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DESIGN AND SUSTAINABILITY FOR INNOVATION IN FAMILY FIRMS. A CASE STUDY FROM THE ITALIAN FURNITURE SECTOR

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Abstract

The increasingly competitive environment requires a continuous innovation for both survival and competitiveness of firms, including FFs. This study aims at investigating to what extent environmental practices and eco-design methods can be included into innovation, in order to develop new products that satisfy consumers' expectations in terms of both aesthetic and functionality and environmental saving. The case of an Italian FF operating in the furniture industry has been deeply analysed. By focusing on a recent innovation project, the study provides empirical evidence that environmental sustainability can be actually considered as an innovative force generating new products and processes.

1. Introduction

In a hyper-competitive environment, innovation is compelling for both survival and competitiveness of firms (D'Aveni, 1995; D'Aveni et al., 2010; Duran et al., 2016; Marklund et al., 2009; McNamara et al., 2003) and several innovation opportunities emerge in light of the increasing globalization, technology changes and new lifestyles and consumer patterns (Bowonder et al., 2010; Pisano, 2015). Notably, environmental challenges occurring over the last decades imposed increasing environmental responsibilities on companies, thus raising the importance of sustainable innovation (Dai et al., 2015).

Eco-design can be seen as a possible response to this situation (Olkowicz and Grzegorzewska, 2014), as it combines environmental responsibility with creativity from the earliest stages of product innovation process (Karlsson and Luttropp, 2006; Plouffe et al., 2011).

This competitive and changing scenario potentially concerns all companies, regardless of type, size and activity, including family firms (FFs) that are usually defined as organizations owned and/or controlled by members of a family or kinship group (Neubauer and Lank, 1998). Given their contribution to the global economy (Amit and Villalonga, 2009; AUB Observatory, 2018[1]), FFs have attracted large attention in recent decades. Nevertheless, prior literature on family business often resulted in inconclusive or contradictory results with respect to both innovation (Calabrò et al., 2019) and environmental practices (Dangelico, 2017; LeBreton-Miller and Miller, 2016).

Thus, the objective of this paper is to go deep in the relationship between FFs and innovation by analysing how environmental strategies can be included into innovative processes, thus leading to the development of new products aimed at satisfying consumers' expectations in terms of both aesthetic and functionality and environmental saving.

With regard to innovation, some scholars described FFs as conservative (Habbershon et al., 2003), risk averse (Morris, 1998), and unwilling to invest in innovative projects (Block et al., 2013). Others, on the contrary, demonstrated their ability to successfully completing innovation projects (Chrisman et al., 2015), owing to their long-term orientation, involvement of multiple generations and family culture (e.g. Craig and Dibrell 2006; Llach and Nordquist 2010; Zahra et al., 2004). Prior research also emphasized the role of the ownership structure in affecting the innovation behaviour of FFs (De Massis et al., 2013). A number of studies agree on the existence of a negative relationship between family involvement and investments in R&D (e.g., Bloch, 2012; Chrisman and Patel, 2012; Munari et al., 2010),

[1] https://www.aidaf.it/wp-content/uploads/2019/11/26/Report-AUB-XI-edizione_25_novembre.pdf (late access: 24/11/2019).

while more conflicting results concern the impact of family involvement of innovation outputs, with respect to which scholars found both positive (e.g., Craig and Dibrell, 2006) and negative (e.g. Czarnitzki and Kraft, 2009) relationships. Such contradictory findings suggest the need for advanced understandings on FFs' innovation (Calabrò et al., 2019; Magistretti et al., 2019), especially focusing on how innovation is carried out within this context and how the owner's involvement can influence its implementation. Prior research, indeed, is quite limited (De Massis et al., 2013), being focused primarily on the analysis of both antecedents and outcomes of innovation processes rather than their execution (Calabrò et al., 2019; De Massis et al., 2013; Roed, 2016).

