A dynamic framework for sustainable open innovation in the food industry

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Abstract

Purpose – This study aims to take a holistic perspective to investigate how open innovation supports sustainability and the contribution to the Unite Nations (UN) Sustainable Development Goals (SDGs).
Design/methodology/approach – The study is based on an in-depth single case study of Andriani SpA, a leading Italian company in the food industry. The case is built by triangulating data from direct observations, documentary analysis and semi-structured interviews.
Findings – The findings show an organization that has developed its competitive advantage by adopting open innovation to embed sustainability in its strategy and business model. The case study complements the understanding of how open innovation can effectively drive strategic renewal and innovation activities to address sustainability objectives in the food industry.
Originality/value – This study contributes to theoretical development by offering new and insightful explanations of firms' strategic behaviour and coevolution toward sustainability via open innovation. It provides practitioners, policymakers, researchers and students with reflections and inspiration about how open innovation may be deployed to support a holistic strategic renewal aimed at sustainability objectives, such as the SDGs, in the food industry.

Keywords Open innovation, Food innovation, Sustainability, Sustainable Development Goals, Strategic renewal, Sustainable business model

Paper type Research paper

1. Introduction

Building a more sustainable and ethical economic system represents one of the main challenges for policymakers, as evidenced by the 8.9% of the worldwide population affected by food insecurity (Sachs *et al.*, 2020). The United Nations 2030 Agenda identifies a central for the private sector, so far mostly evidenced in large corporations (Scheyvens *et al.*, 2016; United Nations, 2015). Yet, to achieve real change and sustainable goals, small and medium enterprises (SMEs) must adapt. However, the integration of sustainable principles within

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businesses represents an activity that implies a high degree of complexity, since the contribution of regulations and recommendations on organizational behaviours is moderated by many factors (Bartolacci *et al.*, 2020; Gatti *et al.*, 2019; Pizzi *et al.*, 2021a, b, 2022). In the context of SMEs, the adoption of sustainable strategies is particularly complex due to technical, cultural and financial barriers typical of smaller-sized businesses (Bartolacci *et al.*, 2020; Ormazabal *et al.*, 2018). Despite the existence of common mandatory provisions and regulations, the adoption of sustainable strategies, capable of embedding sustainability into the business model of the firm, is influenced by organizational and managerial attitudes to such practices, contextual elements and resource constraints (Alassaf *et al.*, 2020; Boons and Lüdeke-Freund, 2013; Schaltegger *et al.*, 2016a, b).

In the past years, many scholars started to discuss sustainable transformation in the food industry because of their pivotal role in the achievement of the Sustainable Development Goals (SDGs) (FAO, 2020; Jouzdani and Govindan, 2020; UN Global Compact and KPMG, 2020). Within this scenario, an enabling role can be covered by open innovation (OI), which was defined by Chesbrough *et al.* (2006, p. 1) as: "*the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively*". The concept was recently integrated by sustainable principles to identify a possible pathway to favour the transition to more sustainable business models by Food firms (Bogers *et al.*, 2020). Yet, a question arises for SMEs in the food industry: how can OI help increase sustainability holistically and contribute to the realization of the SDGs? By answering this question, we contribute to the understanding of the challenges, mostly organizational and cultural, that SMEs face when applying OI practices in the context of sustainability (Van de Vrande *et al.*, 2009).

Stemming from Randhawa *et al.* (2016), our article aims to develop a theoretical framework (which we called the "4SOI framework") to study how sustainable OI (seen at firm-, industry- and community level) can lead SMEs in the food industry towards the achievement of sustainability objectives via strategies for the development of more sustainable business models. Inspired by the studies on sustainable open innovation (SOI) (Bogers *et al.*, 2020), we aim to show how food businesses can achieve significant financial, social and environmental performances by directly contributing to the realization of specific SDGs. From a theoretical perspective, this work aims to contribute to the knowledge on the interconnections between OI and sustainable strategies, especially by highlighting the role of networks and communities as catalysts for innovation. Altogether, the study can also provide practitioners and policymakers with inspiration on how OI may be deployed to support strategic renewal aimed at achieving SDGs in the food industry. To achieve these research objectives, we analyze the case study of Andriani, an Italian company that operates in the market segment of the "innovation-food". Although the European food industry is considered a "traditional sector" (Kühne *et al.*, 2010), Andriani's business model is characterized by a high degree of orientation towards sustainability and innovation. Thus, the case selection was driven by the opportunity to analyze an organization that has based its core competitive advantage by intersecting innovative and sustainable strategies.

The paper is structured as follows. Section 2 proposes a literature review on OI and sustainability in the food industry, providing the theoretical framework of the research object. Section 3 explains the methodology adopted to develop this exploratory research. Section 4 describes the case study and analyzes the different levels of OI experienced by Andriani's company. Section 5 discusses the findings and develops the "4SOI (For Sustainable Open Innovation) Framework". Finally, Section 6 concludes the paper, providing some managerial and political implications as well as suggestions for future research.

