional partners to broad openness where technology is a driver for increased openness (Garcia Martinez et al. (2014). These dimensions of inbound OI may be shaped by various types of innovation such as radical versus incremental, product complexity as discrete versus complex, and the appropriability regime as tight versus weak (Bahemia and Squire, 2010). Open Innovation and the challenges of organizing for OI have been studied extensively during the past decade after its introduction in 2003 by Chesbrough (Chesbrough, 2003). Open innovation has become a highly debated issue in management literature. When trying to define the concept of OI, scholars are aiming at a moving target, as the paradigm has matured and the original definitions have been made more precise by its originators. The OI paradigm assumes that companies use external and internal ideas as they look to advance their technology for creating new products, services or paths to markets. Companies may scan the environment for new technologies, collect industry information, approach external institutions, and establish collaborations with partners or lead users to acquire new knowledge (Chesbrough, 2014).

## *2.3 OI in the food domain*

Managers of food companies are advised to adopt the OI approach because it is reputed to yield faster speed-to-market, lower R&D costs and better adaptation to the customer's needs (Miglietta

et al., 2018). Open Innovation does take place within the food sector (Sarkar and Costa, 2008) and is gaining in popularity in this industry (Saguy and Taoukis, 2017, Saguy and Sirotinskaya, 2014, Arcese et al., 2015, Martinez, 2014, Garcia Martinez et al., 2014, McAdam et al., 2014, Traitler et al., 2011, Bresciani, 2017). Companies in the food industry appear to have adopted OI ideas progressively, but it is mainly large companies that are drivers of OI initiatives (Ramirez-Portilla et al., 2016). Market-driven health benefits and cross-industry collaboration are associated with more radical food innovations (Bornkessel et al., 2016). The United Nations sustainable development goals has gained increased focus in the food industry, and is also used as a driver for innovation (Franceschelli et al., 2018).

#### 2.4 Partner selection among food industry companies

The food industry cooperates closely with machinery suppliers, and equipment procurement is a main source of innovation (Beckeman et al., 2013). The interplay between the food industry and their suppliers of equipment and materials, illustrated in Figure 1, is important for the level of technology in the sector (Rama, 1998, Menrad, 2004, Bigliardi et al., 2010).

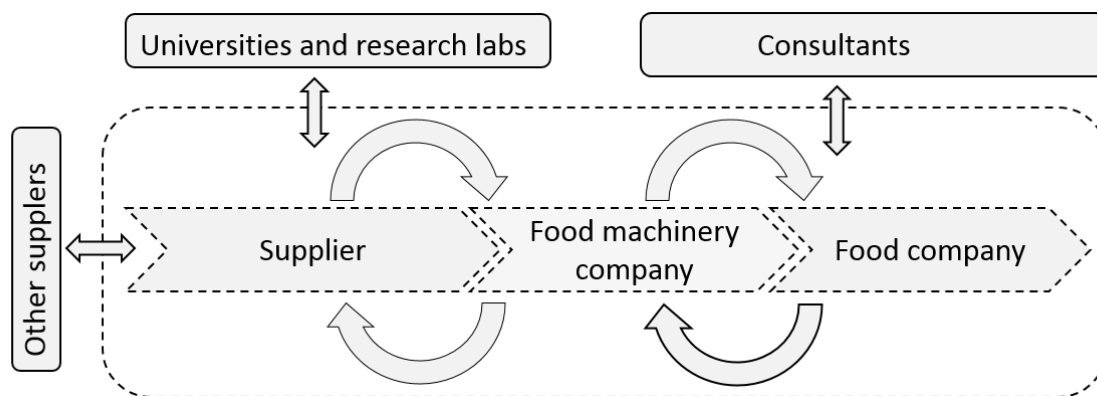


Figure 2 The food machinery framework and the open food supply chain (Bigliardi et al., 2010, Bigliardi and Galati, 2013). Tacit agreements with suppliers, following a norm-based IPR approach (Fauchart and Von Hippel, 2008).

