

MAŁGORZATA JUCHNIEWICZ
University of Warmia and Mazury
Olsztyn

OPEN INNOVATION MODEL IN FOOD INDUSTRY – SCALE AND IMPORTANCE OF THE PHENOMENON

Abstract

The paper presents assessment of the scale and importance of the open innovation model in the food industry in Poland. The analysis showed that food industry companies more often use the closed than open innovation model. This is evidenced by a small percentage of entities undertaking cooperation in the field of innovative activity and cluster initiatives. Cooperation with other entities, which is the basis for the concept of open innovation, is at the same time an important factor favoring innovative processes – a higher level of innovation of beverage producers was related to their greater willingness to cooperate. In conclusion, it may be stated that the concept of open and closed innovations cannot be a substitute but a complementary activity. The strategy adopted by the enterprises should take into account critical areas that should be protected and those in which the activities under the open innovation model can accelerate the innovation processes.

Keywords: open innovation, closed innovation, food industry, cluster, cooperation.

Introduction

Innovation issues remain an essential element in the debate held by scientists and practitioners, associated with creating and building sustainable competitive advantage at each competition level, namely macro-, meso- and microeconomic level. However, the ever increasing complexity of the environment, as well as the growing hyper-competition, distinct concentration of economic sectors, and development of new technologies result in a situation where the traditional approach to innovation is declining in importance. As a consequence, countries, regions,

sectors and enterprises search for new ways to increase the efficiency and effectiveness of innovation processes. The possibilities to build increasingly interactive relations between the participants of innovation processes in real time create at the same time appropriate conditions for systematic involvement of a growing number of stakeholders in innovation. In result, products and services are actively co-produced by enterprises, clients and users. The changing role of participants in innovation processes is a prerequisite for increased openness of enterprises' activity. This trend has been reflected in the open innovation model. Chiaroni et al. (2011) emphasise that open innovation requires extensive networks between organisations to be created and relations with many external partners (producers and their partners, clients, users, universities, research institutes) as well as other organisations and individuals to be established. According to Almirall and Casadeus-Masanell (2010), open innovation brings benefits both to clients (increasing the value obtained by the user) and to entrepreneurs (by improving innovation efficiency).

General context and trends of changes in enterprise innovation activity encourage one to look at the possibilities to use the open innovation model in the food sector. Food sector is one of key industries in the national economy of every country, ranked high in terms of employment, turnover, added value and investment. Historically, food processing is associated with the processing of agricultural products. In the past, such approach resulted in little interest among entities manufacturing food products to adopt new solutions. Currently, the competition between enterprises in the food sector is much more intense, both at domestic and international market. This calls for improved productivity, and consequently for innovation effort, allowing to gain competitive advantage in the long run. Moreover, as rightly pointed out by Avermaete and Viaene (2002), one should pay attention to specific factors that stimulate innovation activity of the food sector enterprises. Such factors, according to Avermaete and Viaene, include problems associated with food risks resulting from diseases and gene modification, as well as environmental and cultural determinants which have recently increased in importance. Also the increasing convergence between sectors observed in economy may be an incentive to use open innovation models in the food sector. This aspect has been pointed out by Brasili and Fanfani (2006), who underline that food sector has numerous links with various sectors in the value chain, including: agriculture, biotechnology, nanotechnology, pharmaceutical industry, retail trade, and packaging producers. Thus, adopting the open innovation model in the food sector may, according to Jongen (2005), not only enhance the efficiency of innovation activities by improving product quality and increasing consumer trust, but it may also improve the social responsibility of food producers.

The aim of this paper is to characterise the open innovation model as well as circumstances justifying its application in the food sector. An attempt has been made moreover to estimate the scale of open innovation in the food sector in Poland. Based on Enzing et al. (2011), it has been assumed that the tendency to

cooperate with other entities, manifested by the existence, number and kind of external links, demonstrates that the open innovation model has been adopted. Statistical data provided by GUS (Central Statistical Office) (*Działalność...* 2011, 2012, 2013) on cooperation between economic entities in innovation activity and within the framework of cluster initiatives have been used for the analysis.