2. Literature review

2.1 Open innovation: evolution of a concept and state of the art

Over the past years, organizations have been adopting a new and wider approach to innovation based on open collaborations with stakeholders, which lead to iterative exchange

processes of several factors, such as resources, technology and knowledge. Chesbrough (2003) defined OI as "*a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology*". Through this approach, organizations open their boundaries to external stakeholders, leveraging mutual knowledge and capabilities to stimulate innovation (Obradović *et al.*, 2021; West and Gallagher, 2006). On the one hand, the paradigm of OI rejects dividing lines between organizations and their external stakeholders. On the other hand, organizations share and acquire knowledge for innovating in a wide network of actors (Bogers and West, 2012; Chesbrough, 2006; Enkel *et al.*, 2009).

Randhawa *et al.* (2016), through a bibliometric study, identified three clusters focusing on the main themes of the extant literature on OI. The *firm-centric aspects of OI cluster* address the investigation of the OI application and implementation at the firm level by focusing on technology and knowledge and adopting a collaborative development perspective (Barham *et al.*, 2020; Chiaroni *et al.*, 2011; Van de Vrande *et al.*, 2009). The *management of OI networks* cluster focuses on the management of industry networks, addressing issues on corporate ventures, intellectual properties and patents (e.g. Seldon, 2011), as well as partnership and alliances (e.g. Han *et al.*, 2012). The *role of users and communities in OI* cluster addresses the investigation of the role of users and communities as innovators and participants in OI (Ebner *et al.*, 2009; Füller *et al.*, 2008). In this cluster, studies have analyzed how user ideas are integrated into the design and development of new products (e.g. Füller *et al.*, 2009) or how communities may contribute to the innovation processes in the context of open-source software (e.g. Dahlander and Wallin, 2006).

Yet, little attention has been given to networks and communities as catalysts for innovation since the contributions to the second and third clusters are more recent. Therefore, the studies on the interactions of the participants and the OI communities remain sparse (Randhawa *et al.*, 2016). This is even more true about OI in the food industry. A limited number of studies assume diverse perspectives, such as regulation (Grimsby, 2020), crowdfunding (Cillo *et al.*, 2019), empirical analyses of specific countries (Della Corte *et al.*, 2018; Miglietta *et al.*, 2017; Santoro *et al.*, 2017) and industries (Fortuin and Omta, 2009; Grimsby and Kure, 2019; Tardivo *et al.*, 2017). Despite the importance of the food industry for reaching sustainable objectives, little attention has been given to the theme of OI in the food industry from a sustainability perspective (Bogers *et al.*, 2020; Bogers and Jensen Jørgen, 2017). The perspective of sustainability could favour the understanding of how OI can be deployed to address societal challenges (McGahan *et al.*, 2021), even with regard to the food industry.

2.2 Sustainability in the food industry

The food industry covers a pivotal role within the current debate about sustainable development (FAO, 2020) and directly contributes to specific goals such as the SDG2 ("*Zero Hunger*"), SDG3 ("*Good Health and Well-being*") and SDG12 ("*Responsible consumption and production*").

However, the systemic nature of the SDGs underlined the need to analyze the food industry through a holistic approach based on the conjoint analysis of the different externalities related to the implementation of sustainable business models (Bebbington and Unerman, 2020; Nilsson *et al.*, 2016). In fact, despite the possibility of prioritizing a certain number of SDGs, the anthropic activities made by organizations impact all the dimensions identified by previous studies on CSR (Dabic *et al.*, 2016) and the Agenda 2030 (Bebbington and Unerman, 2020).

Even though they theoretically converge, socially responsible communications and actions are independent activities (Schoeneborn *et al.*, 2020). Several studies underlined the need to reflect on the risks of adopting unethical mechanisms such as greenwashing and impression management strategies to legitimatize organizations' role within society (Pizzi *et al.*, 2021a, b, 2022; Seele and Gatti, 2017). This approach is particularly widely diffused in sectors like the food industry, where stakeholders paid specific attention towards sustainable

practices (e.g. supply chain, patents). Thus, the comprehension of the actual degree of orientation towards sustainable practices by food organizations cannot be limited to analyzing labels and certifications due to their quasi-mandatory adoption (Elgaaïed-Gambier, 2016; Renard, 2010).

Detecting socially responsible organizations in the food industry represents an activity entailing a high degree of complexity (Ehgartner, 2020; Zuo *et al.*, 2017). Indeed, food organizations could act sustainably through different approaches such as implementing green practices, investing in the local communities and developing ethical governance mechanisms (Hartmann, 2011; Maloni and Brown, 2006). Thus, academics started developing studies about the main factors that characterize sustainable and ethical food organizations. In particular, many of these studies agreed about the enabling role covered by innovation and the integration of the stakeholders within the decision-making processes (Agovino *et al.*, 2018; Cortese *et al.*, 2020).