The food industry appears to rely on non-formal R&D activities as companies interact with suppliers, customers and consultants (Trott and Simms, 2017, Jensen et al., 2007, Kratzer et al., 2017). New Product Development processes are described as learning-by-doing, using and interacting (Trott and Simms, 2017, Jensen et al., 2007, Kratzer et al., 2017). For the SMEs and often family-owned companies, one seldom finds a formalized action plan involving an OI strategy but, instead, a continuous NPD process with external collaborating partners that combines expertise and strength as it progresses (Santoro et al., 2017). Family companies and their owners may build a more personalized long-term relationship with internal and external stakeholders; this will orchestrate mutual learning, fair values and mutual trust among network partners (Lambrechts et al., 2017). For these old, rooted family food companies, market-based OI sources appear to provide more speed-to-market whereas science-based innovation is often associated with more radical new products and processes (Santoro et al., 2017).

Adaptation and possible effects of OI practices in the food industry may be explained by success cases in which, in the development of new winning products, there is collaboration with suppliers in a climate of trust, skills, tacit knowledge and new insights. The matured definition of OI, in combination with informal agreements, is relevant for understanding how the cereal industry innovates in selective partnership.



### **3. Context of the study: the Norwegian food industry and the crispbread case**

#### *3.1 The Norwegian food industry*

The Norwegian agriculture and food industry represents the largest goods-producing value chain in mainland Norway (Meld. St. 9, 2011). The number of employees in the 2,000 food-related enterprises is currently around 50,000 and the production value is NOK 177 billion. The industry consists of four large enterprises and 376 SMEs of which the great majority are small, often family-owned, SMEs. The four large enterprises control more than half of the market. Turnover of fresh, consumable cereals has been stable with a 2–3% annual growth in line with the growth in GDP (NILF, 2014). Increased import has compensated real growth. In actuality, this translates as a sector in decline. The category of crispbread has been one of the main drivers of growth in recent years, even though it represents a relatively small segment of the sector.

#### *3.2 The Open Innovation Cereal Scheme 2010 - 2011*

In 2010, a scheme named Open Innovation Cereal, was initiated to create a series of innovation platforms that could potentially boost creativity in the sector. The scheme was politically supported to establish a precompetitive OI platform. Increasing imports of various cereal products threatened the domestic sector and were the driver for the scheme. The main objective of the OI Cereal Scheme was to increase earnings for the cereal industry through OI, focusing on the development of ideas and opportunities meeting specific consumer needs. Representatives from 25% of all cereal industry actors actively participated in the development of innovation platforms with business opportunities. Ten of these business opportunities were presented at the final dissemination conference in 2011, at which most actors in the Norwegian cereal industry

were represented. The format was future-image and short-story based, complemented with illustrative prototypes such as Minimum Viable Products (MVPs) (Blank, 2013).

### *3.3 The Norwegian crispbread production*

In 2013, Norway started exporting high-end crispbreads and, in 2016, the company Sigdal exported nearly 1,000 tons of their crispbread varieties in addition to the 2,000 tons sold on the domestic market. Prior to 2012, crispbread production was not industrialised in Norway. In 2017, crispbread exported from Norway will likely represent a higher value than all crispbread imported ten years ago. Products based on Norwegian agricultural products have not been particularly successful on the export market. This underlines the uniqueness of the success story with the *Crispy-bread* innovation for both the agricultural and the domestic food industry. Greater value growth than volume growth is evidence of an increased willingness by the customer to pay more for the novel crispbread. This is proof of successful innovation in the cereal industry.

## **4. Methods**

A multiphase mixed methods design strategy was used, combining two sets of qualitative data with one quantitative method. A multiphase mixed methods design (Creswell, 2013, Denzin and Lincoln, 2011) was chosen to follow up the results from the six-year old OI Cereal Scheme, studying effects and looking for possible patterns in NPD processes through the lenses of OI.

This research design was chosen to evaluate results from the scheme which extended over a period of time, and moved back and forth between various forms of data collection, see Figure 3.