Implications of the open innovation model in the food sector

The ongoing change in the nature of innovation activity has encouraged the author to present new features of this phenomenon. In the Innovation Strategy developed by OECD (*New forms...* 2009), it has been highlighted that innovation is created thanks to the involvement of more stakeholders than in the past, and also thanks to the crossing and merger of more knowledge areas than previously. Also, innovation is taking place in an increasingly diversified environment (research consortia, technology transfer centres and technology platforms, risk capital companies, knowledge-intensive business services and clusters), and it is created by mechanisms that are more diversified than ever before. Apart from traditional innovation (closed innovation models), open innovation, triggered by demand or created by consortia, is becoming more popular. Thus, in innovation activity, sharper focus than in the past is placed on decentralisation of project management, as well as on flexibility of organisation, creativity, mutual trust, and efficient communication. Enterprises in the food sector should respond to these changes and tailor their actions accordingly. Open innovation can be an effective competition tool, used by some of these entities. Chesbrough (2003), who is the originator of this concept, has put forward a thesis that food producers can not only use their own resources, knowledge and solutions, but they may also cooperate with other entities, and search for external solutions. This may take place through the purchase of patents and licenses, but first of all through cooperation with other organisations. At the same time, the author emphasises the added value that lies in sharing with other entities the solutions that are not of key importance for a given enterprise. This approach allows sharing of risks and profits, ensuring that solutions that one cannot optimally exploit can be used by someone else. In consequence, the transfer of new solutions may be easier and faster. In the concept of open innovation, also the users are gaining importance – both the subsequent links in the “value chain” and the consumers. It should be pointed out in this context that some scientists perceive the dichotomy between open and closed innovation as artificial. Such an approach has been adopted by Christensen et al. (2005). They argue that even though the use of the term open innovation is relatively new, it does not mean that some completely new phenomena have emerged. The principles of innovation and its core ideas are based on an assumption that earlier knowledge has strong impact on innovative activity, including i.a.: research and development (R&D) theories, outsourcing, cooperation between enterprises, and organisation of an interactive environment (Gronlund J. et al. 2010). Trott and

Hartmann (2009) have even suggested that the idea of open innovation can be described as repackaging and new representation of old concepts on R&D and innovative activities or, as the authors have put it, it is “old wine in new bottles”. Isckia and Lescop (2014), on the other hand, have emphasised that in reality no fully closed innovation model exists, and likewise we can talk about open innovation only in a few situations (e.g. the open source model).

The above considerations indicate that the open and closed innovation models should not be contrasted or treated by enterprises as alternatives. The scale and extent of openness of innovation processes depend on the strategy adopted by economic players and on the sector in which they operate. Research so far has indicated that open innovation is more frequently applied in sectors of advanced technology, such as: computer and IT industry (Christensen J.F. et al. 2005; Dittrich K., Duysters G. 2007), pharmaceutical and biotechnology industry (Fetterhoff T.J., Voelkel D. 2006), financial services (Fasnacht D. 2009), as well as in large enterprises and international corporations (Chesbrough H.W. 2006). This situation is caused by fundamental differences between innovation in food processing and innovation in high technology sectors. In the food sector, a positive outcome of innovative activity is not created based on success of a single innovation, which may be protected by patents (ensuring future long-term financing). Such a positive outcome is mostly based on incremental innovation, on small changes in products and processes, creating new added value for clients, thanks to higher quality product innovation and lower costs. This is a result of differences between the life cycle of products and technologies in the said sectors as well as the way that clients perceive innovation. The incremental nature of innovation in the food sector has been pointed out by Galizzi and Venturini (1996). These authors argue that consumers fear entirely new products, and are reluctant to change their consumption habits. In this context, the effectiveness of commercialisation of new products is conditioned by beneficial interactions with such partners as wholesalers and retailers. On the other hand, innovation in food industry is closely associated with the so called “technology-push”. Advancements in such fields of science as biotechnology and nanotechnology create numerous opportunities to increase added value of food products, thus satisfying the requirements of contemporary consumers (Juriaanse A.C. 2006). Thus, a majority of innovative solutions, which may potentially be used in food industry, can be found outside the sector. This fosters more or less formal contacts with other entities in the innovation system, thus enhancing the open innovation model.