However, despite the positive impacts of the adoption of sustainable behaviours, the integration of sustainable practices within food organizations' business models remains an activity limited by a high degree of barriers (Hemphill, 2013). In particular, the lack of orientation towards sustainable practices is related to technical and cultural barriers that typically affect SMEs (Bartolacci *et al.*, 2020; Caldera *et al.*, 2019). Thus, the transition from traditional to sustainable business model represents a complex activity due to the need to align the different expectations about food organizations' between the various stakeholders involved (Franceschelli *et al.*, 2018).

2.3 Sustainable open innovation as a remarkable challenge in the food industry

The concepts of "Open Innovation" and "sustainability" have been mostly addressed separately, as independent topics. Indeed, few studies addressed these two research areas by adopting an integrated perspective, especially in the food industry (Bogers *et al.*, 2020). On the one hand, socio-economic systems face various problems related to society (e.g. workers' rights) and the environment (e.g. waste of plastic). On the other hand, it is necessary to promote coordinated initiatives where groups of companies collaborate to share skills and knowledge to increase the probability of facing and solving these problems. Pursuing this goal implies the convergence between the concepts of OI and sustainability.

According to Bogers *et al.* (2020), SOI is a process based on knowledge and ideas shared across organizational boundaries, which preserves the needs of present and future generations through pecuniary and non-pecuniary mechanisms that are consistent with the business model of the organizations involved. SOI adopts a long-term perspective through which a network of organizations pursues business objectives compatible with economic and financial performance, social equity and environmental protection. Since this perspective assumes a strong relevance in the context of the food industry (Bresciani *et al.*, 2016), SOI could be a remarkable challenge for companies operating in this industry.

Based on a case study, this exploratory research aims at showing how a company in the food innovation sector achieved meaningful results in terms of financial, social and environmental performance by integrating these dimensions in a new conceptual framework inspired by SOI.

3. Method

The study was done adopting a qualitative approach, which is indicated for exploratory research. This study adopts a case study method to analyze how OI can help increase sustainability holistically and can support the firm's contribution to the realization of the UN SDGs. The use of the case study is appropriate for research questions of the type of "how" and "why". Via the case study, investigative research of current phenomena can be carried out within its actual context and allows to study situations where the boundaries between the phenomenon and the context are not established (Yin, 2018).

Andriani, a public limited company founded in 2009, was selected because it is among the top leading companies in the innovation food industry in Italy, as evidenced by the many awards the company and its entrepreneur have won over the years (https://www.andrianispa.com/category/premi/page/3/). This makes the company a critical case (Yin, 2018) in analyzing the processes, challenges and outcomes of the adoption of SOI.

Similarly to previous studies (Bogers *et al.*, 2020; Brusca *et al.*, 2018), and following the guidelines by Yin (2018) to strengthen the study results, we have triangulated various complementary analyses of data from different sources, via inductive coding, balancing the internal views of the management of the company, with the external views of the stakeholders and the views of the research team. This approach has allowed us to collate in-depth insights into the case study from multiple sources, codified in different types of knowledge and limited the biases to which qualitative research is subject.

In particular, the research design process followed the recommendations by Yin (2018) to test for validity (construct, internal and external) and reliability and entailed, first, the use of different sources of information for analysis (Table 1) to extrapolate both tacit and explicit knowledge and generate complementary evidence. Second, we triangulated via comparison and complementary analysis of facts from different sources, i.e. company reports, archival documents, interviews and direct observations, allowing for the development of converging lines of inquiry (Yin, 2018). Third, the composition of the case study began as early as possible and in parallel with the sustainability projects in progress. Fourth, using an inductive approach (Yin, 2018), key informants received and reviewed the analysis and contributed to a process of co-creation and co-interpretation of the findings.

The analysis was built using primary and secondary data. Secondary data were classified in internal and external data. The data were validated using comparative analysis between the different sources used in the research (Scapens, 2004).

Primary data were collected using participant observations, which represents a methodological approach particularly suitable to gain access to events or groups that are otherwise inaccessible (Yin, 2018). In detail, the research team performed unstructured interviews with key individuals involved in the strategic process of the company and key stakeholders (Qu and Dumay, 2011). The choice to adopt unstructured interviews instead of alternative approaches such as interviews or semi-structured interviews was driven by the opportunity to collect truthful data by using an informal approach (Adler, 1995). The methodological approach was supported by the presence in the research team of a member of

Research question	How can OI help increase sustainability holistically and contribute to the realization of the sustainable development goals?
Unit of analysis	Relationship between OI and strategic management in the food industry; challenges; opportunities; entrepreneurial decision-making
Organization	Andriani
Stakeholders (internal/external)	Founders; board of directors; risk and compliance board; team CSR and sustainability; employees and managers; nutritional observatory; partner universities; suppliers; subsidiaries and joint ventures; consulting firms; auditor; local institutions; territorial associations; key customers; partner NGOs
Duration/timeframe	July 2018–March 2021
Sources of data and reliability	Triangulation of data collected through interviews, direct observation and documentary analysis
Construct validity	Multiple sources of evidence
Internal validity	Systematization of the process of relationship between OI and the grand challenge of sustainability in the cases analyzed
External validity	Logic of methodological replication and discussion of empirical results in light of the state of the art

Table 1.
Case study protocol

a governance body, who allowed insider observation of the main strategic processes for a period of about three years.