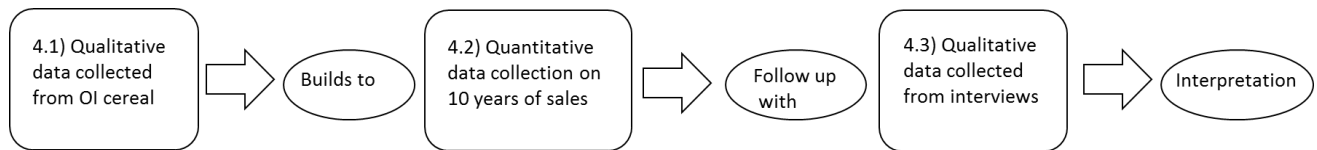


Figure 4 Multiphase mixed methods with qualitative data from OI Cereal, 10 years of sales, and interviews.

(4.1) First, documents from the OI Cereal Scheme 2010 – 2011 were collected and read to look for collaboration patterns. The documents included minutes of meetings, observation reports, reports from interviews, various prototype designs and reports from prototype experiments. These data built up to a need for sales data. (4.2) Second, quantitative data from ten years of sales of bakery products were collected and analysed. (4.3) Finally, to follow up, ten interviews were conducted with important actors in the Norwegian cereal industry.

Qualitative research, however, should not be used to develop generalizations, but to develop theoretical ideas that will have general validity (Lazarsfeld et al., 1948, Corbin and Strauss, 1990, Strauss and Corbin, 1994). The quantitative data analysis software ATLAS.ti was used to delineate insights and details from the overall picture from the interviews and the OI Cereal case study. Interviews and earlier documentations from the OI Cereal Scheme were coded and categorized to detect new meanings and patterns.

The authors and the data collectors are employees at the food research institute, Nofima. Access to data and an understanding of the industry were prerequisites for the correct interpretation of

the interview subjects in their settings. The background from food research, combined with extensive work experience in adjacent industries, is crucial for access and understanding. Access and trust among researcher and interview subjects have produced accurate and valid findings. Research in a field in which scientists have no experience will pose challenges such as access, correct interpretation and lack of trust (Rousseau et al., 1998). Notwithstanding, cognitive blind spots and biased interpretation could result from being too close to the material. Whenever possible, a third-party adviser has therefore been consulted and data have been triangulated.

#### *4.1 Collection of documents from the Open Innovation Cereal Scheme 2010 -2011*

Documents were originally sorted under files including descriptions of work, analytical phase, idea generation phase, idea development phase, experimentation, miscellaneous pictures and dissemination and exploration. Documents had been created as Word documents, spreadsheets, in picture formats and as presentations. Documents contained three interviews, observation reports from domestic study tours, study tours from Osaka in Japan, a study tour from London UK, design-driven prototypes, experimentations and presentations. The previous OI Cereal Scheme had a duration of 12 months. To understand OI processes in the food industry, this study looked for collaboration among the actors during the early NPD processes. Findings from the documents led to follow-up of crispbread sales figures, and further served as a background for the semi-structured interviews.

#### *4.2 Collection of quantitative data from ten years of sales*

Two commercial companies in Norway, Nielsen and Flesland-markedsinfo, collect sales figures from the food trade industry, and official national statistics are provided by Statistics Norway ([www.ssb.no](http://www.ssb.no)). Ten years of bakery products reports from Flesland (Flesland markedsinfo, 2017) and official statistics on export and import of crispbread (ssb.no) have been combined to compile domestic sales figures and import and export figures. Sales figures on crispbread from Flesland have been verified by direct sales figures from Norgesgruppen, a wholesaler representing 42% of the market share for groceries in Norway in 2017. Figures from Flesland originate directly from producers, suppliers and wholesaler chains, bakery NGOs and official statistics. Flesland has collaborated through interpretation of figures.

