
Guest editorial: Open innovation in the food industry: what we know, what we don't know, what we need to know

Guest editorial

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Globalization, fast technological pace and rapid changes in customers' needs have forced companies to rethink their innovation processes, as these processes have become riskier and more unpredictable (Chesbrough, 2003). Increasing difficulty in retaining knowledge, together with the high costs connected with entirely internal development of innovation has pushed companies towards an open innovation (OI) approach. OI can be defined as distributed innovation processes based on purposively managed knowledge flows across organizational and sectorial boundaries (Bogers *et al.*, 2017), which may involve networks of agents such as universities, start-ups, public and private institutions, external suppliers and customers (Chesbrough, 2003). The OI paradigm has reshaped many organizations' understanding of innovation and competition over the last two decades (West and Bogers, 2014).

Food industry-specific challenges such as reduced product life cycles, competitive time-to-market race and a growing need to comply with legal and voluntary quality and supply chain requirements imposed by various value chain actors have accelerated the need for innovation over the last decades. This has led many companies to engage in an open and collaborative approach in their search for research and development (R&D) and innovation (Johnston, 2020; Obradović *et al.*, 2021). On this backdrop, OI is increasingly replacing traditional intra-organizational producer-driven innovation processes with practices that embrace different combinations of inbound, outbound and coupled linkages that facilitate knowledge flows across organizational boundaries (Chesbrough and Bogers, 2014; Bogers *et al.*, 2017).

Studies of the food industry have revealed that OI, collaborative networks and M&A can represent viable approaches to increase competitiveness, customer satisfaction and sustainability (Annosi *et al.*, 2020; Kiessling *et al.*, 2019; Bogers *et al.*, 2020; Kafetzopoulos *et al.*, 2020; Enzing *et al.*, 2011; Garcia Martinez *et al.*, 2014). The relatively few food and beverage companies that actively pursue an OI approach appear to have a better innovation performance, which results in stronger long-term position on the market and better profitability (Bayona-Saez *et al.*, 2017; Enzing *et al.*, 2011; Miglietta *et al.*, 2017). However, the interrelation between OI and food industry is still offering several opportunities for scholars as the recent events related to the COVID-19 pandemic have highlighted the vulnerability of global supply chains and additionally pressured companies to look for different, more flexible and more collaborative approaches to innovation and new business models (Chesbrough, 2020; FAO, 2020a; Walker *et al.*, 2021). In addition, an increasing demand for organic products (Melovic *et al.*, 2020) and local products and a growing consumer focus on sustainability are driving a movement towards both more efficient and more sustainable business processes (FAO, 2020a, b). Other emerging challenges also underline the importance of reconsidering traditional innovation practices in the food sector. For example, introducing the Fourth Industrial Revolution technologies such as block chain, robotics, AI and Internet of things have the potential to dramatically reshape the agri-food sector (WEF, 2018). This development poses a significant risk of disruption on food industry actors, if they cannot engage in creative collaborations with a range of new industries that enter the sector.



Several food companies have already moved towards OI, which could be interpreted as signal of an accelerating transformation. Without due attention to innovation, most firms, notably small and medium-sized enterprises (SMEs), are highly sensitive to market turbulence and their future sustainability will be at risk (Ignaciuk *et al.*, 2021). Innovation has become a strong differentiator in agri-food industry, where applying new technologies and modern processes create massive competitiveness gaps between firms (Byrum and Bingham, 2016). Lack of understanding of OI possibilities and lack of competencies to effectively immerse in OI and incorporate it into companies' strategies are serious barriers, especially for SMEs, which decrease their competitiveness and resilience. Seminal studies have explored the relation between OI and knowledge flows (Baima *et al.*, 2020; González-Moreno *et al.*, 2019; Fertó *et al.*, 2016; Moreno-Mondéjar *et al.*, 2020) and sustainability programs (Bogers *et al.*, 2020) or show the significant beneficial influence of OI in the food industry (Sarkar and Costa, 2008). However, to enable efficient use of OI, further research that theorizes the phenomenon considering the complex and diverse organizational reality in food systems (De Bernardi and Azucar, 2020) is needed, for example, to explore the impact and best practices for successful OI adoption in various sectors of the food industry (Saguy and Sirotninskaya, 2014). This knowledge is urgently needed to inform the future decisions of firms, policymakers and managers.