The secondary data have been divided in internal and external data. As regards internal archival data, we analyzed Andriani's strategic documents, such as sustainability reports, impact assessment and press releases. In particular, we paid specific attention to the contents disclosed in the sustainability reports published during the period 2018–2020 due to the existence of interlinkages between corporate communication and business strategies (Unerman, 2000). As regards external archival data, we collected documents published by independent stakeholders such as mass media, non-governmental organizations (NGOs) and policymakers. The data were gathered using Nexis Lexis, a scientific and professional database that contains newspapers in electronic form and includes a digital feature for searching for articles using specified keywords (Passarini *et al.*, 2017). In this regard, we considered an overall number of articles published during the period 2016–2020 equal to 40.

Finally, the data were analyzed following an open coding approach.

4. The Andriani's sustainable pathway in open innovation

Evaluating SOI represents an activity implying a high degree of complexity due to the dynamic interlinkages between SDGs and organizations. The complexity of the phenomenon is underlined by Andriani's experience, which represents an organization that has enhanced its sustainable business model through continuous engagement with stakeholders. In detail, Andriani operates through a business model characterized by a high degree of orientation towards sustainable and ethical themes, as evidenced by the definition of "*natural innovator*". Regarding the concept of natural innovators, the company's Manifesto explains: *"Learning, understanding and even anticipating nutritional trends is for us the most important part of our work because it gives us an essential goal to achieve. Being always at the forefront in the way we cultivate, process, and produce our products is not only a boast but an obligation to those who trust us. Making sure that all our suppliers and distributors respect, as we do, the environment and the community, in addition to the consumer, is essential, as is helping them to do so when they ask us"*.

However, acting as a "natural innovator" requires the implementation of specific tools to engage with stakeholders such as focus groups, surveys and annual meetings. In this sense, it represents activities conducted by Andriani to avoid the theoretical misalignment between "walking" and "talking" about sustainable development (Schoeneborn *et al.*, 2020).

Furthermore, Andriani engaged with stakeholders through accountability mechanisms characterized by a high degree of transparency and comparability. The combination between these two concepts is underlined by the integration of specific themes within the materiality assessment conducted by Andriani in 2021. In particular, the company included within the assessment themes directly related to sustainable innovation such as "*open innovation*" and "*sustainable and resilient business model*". The two themes underlined the vision towards emerging topics such as climate change, biodiversity and circular economy practices. Regarding the attempt to reflect on a sustainable and resilient business model, the company chose to integrate the theme within its strategy to actively contribute to society through an innovative and sustainable approach. In particular, the operational paradigm was inspired by the need to contribute to the achievement of ambitious goals such as carbon neutrality and COVID-19. However, those evolutionary pathways were characterized by different steps (Randhawa *et al.*, 2016) that have favoured the transition from an approach based on the firm's dynamics towards a more comprehensive approach based on impacts on the food industry and society (Figure 1).

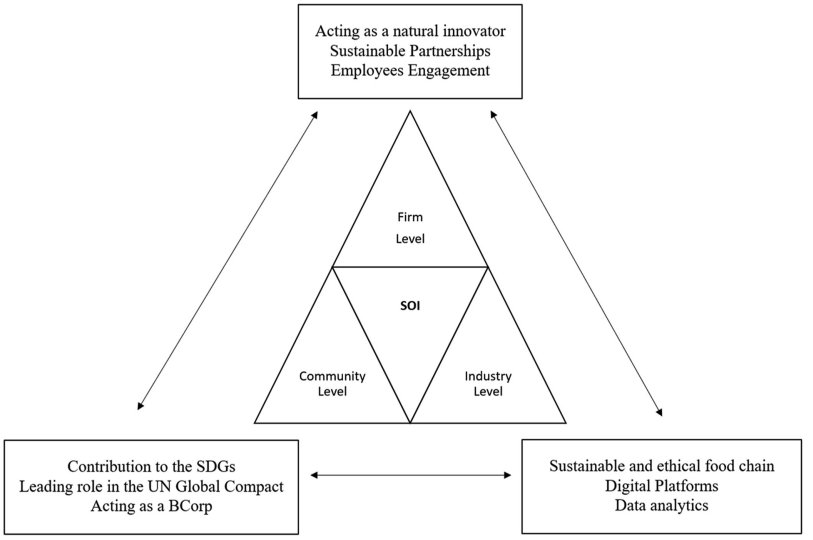


Figure 1.
Key events affecting Andriani's pathway in SOI

4.1 Firm-level open innovation

During the past years, the company's sustainable transition evolved from an environment-based approach to a more comprehensive approach based on the integration of environmental, social and governance (ESG) dynamics within the business model. This evidence underlines the innovative approach of Andriani in a sector characterized by many organizations that operate without a sustainable and ethical vision (Monciardini *et al.*, 2021). Furthermore, the high degree of orientation towards sustainable practices by Andriani is underlined by overcoming the theoretical barriers related to the status of SME and family firms (Bartolacci *et al.*, 2020; Venturelli *et al.*, 2021).