#### *4.3 Interviews*

During the second half of 2016, qualitative guided, expert-structured face-to-face interviews were conducted to study OI and co-creation in the Norwegian cereal industry. In total, ten actors in the cereal industry were interviewed at their own locations in the three largest cities in Norway. Top management employees with job descriptions including Innovation Manager were selected for interviews. Each interview lasted from 1 to 1.5 hours. The recruitment of individuals for interviews was based on the list of participants at the final conference of the OI Cereal Scheme on 1 March 2011. Three of the interviewees represent 90% of the daily bread production in Norway. In addition, public documentation was used to validate sales figures and company information gathered during interviews. Data from face-to-face, one-on-one, in person interviews are presented as representative quotes describing the various innovation processes behind the

scenes. Evaluation of the food industries innovation processes for NPD in the crispbread category is inspired by case study design (Stake, 1995). The aim of this study is to verify theoretical ideas of conditions under which phenomena exist that will have general validity. Therefore, the research has necessitated qualitative elements.

Interview subjects represented the industrial bakeries supplying daily bread to the main grocery store chains in Norway. In addition, two large enterprises supplying bakery goods to all grocery stores, four craft bakeries trading with own local bakery sales and the food service industry, the national trade organization and one hardware automation supplier were interviewed. Some interview subjects covered several companies and because of this, the ingredients industry was represented by two companies. Commonalities shared by all interview subjects were responsibility for NPD and management of the innovation process. Only one company declined to meet for the interview concerning OI and NPD.

The interview guide covered the following topics: background of the company and staff working with NPD, and in what way public instruments, associations, R&D suppliers and others such as ingredients suppliers, machinery suppliers, business customers, end users, competitors and other companies stimulate NPD. The companies were asked to describe the development process for successful and less successful products, picked by them; and finally the companies were asked whether they remembered the OI Cereal Scheme and whether it had any impact in regard to NPD for them. The data collection was intended to gain a new understanding of OI processes in the food industry during NPD. The interview guide is available upon request.

## 5. Findings

### *5.1 OI prototypes transition to commercial products*

The most obvious new product inspired by the OI Cereal Scheme has been the novel high-end crispbread arising from the personal health platform. See Prototype Appendix 1. The idea behind *Crispy-bread* was to develop an entirely new category of products that would compete with crispbread, flatbread and biscuits. The products were designed to be modern, crispy, healthy and super tasty. They were to represent an entirely new category but still resemble traditional Scandinavian crispbread. *Crispy-bread* packaging was to be modern, designer packaging e.g., cellophane through which the unique prototype content could be seen, and was surprisingly similar to the commercial products available on the market today.

### *5.2 Tacit knowledge and learning by doing*

The OI Cereal Scheme revealed that most employees responsible for NPD in the cereal industry had a practical background as bakers. This background as practitioners meant that tacit knowledge, often related to learning by doing, using and interacting, was the innovation strategy. Because it is an old, deep-rooted national industry, most actors know each other's networks and informal network-oriented systems.

### *5.3 Export and new market structures*

The value of crispbread increased from 4.5% in 2011 to 6.3% in 2016 for all bakery goods. In the cereal industry, this is regarded as a significant growth because the volume increased by 36% whereas value increased by 73%. The consumer price index in this five-year period was 12.6%, giving a true value growth of 60.4%. This substantial increase in volume and value is in contrast to all other cereal segments. In 2014, Norway started exporting high-end crispbread to the neighbouring Nordic countries, the EU and the rest of the world. After only three years, the value of total crispbread exports was equivalent to the import of Wasa crispbread ten years earlier.

### *5.4 Large enterprises and their trusted suppliers*

The most used findings and OI examples have been coded 229 times. A frequency count as a code coefficient was tested. The code for mutual trust, used 15 times and OI suppliers, used 24 times, overlapped 5 times in all. This adds up to one in three times for the code mutual trust, and all these overlaps came from the large enterprises. Despite a small dataset, the overlap of trust and OI with suppliers is interesting. However, this study did not find other patterns that distinguished between NPD routines in large enterprises and SME actors.