With this special issue, we have taken the first step to extent our knowledge base and contribute food for thought in relation to what constitutes best practices under various conditions in a diverse sector; what characterizes the sector's actors and their collective innovation practices; what kind of knowledge and information flows occur; and provide a status of the nature of the contemporary research and knowledge landscape in the food industry. The special issues include eight articles, which represents a broad diversity in terms of topic and research methodologies used. The collection includes a literature review, two quantitative survey-based studies and five case studies. In the following, we introduce the individual studies.

Special issue articles

The first article of this special issue, written by Rocco Palumbo, Mohammad Fakhar Manesh, Massimiliano Matteo Pellegrini and Giulia Flamini is entitled "*Setting the conditions for open innovation in the food industry: unravelling the human dimension of open innovation.*" The authors investigated the manifold implications of human resource management practices on the establishment of an organizational climate, which is conducive to OI. The authors found that the propensity of organizations to design and implement training activities, motivation measures and positive exchanges amongst employees did not have a direct impact on the creation of an OI-oriented organizational climate. Rather, the effects of human resource management practices on the establishment of an organizational climate, which is favourable for OI were fully mediated by employees' involvement in decision-making and problem-solving and by their engagement with work. Human resource management practices fostered the participation of employees in organizational dynamics and boosted the levels of vigour, dedication and absorption at work, stimulating their commitment in inbound and outbound flows of ideas, knowledge and skills, setting the conditions for OI.

The second paper by Avni Misra and Anne-Laure Mention entitled "*Exploring the food value chain using OI: a bibliometric review of the literature*" proposes a comprehensive literature review on the foundations and the recent trends about the OI adoption in the food industry. By reviewing 84 articles on the topic, the authors highlighted the evolution of the literature on such a topic, highlighting the interconnection between several fields of study, together with the evolution of the theories and practices driving food companies on successful OI implementation. Avni and Mention (2022) stressed that scholars and practitioners studied

the OI adoption in the food industry mostly with a Eurocentric and North American perspective, stressing the need from scholars around the world in embracing the study of such an intriguing topic. They found the absence of papers exploring the role of OI in the food value chain with a holistic perspective capable of guiding managers on this transition. The paper also shows that scholars are paying an increasing attention to OI of food industry, opening the opportunities for additional exploration for management, manufacturing, packaging and economic perspectives.

The third contribution to the special issue by Riccardo Rialti, Anna Marrucci, Lamberto Zollo and Cristiano Ciappei entitled “*Digital technologies, sustainable OI and shared value creation: evidence from an Italian agritech business*” explores how Industry 4.0 can increase the traceability of products, reduce wastes and enhance sustainable performance in the agritech sector. The authors show that Industry 4.0 technologies can increase the overall performance of the agritech companies embracing the challenge of adopting OI and Industry 4.0. Grounded on the absorptive capacity and knowledge management capabilities theories, the authors explore the case of an Italian company, which successfully evolved to an Industry 4.0 company. The article stresses the necessity of an open approach in guiding the transition from the “old” to the “new” way of doing business, accommodating the requests of consumers by an intensive and open collaboration with suppliers. The paper by Rialti *et al.* (2022) also stresses the benefits in terms of food waste reduction, begin open and meticulously collaborate with supplier, allowing the “last-mile” companies to place orders only when they are needed, in line with a just-in-time philosophy. As a result, the study remarks on the opportunities for agritech in becoming open, creating a tied network with supplier and including the customers in the development of new offerings. However, the authors warn managers that an *ad hoc* information system is needed to effectively manage the complexity resulting from increased interaction with partners.