Since 2009, the founders started to discuss with external experts to avoid the cultural and technical barriers to sustainable transformation. The reason behind this choice is represented by the opportunity to develop new knowledge on sustainable practices through continuous engagement with practitioners, universities and organizations. Also, this strategy favoured the development of conjoint research projects that have in turn furthered the development of internal and external benefits for the parties involved. In this sense, the launch of research projects allowed both Andriani and partners to enhance their knowledge on sustainable practices through the exchange of data, resources and competencies.

The choice to become a strategic partner of the Pollenzo University of Gastronomic Sciences (UNIGS), an international academic institution in food innovation, represents an example of this collaborative approach. Building on the "Four Lens of Innovation" model, the Ho.Re.Ca project developed under the supervision of UNIGS has adopted this philosophy as it involved unconventional professional profiles such as food technologists, researchers, gastronomes and communication specialists. The first achievement of the project is represented by multi-disciplinarity: a simple product development activity has acquired a much broader scientific and humanistic scope, not only able to express products that are "good to eat" but also supported by a 360° background vision about food models.

The aforementioned project is only the beginning of a mutual cultural growth path that increasingly engages the academic world and the production by sharing objectives, means and skills. As one can easily guess, this path also includes barriers related to language and the framing of specific objectives, given the different nature of the partners involved; at the same

time, however, these barriers had the effect of adding lymph to the desire to keep on a common path aimed at continuous improvement. In 2021, indeed, Andriani and UNIGS decided to renew their strategic partnership, and a further project, even more, challenging than the first one, was launched: the development of a handbook about advanced principles of sustainability in the agricultural sector. The project aims to produce an accompanying tool for operators in the sector towards achieving ever-higher food sustainability standards, in line with the EU objectives of the new Common Agricultural Policy (CAP) and the Green New Deal.

The CSR team represents another key factor in the sustainability innovation process. The need to organize a corporate social responsibility (CSR) team was driven by the opportunity to involve experts with different backgrounds in decision-making processes. In this sense, Andriani chose to operate through a multi-disciplinary team is related to the opportunity to adopt a holistic approach based on the evaluation of the contribution made to the society. The team is growing in three years moving from two units in 2018 to five units in 2020. Today, it is composed of CSR manager, sustainability coordinator, food trust and communication, diversity and gender, sustainable supply chains.

The development of innovative and collaborative projects with external institutions such as universities, NGOs and local communities underlined the need for specific expertise to evaluate the impacts related to Andriani's investments.

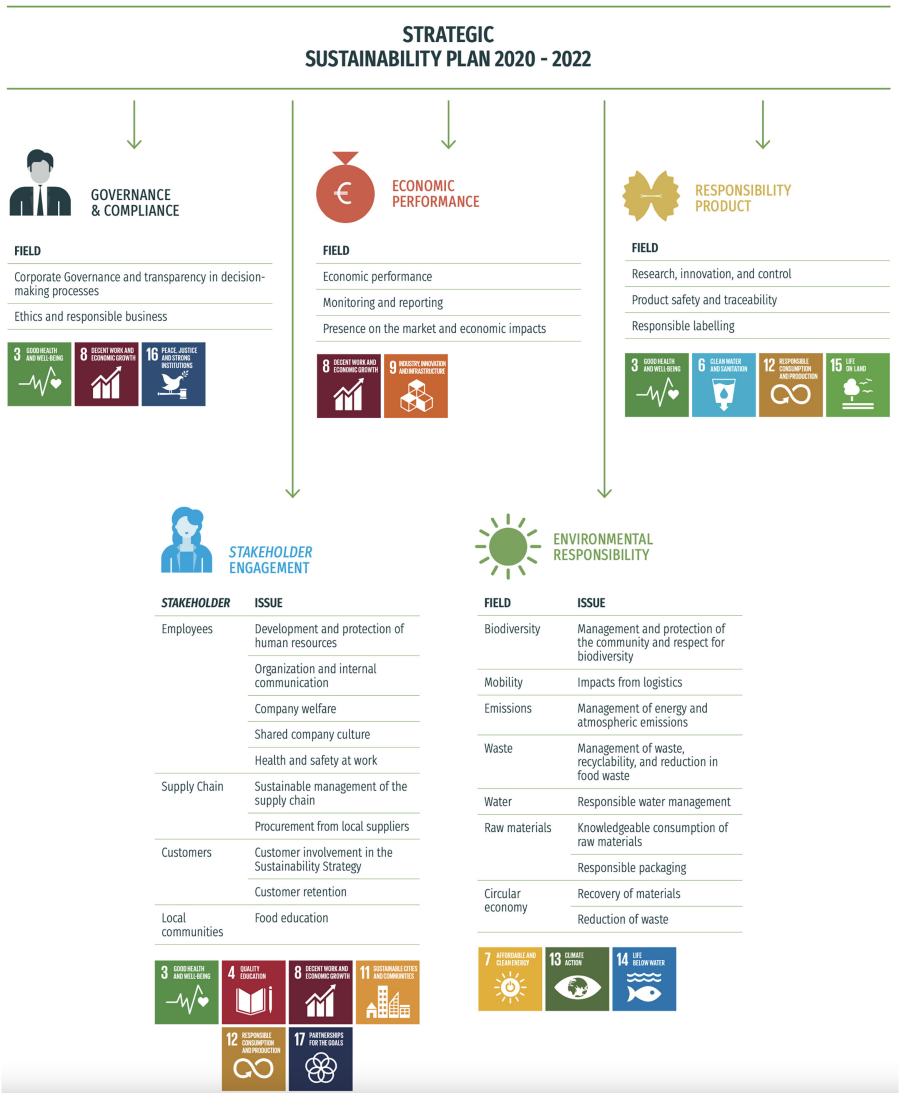
The CSR team is necessary to guarantee the execution and achievement of the sustainability plan, implemented in 2018. The sustainability plan is broken down into five intervention areas, 11 SDGs, 19 fields and 60 specific activities (Figure 2). The aim of this innovation was represented by the opportunity to enhance Andriani's sustainability in terms of B-Impact, which represents the main tool used to evaluate the contribution provided by a benefit corporation to society.