Inconclusive results also emerge concerning to FFs' adoption of eco-design methods. Extant literature suggests that FFs are more likely to engage in environmental practices than those that are non-family (Craig and Dibrell 2006; Núñez-Cacho et al., 2018). Possible explanations lie on three main characteristics of family businesses, namely prominence, continuity and enrichment (Debicki et al., 2016), which make FFs more willing to risk the uncertainty of economic outcomes related to undertaking environmental strategies (Berrone et al., 2010; Sharma and Sharma, 2011). Yet, how FFs act in the adoption of eco-design practices when developing new products has been overlooked by the literature, as major attention has been focused on large companies and non-family businesses (Núñez-Cacho et al., 2018). Moreover, although prior researches highlighted the high propensity of FFs to adopt proactive environmental strategies (Delmas and Gergaud, 2014; Sharma and Sharma, 2011), to the best of our knowledge, few to no studies deal with the analysis of environmentally friendly products' development process in a family setting. Thus, research on this topic advocates for further investigations.

Starting from these gaps, two main research questions operationalize the purpose of this study:

H1): How do FFs manage the innovation process? In particular, what is the role of the owner/s in the different steps of the product innovation process?

H2): How can eco-design practices generate new environmentally friendly products in FFs? In particular, what factors can enhance or hinder the implementation of eco-design in FFs?

Given the scarcity of prior research on the topics investigated, the study is explorative in nature, based on a qualitative single case study carried out on a design-intensive FF operating in the Italian furniture sector.

The research contributes to the body of literature on FFs' innovation in different ways. First, it investigates how innovation takes place and is managed in a family setting and contributes to the conversation regarding whether founder/owner involvement can be advantageous or not for im-

portant innovation outcomes (Jayaraman et al., 2000). Second, by focusing on the eco-design concept, the study goes deep into the development of environmentally driven innovation in FFs, which has been scarcely investigated until now (Huang et al., 2009; Scott-Young, 2013). Further contributions derive from the specific context of analysis, which is worthy of attention and investigation. The furniture sector is very important from an environmental standpoint (Azizi et al., 2016) and furniture companies are highly involved in design innovation, especially within the Italian context (Vickery et al., 1997). In addition, this research focuses on a design-intensive setting, which has been slightly overlooked by prior research on family business innovation (Magistretti et al., 2019), although it seems to be very interesting for analysing the relationship between innovation and family involvement (Dalpiaz et al., 2014).

The rest of the paper is organized as follows; section 2 focuses on the concept of innovation and eco-design, with specific attention to FFs. The research method is described in the third section, while the fourth section provides the case study analysis. Section 5 discusses the results along with their theoretical and managerial implications. The last section provides conclusions and suggestions for further research.

2. Theoretical background

2.1. Innovation in FFs

Literature on family business innovation has rapidly developed over the last decades (Calabrò et al., 2019). Scholars adopted different approaches and methodologies. A number of theoretical perspectives were applied. Starting from the behavioral agency theory, some authors (e.g., Roessl et al., 2010; Wright, 2017) suggested that FFs typically underinvest in innovation, while others (e.g., Konig et al., 2013) underlined their great ability to adopt discontinuous technologies and innovations. The social-capital theory and the social system theory were also used to explain both advantages (e.g., Andrade et al., 2011) and limitations (e.g., De Clercq and Belausteguigoitia, 2015) of FFs related to innovation practices. According to the social system theory, for instance, researchers found that the familiness of the firm can play a different role, depending on contextual factors such as performance hazards, type of family involvement, and generational effects (Roed, 2016). Hence, conceptual studies – while producing interesting findings – did not provide a comprehensive and shared framework of FFs' factors affecting innovation, both positively or negatively.

Empirical research findings were often contradictory too. While some scholars demonstrated a positive association existing between innovation

and FFs (Kim et al., 2008; Llach and Nordqvist, 2010), others found negative ones (Block, 2012; Chen and Hsu, 2009; Chrisman and Patel, 2012; Munari et al., 2010). An important stream of contemporary research concerns the role of the family involvement in ownership, government and management, which can result in unique resources that may affect the family business innovation. In this respect, a number of studies is consistent in pointing out the negative relationship between family involvement and R&D expenditures (e.g., Block, 2012; Chen and Hsu, 2009; Munari et al., 2010), while contradictory results emerged concerning the impact of family involvement on innovation output. For example, Gudmundson and colleagues (2003) found a positive association between family ownership and the firm's ability to introduce new products and services. On the contrary, Chin et al. (2009) demonstrated that family involvement negatively affects both the quantity and the quality of the patents received, while Berrone et al. (2010) also highlighted the negative influence of FFs owner's aspirations to self-government on their willingness toward innovative collaborations with other firms.