The cooperation level and partners in innovation activity in the food sector

Innovation requires capacity to search, absorb and use external knowledge and to exchange knowledge generated within the enterprise. This aspect is of crucial importance at the microeconomic level, i.e. the level of enterprises (Argote L.,

Ingram P. 2000), as well as at the mesoeconomic level, i.e. the level of sectors, branches and regions that form innovation networks (Ahuja G. 2000; Powell W., Grodal S. 2005), and also at the highest level, i.e. at the level of the innovation systems (*Sectoral...* 2004). Access to external knowledge may be helpful at each of the said economy levels in terms of generating or better use of sources of competitive advantage. In this context, it is important to consider the extent of cooperation with partners and the kind of partner institutions the cooperation with which was assessed by enterprises as most advantageous for their innovative activity.

The extent of cooperation with external partners indicates that the open innovation model is of little importance. Innovations are mostly developed by enterprises themselves, which may be interpreted as adopting a closed-innovation strategy by enterprises. In Poland, around 6% of industrial enterprises in total cooperate on innovation. Beverage manufacturers compare somewhat favourably with other entities in this respect – ca. 8% of beverage manufacturers cooperate on innovation. Cooperation of manufacturers of food products is even less significant – only 3% of them take advantage of this opportunity in the innovative processes (GUS 2011). These data cover both enterprises engaged in innovation and those which do not undertake innovation activity. Innovation active enterprises¹ much more frequently take advantage of the opportunity to develop new solutions jointly with other entities (Table 1).

Table 1

Enterprises that cooperated with other enterprises or institutions on innovative activity as % of total innovation active enterprises

| Specification | Years | | |
|---|-----------|-----------|-----------|
| | 2008-2010 | 2009-2011 | 2010-2012 |
| Industrial enterprises | 33.8 | 32.6 | 33.8 |
| including: manufacture of food products | 24.1 | 24.6 | 27.2 |
| manufacture of beverages | 29.4 | 25.5 | 34.0 |
| manufacture of tobacco products (max.) | 71.4 | 75.0 | 100.0 |
| manufacture of apparel (min.) | 13.7 | 11.9 | 12.7 |

Source: own compilation, based on GUS data for 2011, 2012, 2013.

In 2010-2012, 33.8% of innovation active industrial enterprises cooperated on innovative activity. This means that the share of innovation active entities cooperating with other stakeholders is relatively stable. The tendency to cooperate on innovative activity was more visible in enterprises manufacturing beverages than in entities engaged in manufacture of food products. The

¹ Innovation active enterprise is an enterprise which during the analysed period introduced at least one product innovation or process innovation, or implemented at least one innovative project which was disrupted or abandoned (was unsuccessful) or was not completed in that period (i.e. it is being continued).

tobacco sector was the undisputed cooperation leader. Its representatives declared that in 2010-2012, their entire innovative activity was conducted in cooperation with other entities. Analysing the cooperation of food industry entities with other low-technology sectors, one may come to conclusion that their level of openness of innovation processes was similar. Only in the case of apparel manufacturers cooperation on innovative activity demonstrated a clearly divergent trend. Comparing the tendency to cooperate with other entities, it should be pointed out that this tendency strongly affects the innovation level in individual sectors. The highest percentage of innovative enterprises was recorded among manufacturers of tobacco products and the lowest among apparel manufacturers.

Similar trends were observed among food sector enterprises – a higher percentage of innovative enterprises was recorded among manufacturers of beverages than among entities engaged in manufacture of food products (GUS 2013). On these grounds, a thesis may be formulated that cooperation with external entities, which is a central paradigm of open innovation, is a factor streamlining the innovation process in enterprises and in sectors, and in consequence it increases their innovation level. At the same time it should be stated that Grzybowska (2013) is right in arguing that it is not always clear that the creation of innovations in enterprises is not accompanied by any elements of the open innovation model (e.g. knowledge transfer). Nevertheless, the presented data show certain trends that may be considered as characteristic in this respect. A low degree of propensity for cooperation, being one of the signs of openness, is typical not only for entities in the food sector but for all industrial enterprises.