4.2 Industry-level open innovation

Integrating sustainable principles within the food industry represents one of the main challenges for Andriani. As evidenced in the previous sections, sustainable behaviours are not adequately diffused due to the lack of innovation and transparency that characterized the food industry. This criticism is particularly relevant for food organizations interested in integrating sustainability within the entire value chain. Thus, Andriani launched several projects with suppliers and clients to achieve shared benefits. In particular, the two main initiatives developed to contribute to sustainable development through OIs are represented by the participation in the SEDEX's project and the collaboration with Nativa Società Benefit.

Firstly, the SEDEX's project consists of the inclusion of Andriani to an ethical digital platform based on the exchange of sustainable data between participants. The participation in the project favoured the development of strategic initiatives based on the mitigation of the supply chains' impacts. Furthermore, to develop an entrepreneurial ecosystem based on trust and reciprocity, the company requires suppliers to adopt SEDEX on a mandatory basis. In this sense, on a hand, potential clients interested to integrate Andriani within their supply chains can evaluate the organizations through sustainable and ethical indicators. On the other hand, Andriani can select its suppliers by including sustainable and ethical parameters. Also, data collection about sustainable and ethical practices facilitated the disclosure of non-financial information.

The second initiative to innovate the food industry through an approach based on OI consists of the projects conducted by Andriani with Nativa Società Benefit, a purpose-driven design and innovation company. In 2020, Andriani evolved from a traditional organization towards a benefit corporation, which represents an innovative business model based on adopting sustainable and transparent principles within the organization. After this juridical change, Andriani started to discuss with Nativa to identify possible innovations related to the



Source(s): Andriani Sustainable Development Report 2019 (p. 27)

Figure 2.
Andriani's sustainable strategic plan. Source: Andriani Sustainable Development Report 2019 (p. 27)

opportunity to identify suppliers through an algorithm based on the benefit impact assessment's requirements. Building on a coevolutionary collaboration between Andriani and suppliers, the project aims to ensure that suppliers' practices respect the company's founding values and contribute to spreading a positive impact on people and the environment, laying the foundations for a regenerative supply chain. In detail, the project will favour the evaluation of the suppliers' impacts through the analysis of specific items such as the existence of a code of conduct, the existence of operational guidelines, stakeholder

mapping, the presence of a compliance strategy and the development of a common evolutionary path. Thus, the cooperation between Andriani and Nativa favoured the identification of an impact assessment based on the integration of sustainable practices within the traditional decision-making criteria such as costs, quality and services. In this sense, Andriani will encourage and support suppliers to revise their business models to achieve the external benefits related to their inclusions within an entrepreneurial ecosystem characterized by ethical and sustainable principles (Pizzi *et al.*, 2021a, b, 2022). In addition, the assessment made by Nativa has supported the identification of suppliers through a final classification based on five different merit classes, and it could foster the implementation of a supply chain SDGs evaluation scanner.

4.3 Community-level open innovation

Since 2018, Andriani actively contributes to the 2030 Agenda. As evidenced by the non-financial reports, the founders tried to contribute to the SDGs by identifying a clear connection between their initiatives and the 17 SDGs identified by the United Nations. In detail, building on an *ex ante* open discussion with internal and external stakeholders, Andriani identified a set of material themes to connect strategic plans with a set of goals not directly related to the organization's core business. Furthermore, Andriani is a founding member of the UN Global Compact Italy, representing the Italian branch of the leading organization UN Global Compact. In this sense, the continuous engagement with stakeholders about the SDGs and the involvement in the initiatives developed by UN Global Compact Italy favoured the development of conjoint projects not directly related to core business.