### *5.5 Mutual trust*

Mutual trust and company size are crucial for openness. Companies of the same size tend to exchange hard working employees among themselves *“We provide recommendations to our best young employees when they leave our region. – They will immediately get work at bakeries in*



*other parts of Norway. – When we get people with the same recommendations – we hire them straight away”* Handcraft bakery. This quote illustrates the common trust and indications of OI among handcraft bakeries because they exchange workers, routines and ideas. In contrast, geographically-close companies that compete for the same customers are less open among themselves *“I do not have a problem inviting any bakers into my production facility – except for the local competitors – because they do copy-paste”* Handcraft bakery.

### *5.6 More open, but not end-user driven*

There is an apparent contradiction between what companies say and what they actually do in regard to openness. Companies begin by explaining how they do not give away ideas and processes to competitors, and how they do not believe in OI paradigms for them. However, this study finds that companies do interact intensively with suppliers, R&D providers, governmental agencies, end users and NGOs during NPD. When companies describe how they came up with their most successful products, they describes a clear pattern of co-creating with suppliers, R&D providers and business customers. *“For us, innovation and product development are very customer-orientated – Starbucks is one of our customers”* Large-scale bakery. When industrial bakers talk about customers and user-driven innovation, they mainly refer to business customers and business-to-business relationships. While OI often is associated with end-user driven innovation, this is not the case for the cereal industry. These companies tend to define food distributors as the user.

### *5.7 Suppliers of machinery and their impact*

The co-creation process among machinery suppliers to the bakery industry is by far the most crucial for innovation and survival. *“It is no accident that all the firms in the bakery industry that have invested in automation are the ones making the money”* Machinery supplier to the food industry. The owner of these complementary assets appear to profit from the innovation co-created with the machine supplier. By combining sales figures from the bakery industry with customer relationships and investments in robotics and machine hardware, a pattern emerges in which the companies that invest make the profit.

### *5.8 Successful New Product Development*

Innovation management concepts such as OI and co-creation tools are implemented by the cereal industry pragmatically. The industry appears to deal with these processes efficiently but are often not as systematic as originally planned. *“Typical cases where new products flop occur when the process has been running too fast”* Handcraft bakery. However, clear patterns combining the duration and structuring of successful innovation management processes have not become apparent during this study.

In this industry, Open Innovation processes and value co-creation activities tend to stop soon after idea mining and insight studies are completed, and this was the case when developing high-end crispbread. *“We produced crispbread before the OI Cereal Scheme started - got the idea during a diet course, Grete Rode, – we talked with suppliers about recipes and modified them –*

*we are now producing rounded crispbread – it is very time- and labour-intensive”* Handcraft bakery. This bakery brought the idea of high-end crispbread into the OI Cereal Scheme, where prototypes were re-designed and modified before the prototype launch. Only small-scale process automation was implemented so that it remained a local product. A similar handcraft bakery with the same products was taken over in 2012 by an industrial bakery, and high-end crispbread became an export product.

### *5.9 Suppliers, IPR and secrecy*

Products are easy to copy in the food industry after investing in specialized, but still available assets, from suppliers in the sector. Competition is relatively strong among the national companies on long shelf-life bakery products compared to freshly-baked goods, due to the competitive advantages of location production and transport of freshly-baked goods. *“This type of crispbread, which represents a shift in quality level, is performing well. This was marginal to what we normally do. – We modified and robotized known technology with a wet dough, together with the hardware supplier. – This has been a successful launch”* Industrial bakery. There are several industrial bakeries producing the new high-end crispbread today. Automation through national hardware suppliers has been crucial for upscaling this national foodstuff with a novel design.

It appears that bakery ingredient suppliers, by introducing bakery mixes, bakery agents and various flavours, have persuaded the handcraft bakeries to produce more or less the same products *“Today the smells produced by any small-scale national handcraft bakery will be from*

*the same bakery mix supplied by one of the two ingredients suppliers. – They have given away the only competitive advantage they once had of being special. – Today only the industrial bakeries know how to make bakery products from scratch.*” Bakery hardware supplier. The provocative contradiction of lost handcraft in the small-scale bakeries was partly supported by findings from the handcraft bakeries themselves. However, today NPD for handcraft bakeries appears to be focusing on making fewer products with pure ingredients and from scratch. In this way, handcraft bakeries appear to be moving away from the bakery mix suppliers towards the pure ingredients suppliers. These may be different companies and new relations will have to be built. High-end crispbread is another example of industry, rather than handcraft bakeries, producing rustic “home-made” products.