Cooperation on innovative activity may be undertaken with various partner institutions. Innovation processes require that those who implement them have capacity to absorb knowledge from different sources, which in turn raises a question which of such processes are perceived by entrepreneurs as the most important ones. In the context of open innovation model, this is a key issue in terms of possibilities to select cooperation partners at different stages of the innovation process. The analysis conducted has demonstrated that suppliers of equipment, materials, components and software were the leading partner in innovation (Table 2). Almost one third of industrial enterprises cooperating on innovative activity valued most highly their cooperation with the said group of partners. Manufacturers of food products value their cooperation with suppliers much more – more than half of them considered such cooperation as beneficial. Cooperation with suppliers was seen as less important by manufacturers of beverages; only one in four ranked it highest. Bigliardi and Galati (2013) underline that suppliers cooperating with many enterprises are an important source of knowledge in the open innovation model. Cooperation with suppliers opens up an opportunity to gain knowledge on competing companies, irrespective of the internal risk involved in cooperation.

Collaboration between enterprises from the same group is yet another promising area of cooperation on innovative activity. Its special importance in the opinion of manufacturers of beverages is worth pointing out – every second of them indicated such cooperation as the most profitable. The role of other partners, such as clients, research institutes and universities, was seen as much less significant. In the context of open innovation model, the relatively lesser significance of the impact that consumers have on innovation process is of special importance. A consequence and at the same time a specific kind of this model is the idea of demand-driven approach to innovation (User-Driven-Innovation). Such innovation is based on better understanding and knowledge of consumer needs and expectations (both explicit and implicit). This kind of innovation is defined as a process of tapping users’ knowledge in order to develop new products, services and concepts. The user-driven innovation process is based on an understanding of true user needs and a more systematic involvement of users in the process of enterprise development (Nordic Innovation... 2008). One may agree with the statement, confirmed by Baruk’s research (2010), that consumers of food products fear entirely new products and are reluctant to change their consumption habits. However, the involvement of clients in creating such products may become – depending on the strategy pursued by a given enterprise – a useful tool in applying the open innovation model for creating selected products. There are examples of such activities on the Polish market.

Table 2

Kinds of partner institutions the cooperation with which in 2008-2010 was assessed by enterprises as most beneficial for their innovative activity (% of enterprises that cooperated on innovative activity)

| Specification | Industrial enterprises | Manufacture of food products | Manufacture of beverages |
|--|------------------------|------------------------------|--------------------------|
| Suppliers of equipment, materials, components and software | 29.7 | 52.3 | 20.0 |
| Enterprises from the same group of enterprises | 19.6 | 17.4 | 46.7 |
| Clients | 15.7 | 13.4 | 13.3 |
| Research institutes | 11.4 | 10.7 | 6.7 |
| Universities | 11.1 | 10.6 | - |
| Consultancies, commercial and private R&D laboratories | 7.8 | 6.4 | 6.7 |
| Competitors and other enterprises representing the same branch of activity | 3.2 | 1.2 | - |
| Polish Academy of Sciences research centres | 0.9 | - | - |
| Foreign public research institutions | 0.6 | 0.7 | - |

Source: own compilation, based on GUS data for 2011.

Cluster as an element of open innovation

The idea of clusters originates in the Marshallian (1920) concept of industrial agglomeration, the phenomenon of Italian industrial districts (Bagnasco A. 1977), as well as the research on the impact of sectoral competition between enterprises in individual geographical zones (Callegati E., Grandi S. 2005). The most commonly used definition of clusters is that proposed by Porter (2000): a cluster is a geographical proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and externalities. The key features of clusters, as pointed out by Szymoniuk (2014), are associated with local concentration of companies, their belonging to the same sector or to a number of associated sectors, as well as with cooperation and competition between cluster members, and cooperation between entities providing business services and research and development centres or scientific centres and public administration, and also with creating specific cluster identity. Thus it may be concluded that the concept of open innovation and regional clusters involves a number of complementary ideas and conceptual associations. On these grounds, Vanhaverbeke (2006) formulates a thesis that enterprises in clusters are willing more than others to use open innovation systems. On the grounds of above observations, the extent of engagement of food sector enterprises in cooperation within the framework of cluster initiative was established² (Table 3).