This paper by Maral Mahdad, Mustafa Hasanov, Gohar Isakhanyan and Wilfred Dolfsma entitled “*A smart web of firms, farms, and Internet of Things (IoT): enabling collaboration-based business models in the agri-food industry*” explores what it might take for agri-food firms to capitalize on ecosystem interdependencies by moving from traditional business models to collaboration-based business models. Contrary to previous research on the positive impact of OI implementation on firms’ innovation performance and market position in the agri-food sector, this research takes a step backward and sheds light on what it takes for these actors to engage in a collaborative set-up and innovate their business models. Researchers from Wageningen University and Research Centre collected data from four online focus groups. They closely engaged with multiple stakeholders with varying roles in the agri-food ecosystem of EU H2020 project Internet of Food and Farm (IOF2020). This study is the first step toward realizing how IoT-enabled ecosystem actors can co-create competitive advantage through developing collaboration-based business models. The study found that any collaborative set-up in agri-food has to constantly reconfigure itself to balance the needs of farmers and the needs of the market. This research documents how continuous interaction and negotiation amongst actors prepare a space for benefiting from an OI approach. The authors claim that as digitalization becomes “the new normal”, it becomes clear that the agri-food technology providers need to gradually switch from traditional product/service-centric business models to customer-centric business models to thrive on a common ground for systemic value creation.

This paper written by Lara Penco, Andrea Ciacci, Clara Benevolo and Teresina Torre entitled “*Open social innovation for surplus food recovery and aid during COVID-19 crisis: the case of Fondazione Banco Alimentare Onlus*” applies the Open Social Innovation (OSI) concept to Fondazione Banco Alimentare Onlus (FBAO), a food bank in Italy, to evaluate what this type of action resulted in for the food bank during a health crisis. It answers the following research question: How does a crisis, such as the COVID-19 pandemic, stimulate the adoption

of OSI practices in order to renovate the activities of FBAO and find appropriate solutions to carry out its social mission? The study shows how COVID-19 has stimulated the adoption of OSI practices in order to continue to respond to the social mission, creating innovative projects or finding new way to do the same things. In detail, it examines how inbound and outbound OSI mechanisms can change business models and increase the adaptation capacity of food banks, as well as their effectiveness, offering an innovative contribution to the literature on OSI. In addition, the paper provides a rich context in which the social value drivers provided by OSI are studied. It is the first paper that studies the COVID-19 crisis response of a food bank from an OSI perspective, focussing on the inbound and outbound OSI processes that characterized the entire network of relationships.

Andrea Venturelli, Andrea Caputo, Simone Pizzi and Giuseppe Valenza in the paper entitled “*A Dynamic Framework for Sustainable Open Innovation in the Food Industry*” introduce a holistic perspective to investigate how OI supports sustainability and the contribution to the UN Sustainable Development Goals (SDGs), in the context of SMEs. The paper presents a unique case study of the Italian SME Andriani SpA, a leading actor in innovation in the food industry, who won over the years many awards, including the Ernst and Young Entrepreneur of the Year award. The case is built by triangulating data from direct observations, documentary analysis and semi-structured interviews. The study contributes to answer the important research question of how can OI help increase sustainability holistically and contribute to the realization of the SDGs? The authors contribute with their findings to the understanding of the challenges, mostly organizational and cultural, that an SME faces when adopting OI practices in the context of sustainability. Their work shows how OI can effectively drive strategic renewal and innovation activities to address sustainability objectives in the food industry. The 4SOI, a multidimensional framework, is developed that can support the practical adoption of OI by similar companies and it underlines the opportunity for managers and owners to integrate within their business models sustainable and ethical principles to enhance their competitive advantages through positive impacts on societies.

Based on a sample of 160 Portuguese fresh fruit farmers, Claudia Dias, Ricardo Rodrigues and João Ferreira, in the paper “*Farm diversification efforts, (open) innovation networks, and performance: what is the connection?*” examine the association between farm diversification, (open) innovation networks, and environmental (EP) and financial performance (FP). Applying latent class analysis and an original framework that operationalizes the conventional and unconventional nature of farm diversification, the authors discriminate three classes of farmers. The results of linear regression show that different types of diversification efforts and (open) innovation networks are linked with performance, while the results of multinomial logistic regression suggest that FP and R&D projects are related to the likelihood of being part of a farm diversification class.