Hence, the topic of innovation in FFs - despite its relevance (De Massis et al., 2013) - is still controversial and worthy of investigations for both theoretical advances and practical applications (Diaz Moriana et al., 2018). This is where the present study takes up its work.

2.2. Eco-design methods for FFs' innovation

Growing environmental issues and related consequences are affecting the way people do business all around the world (Dai et al., 2015). Governments, consumers, investors and other actors involved in the global value chain are more likely to interact with organisations environmentally responsible (Jansson, 2011).

As introduced earlier in this paper, the way FFs relate to environmental issues still represents a debated topic in the literature. Because of their long-term orientation, intergenerational aspirations and confidence in the reputation (Berrone et al., 2010; Brigham et al., 2014; Cretu and Brodie, 2007), family businesses are often depicted as much likely to engage in environmental practices. However, Le Breton-Miller and Miller (2016) underlined a number of FFs' characteristics that may work against environmental practices, such as conflicts occurring when family members fail to get along or socioemotional restrictions, which may reduce the family motivations towards environmental investments. Anyway, the environmental issue cannot be undervalued by FFs, since the aesthetic and functional values of products cannot be long considered as tools of differentiation and competitiveness (Hertenstein et al., 2013) without considering their environmental and social sustainability.

Thus, the concept of eco-design becomes critical for firms' growth and long-term survival (Plouffe et al., 2011). This has been variously defined by prior researches; Bovea and Pérez-Belis (2012) describe eco-design as an activity focusing on the integration of environmental issues into product development. van Hemel and Cramer (2002) define it as the systematic effort of a firm to improve the environmental profile of product(s) in all stages of the product life cycle. Sometimes eco-design has been also referred to as Design for Environment (DfE), "an umbrella term describing techniques used to incorporate an environmental component into products and services before they enter the production phase" (Olkowicz and Grzegorzewska, 2014: 206). The common core of such definitions is captured by Marques and colleagues (2017) who define eco-design as a process including all activities along the value chain, such as the creation, distribution, consumption, disposal and re-entry of a product into the market, carried out with sustainability principles in mind.

Concerning the furniture sector, on which this study focuses, eco-design can encourage remove sustainable forest management, by taking care of the lands' biodiversity and regeneration capacity remove and preventing illegal woodcutting. In designing and conceptualizing new products, eco-design enhances the limited use of raw materials by creating, for example, furnishing objects whose components are readily separable at the time of their disposal. Additionally, the use of raw materials easier to recycle than wood – such as aluminium and glass – could be improved in this step. In the production phase, eco-design could suggest the increasing use of water paints, instead of chemical ones, both to improve the workplaces' healthiness and to reduce gas emissions. During the assembly and product finishing, eco-design can promote the use of machinery with high energy efficiency, the adoption of glues containing no-toxic elements, and the re-use of production wastes. Finally, concerning the distribution activity, eco-design could suggest the optimization of products' storage, to enable a better use of spaces and to reduce the number of trips, with related advantages in terms of fuel consumption and gas emissions.

Notwithstanding an increasing recognition of the strategic relevance of eco-design (e.g., dos Santos et al., 2019; Krotova et al., 2016), the topic has received little attention within the FFs context. A recent study of Olkowicz and Grzegorzewska (2014) highlighted that using a method of eco-design and implementing environmental innovation can be successful, even though resources are limited and firms are controlled by family owners. However, empirical evidence from Deutz et al. (2013) suggested that large companies seem to be more likely to include the environmental principles at all stages of the design process than small and FFs. Hence, research findings are rather contradictory.

Certainly, several requirements are needed for implementing an eco-

design strategy, which sometimes can make it difficult for a family business. Among others, Olkowicz and Grzegorzewska (2014) pointed out the importance of (i) using certified woods, (ii) monitoring data about environmental pollution emissions and waste materials from the manufacturing process, (iii) obtaining certifications from the eco-labels institutions. Above all, the authors highlight the family's intention of establishing a competitive advantage from the eco-design, without which its success is very difficult to reach.