Regarding the specific activities developed to move from a "business as usual approach" to a sustainable approach, Andriani launched a project in Ethiopia. Building on the main idea to combine OI and sustainable development, the group launched the project Ethiopian Sustainable Farming and Agriculture Initiative (ESFAI). The project consists of the integration of new innovative crops within Andriani's supply chain. The company chose to integrate the Teff, which represents a multi-purpose crop that has high importance for the Ethiopian diet and culture. The investments made by Andriani in Ethiopia will support the development of the rural area through the involvement of Italian and Ethiopian research groups. Furthermore, the involvement of Ethiopian citizens within the process will facilitate the knowledge transfer between Andriani and local communities, representing critical actors during the processes related to Foreign Direct Investments (Mutonyi *et al.*, 2018).

5. Discussion: developing the 4SOI (for sustainable open innovation) framework

Actively contributing to the SDGs represents one of the main challenges for worldwide organizations (Bebbington and Unerman, 2020; Sachs *et al.*, 2019). However, the implementation of sustainable practices is influenced by barriers related to several factors such as the sector of origin and firms' size. Those barriers are higher for sectors characterized by a lack of orientation towards unconventional themes such as sustainability and technological innovation. An increasing number of scholars started to identify potential enablers to support organizations' sustainable transition. In particular, a part of the literature underlines the opportunities related to OI, representing enablers for developing new knowledge through the exchange of information between parties (Gibson *et al.*, 2019; McGahan *et al.*, 2021).

The insights collected through the case show that SOI represents a multidimensional concept based on the integration between stakeholder engagement and sustainable and ethical principles, with direct impacts on sustainable development and sustainable

competitive advantage. The four dimensions are interlinked due to the need to consider all the implications related to the adoption of sustainable practices in operations, industries and communities. In this sense, transforming business models cannot be achieved without a clear comprehension of the main implications related to the adoption of behaviours different from a "business as usual" approach (Scheyvens *et al.*, 2016). In particular, the choice made by the firm to actively contribute to global challenges not directly related to its core business underlined the central role covered by ownership and governance, which represent the main enablers for an effective sustainable transformation.

Furthermore, the qualitative analysis underlined the evolutionary pathway of the company over the years. As evidenced in prior studies about sustainable business models, evolving from a linear towards sustainable business models requires a coevolutionary approach based on long-term horizons (Schaltegger *et al.*, 2016a, b). This evidence was also confirmed by Andriani's experience. After a first stage characterized by initiatives developed to enhance operations' sustainability, the company started developing cooperative projects to enhance the sustainable transition of the food industry. Furthermore, the high attention paid by institutions facilitated the launch of initiatives at the international level. In this sense, the group's SOI followed the theoretical paradigm proposed by Randhawa *et al.* (2016). The first decade of the company was characterized by a progressive transition from an OI approach based on the need to improve operations towards an approach based on the opportunity to contribute to the sustainable innovation of the sector. Finally, at the last stage, the company started to adopt an OI approach characterized by the need to contribute at a worldwide level through its activities. Thus, OI represented for Andriani an enabler for sustainable transition, even if in presence of physiological barriers related to the implementation of unconventional practices. The case also highlighted the signalling effects related to the implementation of sustainable practices characterized by coordinating activities between organizations and stakeholders (Bogers *et al.*, 2020). In fact, the coevolutionary approach that has characterized SOI activities made by Andriani underlined the existence of a direct relationship between "early win", stakeholder engagement and contributions to the SDGs.

The central role covered by the long-term vision is underlined by the existence of many tools used to engage with stakeholders, one of the main enablers for effective OI. Despite the absence of legal requirements, the firm implemented several communication tools to move from an approach based on the evaluation of the relationship between input and output towards a multi-dimensional approach based on the interrelationships between input, output and outcomes (Bebbington and Unerman, 2020). In this sense, the transparent approach used by the organizations to communicate their long-term vision was driven by the need to signal their central role within society (Schoeneborn *et al.*, 2020). Thus, the choice to transform Andriani into a benefit corporation represents the last step of evolutionary pathways inspired by the opportunity to create value for the entire society, as evidenced by the voluntary assessment made by the company to evaluate its contribution to the SDGs.

Finally, the strategic role covered by sustainability was also confirmed by the combination between the sustainable strategic plan and the industrial plan developed by Andriani. Integrating sustainable themes in industrial plans represents an unconventional strategy used by the governance to certify their sustainable vision. Stakeholders played a relevant role by actively contributing to the definition of the strategic plans through their involvement in the materiality analysis. In this sense, non-financial reporting represented for Andriani a strategic practice used to identify the material themes to integrate within its evolutionary pathways. Many sustainable innovations developed during the past years were driven by the exchange of information between the company and its internal and external stakeholders. Furthermore, Andriani revised their communication strategies to move from static and non-financial materiality towards a dynamic and double materiality inspired by the opportunity to integrate financial and non-financial indicators under a common umbrella (Figure 3).