The paper written by Amina Buallay titled “*Sustainability reporting in food industry: an innovative tool for enhancing financial performance*” investigates the relationship between sustainability reporting and food industry performance. The findings elicited from the empirical results show that there is a significant relationship between environmental, social and corporate governance (ESG) and financial performance (return on equity). However, there is no significant relationship between ESG and operational performance (return on assets) and market performance (Tobin’s Q). This paper presents a new framework that considers sustainability reporting as an innovation tool, examining innovation in terms of its positive or negative impact on financial performance. It contributes to research on the innovation paradigm and knowledge management by highlighting the significance of sustainability reporting as a tool for innovation in enhancing financial performance.

In the last paper of this special issue titled “*European novel food, patents and brokers of knowledge*”, Sveinung Grimsby and Magnus Gulbrandsen (2022) study how public regulation

promotes or hinders openness in the food industry, specifically how European novel food regulation affect external ties among novel food pioneers seen through patents and their inventors. They find that novel food pioneers deliberately use patents, approved novel food applications and health claims as flag-planting strategies. Intellectual property rights are used to guard against unintended spillovers. To achieve this, external research organizations are active collaborative partners throughout the process of novel food development.

The future direction of OI research in the agri-food industry

The agri-food sector is a significant contributor to, or the context for, many of the complex societal problem that the 17 SDGs are designed to address. Significant challenges such as, for example, climate change, environmental degradation, gender inequality, poverty, hunger, health and well-being problems are directly linked to existing socio-technical regimes in agriculture, agritech and food industries (WEF, 2018). Being a significant contributor to the problems positions the agri-food industry as a key player in the development of innovative solutions to address these challenges. Goal no. 17 – global partnerships for sustainable development – emphasizes the complex nature of the problems addressed in the SDGs and acknowledges that these problems can only be addressed collectively. This brings the OI paradigm and associated methodologies and practices to center stage in agri-food organizations' efforts to contribute to achieve a more sustainable future. In these issues, Venturelli *et al.* (2022) illustrate how SMEs can strategically engage with the SDGs in the context of the food industry, and we content that studying how the OI paradigm can contribute to reaching the SDGs will probably be the most urgent OI research agenda for many years ahead. Advancing this agenda is challenging and will require research addressing all organizational and societal levels involved in the argifood industry.

Bogers *et al.* (2017) provide a useful conceptualization of the (generic) OI research landscape and levels of analysis including intra-organizational, organizational, extra-organizational, inter-organizational and industry/societal levels. Moreover, as highlighted Misra and Mention (2022), the agri-food industry comprises complex value chains and networks consisting of input, production, processing and output stages. Of the eight articles in this special issues, one study addresses the intra-organizational level (Palumbo *et al.*, 2022), and five studies mainly address the organizational level (Buallay, 2021; Dias *et al.*, 2022; Rialti *et al.*, 2022; Penco *et al.*, 2022; Venturelli *et al.*, 2022). The bias toward the organizational and inter-organizational level of analysis seems to mirror the general focus of agri-food industry OI-oriented research. This research focus is important and provides a necessary basis for scrutinizing the processes and outcomes at inter- and extra-organizational level, as done in the remaining two articles by Misra and Mention (2022) and Mahdad *et al.* (2020). Thus, these two articles provide important contributions to research streams urgently needed to enhance our understanding of the potential in the before-mentioned SDG-oriented partnerships. Misra and Mention (2022) articulate the importance of a future research stream that emphasizes the importance of considering the food value chain as the study object and which aims to better understand collaboration processes across multiple actors engaged in such value networks and chains. Finally, the highest level of analysis in the categorization by Bogers *et al.* (2017), i.e. studies at the levels of industry, region or society are not only lacking in this special issues but are also rather infrequent in the agri-food-related OI literature in general. This is unfortunate, since engaging with these levels of analysis seems highly necessary if we as research community aim to play a constructive role in understanding and supporting the sectorial and societal transformation processes so urgently needed to progress on the SDGs.