All this suggests that there is space for additional research, in order to understand how eco-design can be implemented by FFs and what conditions can affect its adoption. Advancements on this topic are critical since eco-design could help FFs to discover new technological opportunities and solutions with a positive environmental impact (Ghisetti and Montresor, 2018), thus enhancing their transition towards environmentally friendly productions (Mulder, 2007).

3. Research method and data collection

This research was based on an in-depth analysis of a single case study carried out within the Italian furniture sector. This method has been selected because it reveals its usefulness for understanding "how" and "why" certain events occurred. Moreover, it is suitable for studying new topics, as well as for developing emerging theories (Bonoma, 1985; Yin, 1981). Indeed, the concepts of innovations and eco-design, here investigated, are very complex in nature. They require a careful and thorough analysis in order to explore how and why innovation is managed and eco-design practices are implemented along different stages of the value chain. Several prior studies related to these topics are qualitative in nature and are based on a similar approach (e.g., Cerdan et al., 2009; Ghisetti and Montresor, 2018; Kammerlander et al., 2015).

Despite the single case study method could reduce the generalizability of the results and increase observer bias (Vissak, 2010), it allows to retain the depth of the study (Piekkari et al., 2009) and the richness of results (Dubois and Gadde, 2002). Therefore, it was properly fitting with the explorative purpose of the current research.

In selecting the case study, Eisenhardt and Graebner (2007) suggest that qualitative samples should be purposive rather than random, meaning that participants should be chosen according to some criteria guided by the study purposes. Following prior research about FFs based on case studies (Casprini et al., 2017), we selected a FF that promised to provide a rich and detailed description of the phenomenon under investigation, as recommended by the "intensity sampling strategy" of Miles and Hurberman

(1994). The case study firm is Fiam Italia Srl (Fiam), a furniture company based in Pesaro, in the Marche Region. Fiam has been selected for various reasons. First, it classifies as a FF as it is entirely owned by the family and all members occupy managerial positions. Vittorio Livi is the founder of FIAM, while his sons, Daniele and Francesco, respectively play the role of CEO and Export Area Manager of the company. Second, the company operates in the furniture sector, more specifically in the subsector of furniture and furnishing accessories (such as mirrors, tables, coffee tables, chairs, shelves, display cases, magazine racks, umbrella holders and other accessories). This industry is of paramount importance as there is a growing concern about the environmental effects related to goods production, use, and final disposal at the end of their life cycle (González-García et al, 2012). Third, Fiam is a design-intensive firm, as it heavily relies on the creativity and innovativeness of designers for the development of its new products (Dell'Era and Verganti, 2010). As prior research noted, in this kind of organisation, "the role and involvement of the founding and controlling family in product innovation and their interest in preserving the family name and identity across generations of new products are of paramount importance" (Magistretti et al., 2019: 1122). Fourth, the company is very well known for its innovativeness. Since its beginning in 1973, Fiam focuses on innovation as the main driver competitiveness, as evidenced by a number of successful products - such as "Ghost", the first chair produced from a single sheet of glass and recognized worldwide as a design icon - and prestigious Awards for innovation, e.g. the Leonardo Quality Award (2015) and the Compasso d'Oro Awards (2001). Finally, Fiam is clearly involved in environmental practices. Since its foundation, the company has been working with glass, which is one of the raw materials, entirely recyclable, with the lowest environmental impact in the furniture sector. Moreover, the company adopts process certifications and stands out for the continuous research of new products and processes aimed at reducing the environmental impact of its activity. Notably, in recent times, the company has improved its efforts to move towards a circular business model, by introducing the eco-design principles into its processes, in order to put the environmental issues at the early stages of the product innovation (Karlsson and Luttropp, 2006).

Thus, the Fiam case study provides a good opportunity to address our research questions, as it offers the "rare and extreme" qualities requested to observe the phenomenon under investigation (Eisenhardt and Graebner, 2007).

Multiple interviews were conducted during 2018, to collect information concerning the overall approach of Fiam towards environmental issues and to provide a deep investigation of how the company manages the new product development process. Moving from our research questions, a good example of eco-design innovation has been considered, in order to

understand both the role of the owners in the new product development process and factors affecting its implementation and success.