#### 5.10 Power balance and vertical integration

*“Increasingly, it is the stores [profile grocery chain stores] that make the decisions we are so dependent on distribution. This is the key to success....if we don’t have distribution, we can forget innovation... and to get distribution, we need the distribution people on our team, and then they want exclusivity on what we co-create – of course – and we will give it to them. This leads to less radical innovation.”* Innovation manager in the bakery industry. This quote illustrates how the power balance in the food industry may influence NPD and ownership. The profile grocery chain stores may lead activities and own property rights during joint creation of products and processes. In the same setting several food producers named themselves “crofters” during self-description, illustrating a shift of power towards the distributors.

## 6. Discussion and conclusions

### *6.1 Implications for theory*

This study finds evidence that the food innovation network is primarily centred on scientific and technical actors. The crispbread case can demonstrate a successful OI case by the export of agriculture-based products from a country with highly-subsidised agriculture and one of the highest labour costs in the world. This is in contrast to the conclusion that subsidised domestic agriculture is negative for export from the protected market (Bojnec and Fertó, 2017). Actors in the food industry consider public support and external R&D to be significant factors for company miscellaneous innovation and NPD activities. Compared to the results from Karantininis et al. 2010 (Karantininis et al., 2010) this study shows no indication that vertical integration has a positive effect on innovation. In contrast, and consistent with Beckeman et al. 2013 (Beckeman et al., 2013), this study does reveal that, in regard to trust, vertical integration in the food supply chain negatively affects innovation activities.

Various aspects of inbound OI have been observed in companies, and are considered important for NPD in the food industry. Open Innovation in the food industry is well-hidden and not organized as it is for large high-tech companies. The lack of IPR instruments makes mutual trust during collaboration, and openness among actors, more important factors in NPD for food companies. Companies in the food industry rely on secrecy as their IPR strategy, perhaps forcing the closure of the innovation processes too early, and thereby preventing ideas from maturing and being further processed until they are sustainable. This is in line with findings from company culture where the most common form of innovation is closed innovation with internal

capabilities such as doing, using and interacting (Kratzer et al., 2017, Flammini et al., 2017). The crispbread case may also illustrate how innovation and tradition are not opposites, but blend and provide a crucial competitive edge for product and process innovation for regional, traditional food and drink products. This is in line with conclusions from the Italian family wine business (Vrontis et al., 2016).

Figure 5 illustrates the OI supply chain for NPD in the food industry. The figure is inspired by OI models for the food industry such as the sharing-is-winning model (Saguy, 2011) and the food-machinery framework (Bigliardi et al., 2010, Beckeman et al., 2013). However, consumers and competitors are added to this model of an OI supply chain, which is founded on trust.