In addition to adopting a network perspective, Mahdad *et al.* (2020) also focus on a combination of two emerging trends in the agri-food industry that should attract the interest of future research: the link between OI and new business models and the consequences and

opportunities of the rapid technological development, respectively. In their article, [Rialti et al. \(2022\)](#) address these issues at the organizational level. We believe that at the organizational as well as at the inter-organizational level, the question of how new opportunities provided by Industry 4.0 and biotech technologies will drive value creation and capture in collaborative ecosystems will be a major focus within OI research in the coming years.

Another rather underexplored research topic in the agri-food-related OI literature is the application of OI in the global south to address the substantial SDGs-related challenges experienced here such as, for example, reducing inequality, promoting responsible production and consumption, ensuring decent work and economic growth, which engage stakeholders at all levels from states and regions, to communities, organizations and individual citizens. The Western management and organization studies community is increasingly recognizing, not only its obligation to collaborate with south colleagues, but also the unique opportunity to complement Western-centric theorizing with research targeting the diverse contexts in the global south (e.g. [George et al., 2016](#)). Many of the characteristics that distinguish Western agri-food firms from firms in other industries are amplified in, for example, African contexts: agri-food firms are small and medium-sized, they operate in a low-tech sector, the level of innovation is limited resulting in incremental innovations and firms lack access to resources to commercialize innovations. The inherent promise of OI – to be able to draw on knowledge from far beyond the organizations border – seems especially promising in this challenging context. This may offer unique research opportunities for OI researchers, who should ask how disadvantaged organizations and individuals could benefit from access to knowledge from around the World to ensure a fair, inclusive and democratic development. We envision a proliferation of OI and OSI research emerging from this field, for example, investigating the antecedents, processes and outcomes associated with crowdsourcing and distributed problem-solving (see, e.g. [van Etten, 2011](#)).

OI can play a significant role for commercial as well as social and civic society purposes in both the global North and South. This dimension is highlighted by [Penco et al. \(2022\)](#). Their study highlights the relevance of OI to food waste and food security organizations and initiatives, a field of practice that attracts increasing awareness and engages communities of on volunteers, businesses, public agencies and non-governmental organizations (NGOs). We foresee an increasing focus within the OSI research community on research questions related to community-based phenomenon such as, for example, local food co-operatives and food waste NGOs.

As indicated above, OI can become a viable and effective pathway for achieving social and economic growth and development in widely different contexts. However, the lack of adequate techniques and methodologies to measure efficacy is a possible barriers for wider application of OI in agri-food communities and ecosystems. A better understanding of OI related processes at the various stages in food value chains and their mutual relationships as well as the relationship between the organizational levels and their vertical integration will contribute to overcome this methodological challenge by providing the foundation for designing more reliable research methodologies. This stream of research needs further development. We hope that this special issue has contributed to this ambition and thereby advanced the role of OI in promoting business effectiveness, equality, sustainability, and thus the strive toward more socially illusive, fair and equitable food value chains around the globe.

The studies in this special issue, flag numerous implications for practitioners and policymakers. Authors of the special issue articles acknowledge that all actors should embrace shared responsibilities, foster up-skilling and re-skilling as well as commitments to seize opportunities and tackle the ongoing challenges. Accordingly, additional value can be obtained through tailored human resourced practices and multidirectional knowledge

transfer aimed toward long-term strategic partnership (Mahdad *et al.*, 2020; Palumbo *et al.*, 2022). Moreover, the food sector has the capacity to bend the curve on sustainability, downsize the environmental deprivation (Buallay, 2021) and provide responses in societal crisis such as, for example, the COVID-19 pandemic (Penco *et al.*, 2022). Thus, policymakers are encouraged to foster R&D programs and enhance innovation networks (Dias *et al.*, 2022).

The editors would like to thank the many scholars who provided support in compiling this special issue. Their thorough and thoughtful reviews helped the authors improve their respective articles and, importantly, guided the guest editors in making judgements about the extent and articulateness of contributions to theory and practice.

A special thank you goes to Stefano Bresciani and the *British Food Journal* administrative team for their support. We expect this special issue sets the tone for the next wave of influential contributions for OI in the food sector, as it occurs globally.

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Further reading

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