Each interview was based on a semi-structured and open-ended questionnaire which lasted for approximately two hours. To improve the quality of the information gathered through the interviews we identified people, within the firm, who would be most able to inform us on our main research question and "are willing to share their knowledge" (Patton, 2015: 284). All the interviews were conducted in Italian, recorded, transcribed and translated into English. Additional questions were asked, when necessary. The respondents were encouraged to give any kind of additional feedbacks. Moreover, the final reports of each interview were sent to the respondents for possible changes, in order to improve the validity of this study. For data triangulation, we collected information from other sources, such as the firm's website, its profiles on different social networks and other documents provided by the managers interviewed. The use of such tools allowed us to reduce the likelihood of misinterpretation and to consider multiple viewpoints (Ghauri, 2004).

4. The case study analysis

4.1.Company profile

Fiam produces and sells manufacturing furnishing items in curved glass, since 1973. From the beginning, the company has been fully owned and controlled by the entrepreneur's family, more specifically by the founder Vittorio Livi and, in recent years, by his two sons Daniele and Francesco Livi. Actually, Fiam involves about 50 employees, with an annual turnover of approximately €9 million. About 30% of annual turnover comes from the Italian market, about 35% from EU Countries, and about 35% from extra-EU markets. Hence, despite the company concentrates mostly on the European market, it is experiencing an interesting growth in international countries, especially in Asia.

Furnishing items include tables, chairs, consoles, libraries, shelves, and other glass accessories, such as mirrors, lamps, coat-hangers, valets and magazine racks. All products are realized in curved glass and aim at transforming both home and office environments into stimulating spaces to be lived in and admired. Each product represents a perfect mix of quality, art and design. Notably, the type of glass used by Fiam is called "float", industrially produced by the multinational AGC, of which qualitative standard allows the company to realize products perfectly flat, which preserve over the time the purity of transparency and an almost total absence of defects in the vitreous mass.

As for the distribution system, the company relies on different agents, who refer to the various sales managers, according to specific geographical markets criteria. Every year, the sales managers define the reference budgets for each agent, in line with the results of the past year and the future development prospects of each area. The agents deal with the intermediate customers, e.g. the retailers, and help them throughout the overall processes of purchasing and management of the relationship with the company. The retailer then sells to the final customers, also providing them with additional services, such as pre- and after-sales assistance.

4.2. Innovation within Fiam

Fiam has always been recognized for its innovativeness, being the first company that produces furnishing items in curved glass. Starting from the first table "Onda pouf" that was entirely designed by the company's founder, Fiam constantly developed new products. In 1984, a revolutionary project was achieved by producing the first single-block table, namely "Ragno", while in 1987 was created the first curved glass armchair, "Ghost", which is a monolithic chair in 12 mm-thick glass. In 1997, for the first time, the curved glass was combined with a mirror for producing "Caadre", designed by Philippe Starck, while recently, in 2012, Fiam launched "Macramè", a collection of coffee tables comprising hand-interwoven spun glass base.

Design and technology are the main drivers of innovation within Fiam.

A critical role is played by the designers. The company's founder, Vittorio Livi designed several products for Fiam, from its beginning to recent years. Moreover, the company developed a very rich and prestigious portfolio in terms of collaborations with world-renowned designers, including Philippe Starck, Marcel Wanders, Daniel Libeskind, Cini Boeri and Vico Magistretti, which enabled it to successfully compete on a global scale. Thanks to these partnerships, FIAM created and launched increasingly innovative products by integrating new forms and materials. Some of these products have been exhibited in 25 international museums, among which the Museum of Modern Art (MoMA) in New York.

Fiam accepts a wide concept of design, which involves both aesthetic and functional features of the product. As the company CEO said:

"We have experienced the effectiveness of conceiving the product of design as a dynamic and versatile object, which permits the customers to become co-authors of a unique work".

Several custom-made products, designed by world-famous, are born to be adapted to demanding and evolved clients. For example, "Rialto", "Rialto L" and "Luxor", offer various possibility of transformation of measure and structure, and each piece can be customized using chest of drawers,

choosing different sizes, shapes and finishes. Hence, innovation in Fiam uses design with an overall effort for integrating the search for beauty with the attention to customers' needs.