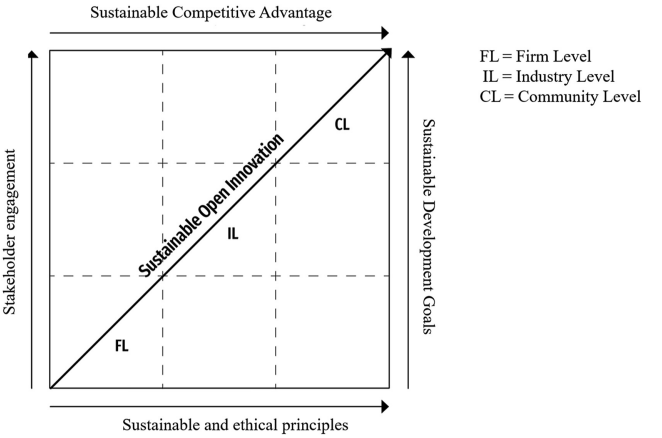


Figure 3.
4SOI framework

6. Conclusions

Evolving from linear towards sustainable and, possibly, circular business models is one of the main challenges for firms nowadays (Pizzi *et al.*, 2021a, b, 2022; Sachs *et al.*, 2019). This evidence is particularly relevant in the food industry, which is considered by academics and policymakers among the main strategic drivers for the achievement of the 17 SDGs proposed in the 2030 Agenda (Bogers *et al.*, 2020; UN Global Compact and KPMG, 2020). However, in the business sector, the achievement of those targets is negatively influenced by the existence of cultural, technical and dimensional barriers. Thus, management scholars are called to identify managerial practices to fill those gaps (Pizzi *et al.*, 2020).

The paper discussed some lessons learnt to guide future research, practice and policy. Firstly, the case follows recent studies about how OI can effectively drive strategic renewal and innovation activities to address a stated sustainability objective (Bogers *et al.*, 2020). Moreover, this case study may provide practitioners, policymakers, researchers and students with inspiration about how OI may be deployed to support a holistic strategic renewal aimed at sustainability objectives, such as the SDGs, in the food industry. Finally, the paper contributes to expanding our understanding of OI and to future research on the interlinkages of OI, sustainable strategy and sustainable business models (Scuotto *et al.*, 2017; Vanhaverbeke *et al.*, 2017).

In particular, this study extends the scientific debate through new insights on the food industry, a standalone topic within the theoretical debate on SOI (Bogers *et al.*, 2020; McGahan *et al.*, 2021). The case study confirms the enabling role covered by OI, which represents an effective strategy to avoid some of the main barriers that negatively affected the integration of sustainable practices by food organizations (Fiore *et al.*, 2020; Pohlmann *et al.*, 2020). The direct involvement of Andriani's stakeholders in decision-making activities supported the development of new innovative practices that have impacted the business model. Furthermore, the analysis reveals the central role covered by the existence of a long-term vision by managers and owners. The analysis showed that Andriani constantly revised its business model through the adoption of a coevolutionary approach based on continuous engagement with internal and external stakeholders.

Regarding the evolutionary approach, the analysis also shows that over the years the company moved from a firm-level strategy towards a community-level approach through SOI, which represents an activity rarely adopted by managers due to the absence of direct interlinkages with firms' core business (Randhawa *et al.*, 2016). In this sense, the case study underlined the need for academics and policymakers to evaluate sustainable practices

through a dynamic lens to collect useful insights about sustainable evolutionary pathways in controversial sectors such as the food industry.

The managerial implications are several, as evidenced by the 4SOI, which represents a multidimensional framework based on the integration of different theoretical dimensions. In detail, the analysis underlined 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. The evolutionary pathway of Andriani was characterized by the combination of financial and sustainable growth. Combining financial and non-financial dynamics within a common operational paradigm represented a key factor to enhance competitive advantage over the years. Furthermore, the case underlined the existence of direct benefits for entrepreneurs related to the opportunity to engage with strategic partners to enhance sustainable practices. Engaging with strategic partners with different backgrounds represents one of the main cultural barriers for an effective SOI. However, as evidenced by the continuous engagement between Andriani and unconventional partners such as academics and practitioners, those processes can foster the sustainable transition due to the knowledge exchange between stakeholders with different expertise.

The policy-making implications are represented by the need to build an institutional context inspired by sustainable and ethical principles. The results of the research confirm the high degree of dependency between firms' strategies and managerial approaches. Thus, policymakers should identify new strategies to encourage a wider number of organizations to rethink their business models according to the SOI paradigms.

This study has several limitations. The first and main research limitation consists in the use of a single case study as a methodological approach, which allowed for in-depth analysis but may raise concerns of generalization. Thus, future research could fill this knowledge gap either through the adoption of quantitative methods to evaluate the main determinants that impact the relationship between OI and corporate social responsibility or by replicating multiple case studies to develop additional fine-grained insights. Another limitation lies in the contextual element of the case study, which may be influenced by cultural determinants pertinent to Italy and its southern regions. Future research could corroborate our results by selecting different contexts and regions.

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