Table 3

*Enterprises that cooperated under the framework of cluster initiative
(in % of total enterprises which cooperated on innovation activity)*

| Years | Industrial enterprises | Manufacture of food products | Manufacture of beverages | Minimum | Maximum |
|-----------|------------------------|------------------------------|--------------------------|---|---|
| 2008-2010 | 12.2 | 11.0 | 26.7 | 5.4 (manufacture of paper and paper products) | 40.0 (manufacture of tobacco products) |
| 2009-2011 | 12.8 | 22.2 | 25.0 | 3.4 (manufacture of rubber and plastic products) | 100.0 (reclamation) |
| 2010-2012 | 13.1 | 5.5 | 12.5 | 2.2 (manufacture of furniture) | 66.7 (manufacture of tobacco products) |

Source: own compilation, based on GUS data for 2011, 2012, 2013.

² Cluster initiative is understood as cooperative links formally established based on a letter of intent, association agreement, consortium agreement, etc. (GUS 2011).

Cooperation under cluster initiative was undertaken most willingly by entities of tobacco and reclamation sectors, and least frequently in such sectors as: manufacture of paper and paper products, manufacture of rubber and plastic products, and manufacture of furniture. In the analysed time series, a positive phenomenon was noted, consisting in a slight but systematic increase in the share of industrial enterprises cooperating in clusters in the total number of entities cooperating on innovation activity. Enterprises manufacturing food products and beverages compare unfavourably with other enterprises in this aspect. In 2008-2010, the cooperation under cluster initiative pursued by manufacturers of food products was slightly lower than in the case of industrial enterprises, and for manufacturers of beverages it was over two times higher. In the subsequent period, a marked (two-fold) increase was recorded in the scope of cooperation of enterprises manufacturing food products, whereas the level of cooperation of manufacturers of beverages under cluster initiative remained unchanged.

In 2010-2012, the extent of cooperation of manufacturers of food and beverages under cluster initiative has decreased greatly, as compared to 2009 and 2011, by 16.7 percentage points and 12.5 percentage points, respectively. This phenomenon, as pointed out by Figiel et al. (2012), may result from the mismatch between cluster potential and the intensity of cluster initiatives associated with this sector, caused by the distribution in the concentration of activity in the food industry in individual voivodships. The authors argue that the spontaneous nature of cluster initiatives, resulting from the financial support for such initiatives, will not bring the expected results. The instability of cooperation under cluster initiatives in the analysed periods, as discussed above, confirms this thesis. This is very important from the point of view of implementing open innovations in the food sector enterprises, and it implies that targeted financial support for clusters in the food sector (enhancing their international competitiveness) may be a factor contributing to a stronger bond and improved cooperation between entities cooperating under cluster initiative. In this context, this is also a factor, as pointed out by Lavie and Rosenkopf (2006), boosting the synergy effects of joint creation of knowledge, which is complementary to the open innovation approach.

Summary

Enterprises find it increasingly difficult to maintain competitive advantage using solely own means and own capacity. Cooperation with other entities, which lies at the basis of the open innovation concept, is an important factor fostering wider access to knowledge and new technologies. The scope of cooperation between enterprises of the food sector with other stakeholders demonstrates that they usually follow the closed innovation model. This leads to conclusion that entities operating in the food sector believe that they have sufficient own resources and do not need external knowledge in order to create new solutions.

On the other hand, external knowledge plays a substantial role in stimulating innovation activity. This has been demonstrated by a higher level of innovation among manufacturers of beverages, which is associated with greater tendency to undertake joint actions and engage in cooperation under cluster initiative. To conclude, it may be stated that the concept of open and closed innovation may not be a substitutive but rather complementary activity. The strategy adopted by enterprises must account for critical areas which need to be protected as well as areas where open innovation may speed up innovation processes.

The study has presented one of dimensions of open innovation, namely centripetal innovation, based on knowledge resources flowing to the organisation. Another issue is centrifugal innovation, assuming that some resources and projects are transferred outside of the organisation. Defining the scale of openness of centrifugal processes and assessing the relations between them and the scope of disadvantages and advantages resulting from their application would be an important element of research in the field. The future research should also account, in a greater extent than currently, for the spatial aspects of the open innovation model. This applies in particular to relations between the level of innovation openness and the existence and strength of regional clusters in food economy.

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