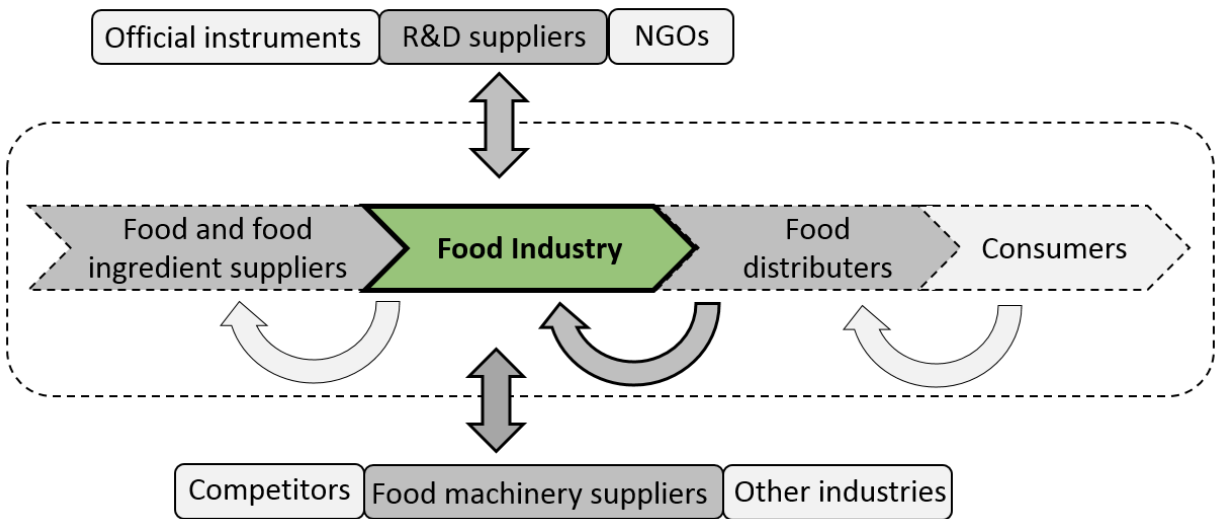


Figure 6 The OI supply chain for NPD in the food industry, arrows and their colours represent flow of knowledge among actors. Inspired by the food machinery framework and the open food supply chain (Bigliardi et al., 2010) and (Trautler and Saguy, 2009)

Findings in this study support the importance of food machinery suppliers in the development of new technological solutions at early stages of NPD. Figure 7 also illustrates the interaction between main actors of the supply chain with OI for the food industry. The linear stream of food actors in the supply chain share knowledge when value is added to products, while other suppliers such as external R&D, official instruments, NGOs and competitors accelerate internal and external innovation during interaction. Co-creation with end consumers does not seem to be a widespread strategy for the food industry, nor does interaction with other industries such as designers with prototype development such as for the OI Cereal Scheme.

## *6.2 Implications for practice*

Six years after the results from the OI Cereal Scheme were shared by open dissemination, this study identifies several of the ideas in new product categories, among which Crispy-bread is by far the largest. Today's 3000 tons of Norwegian-produced *Crispy-bread* makes a significant impact on the food industry and its export of agricultural products. This study has examined whether there are patterns for how firms develop new products and services in terms of OI. The results indicate that companies interact and are more open in practice than they realize, and this seems to be positive for innovation. Companies explain why they do not believe in or do not participate in OI processes, only later to reveal multiple patterns of openness and co-creation towards suppliers of goods/machinery, R&D suppliers, officials, users, chain stores, NGOs and competitors. Nevertheless, certain factors appear to operate for the company to open up. The companies should be roughly the same size; and it is a major benefit if they do not compete for the same customers.

### 6.3 Limitations and future research

This contribution to OI research is oriented towards continual NPD processes with external collaborating partners in the food industry. The OI paradigm has helped to better understand the NPD process in the food industry in terms of openness, secrecy and co-creation among players as suppliers, governmental institutions and users for this industry. The results detect patterns of OI, but these are not the same as the OI paradigm that originally focusses on R&D mechanisms that manage spillovers with formalized action plans. Patterns of interplay with suppliers and personal long-term relationships of trust have emerged. These patterns support previous findings from scholars studying OI in the food industry (Lambrechts et al., 2017, Menrad, 2004, Milford, 2014, Rama, 1998, Trott and Simms, 2017, Bigliardi and Galati, 2013, Beckeman et al., 2013, Bresciani, 2017). Further research on innovation and openness among companies in the food industry should look for patterns of trust across multiple levels such as individuals, groups and companies. There continues to be a lack of research on interactions of the food supply chains and their link to innovation.

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## 5 Crispy-bread

### Business opportunities:

- We are developing a brand new category of products that will compete with crackers and flatbread
- The products are modern, crispy, healthy and super tasty.

### Concept:

- Rosenborg Bakery in Trondheim has increased demand for its newly developed products.
- The food packaging should underline the healthy content and range of flavours.



Colour coding of flavour variants



Sprøbrød

Brandgarden  
DesignHub\*Norway  
Nofima Mat  
1. mars, 2011