Fiam's's innovation is also driven by technology and process innovation. Technological research is very important for the final result of Fiam products:

"We have a high level of craftsmanship in fusion with high technology - explains the CEO during a past interview[2] *- we have an instrument that controls the ovens and the success of the glass bending. We are not improvised; it is the result of forty years of experience".*

What is important is not only the use of high technology but also its continuous innovation. To carry out some projects, indeed, the company has even created "ad hoc" technologies. As in 1982, when Massimo Morozzi proposed the design of the "Hydra" table whose realization required the invention of an exclusive water-jet process.

The success of innovation in Fiam results from different factors, as emerged during the interviews. First, there is the high attention to each phase of the production process, from the initial melting phase of the glass up to the stress tests carried out in the final perfection checks. The new product development passes through a series of controls and must ensure compliance with certain production and process standards before it can be concluded. Some tests, such as the impact with a metallic sphere, certify the quality of the production process, in which each processing phase involves careful checks and verifications to guarantee the perfection of the finished product. Moreover, a critical role is played by human craft skills. The process of glass bending, for example, requires different attitudes. It is necessary to pilot and impress the right temperature in the various points of the slab; to move correctly the mold; to shape the glass, where necessary, by using various tools; to maintain the conditions of a balance of the glass between the solid and liquid state.

"Passion is not enough – says the CEO - manual skill demands a high sensitivity! The intervention of the master bender and his ability to work in harmony with his colleagues working in front of the oven, are essential elements for the quality and success of the new product".

According to the CEO, another factor influencing the success of innovation in Fiam concerns the direct involvement of the family in the innovation activity. The founder, as a designer, created several products for Fiam. Hence, he directly authored the development of new products, providing his original idea as well as driving the overall process of new product development. In order to realize the designer's idea, indeed, a strong collabo-

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[2] http://www.primarete.it/it/articolo/intervista-a-daniele-livi-amministratore-delegato-fiam-italia-spa (late access: 29/11/2019).

ration is needed between the designer and all people involved in the different stages of the new product processing. Therefore, the founder not only plays a supervisory role in the innovation process, but also interacts continuously with the various company employees involved in the project. This involvement of the founder and the other family owners also occurs when the new product is proposed by an external designer. Moreover, innovation is often encouraged by the family as it always participates in national and international events from which they inspire their innovativeness.

Finally, the management of innovation within Fiam largely benefits from external contributions. The company collaborates with great names of Italian and international design landscape. Moreover, it has important collaborations with other firms operating in the same geographic area (central Italy), as a single unit of an Italian Furniture District. Owing to these partnerships, such as with Biesse Group, it gained several advantages both in terms of economic growth and, most important, in terms of product and process innovations.

4.3. Fiam's approach towards environmental issues

Over the years, Fiam showed increasing attention towards environmental issues.

Glass is the main raw material used by Fiam, since its origins. As noted by the company's founder:

"Glass is nature, as it consists mainly of sand and lime. It is aseptic, non-toxic and does not release any harmful substances. Glass is eternal and can be recycled endlessly, without waste. For all these reasons, it has always been the soul of Fiam and the main reason why we try to valorise all its virtues through production processes carried out in line with environmental and social standards".

Despite the use of other materials (like steel and wood), which have been gradually introduced to accomplish the designers' proposals, Fiam has always been focused on glass, in order to sustain its leadership in this specialized sector, as well as to minimize the environmental impact of its production processes. As stated by Daniele Livi:

"Fiam is actively re-using leftover production raw materials to manufacture other innovative and unique products, and the introduction of the DV Glass® represents a good (and rare) example of the company's commitment towards environmental issues".

Furthermore, the company is planning the adoption of renewable energies for the near future and it is involved in reprocessing activities concerning waste and garbage.

Fiam clearly declared to adopt such practices mainly for reducing the environmental impact of its activities. Meanwhile, the company also stressed the possibility of increasing the total amount of product sales, especial-

ly among consumers who are increasingly aware of sustainability and related issues. Finally, economic motivations linked to costs reduction and increased revenues have also emerged among the main motivations pushing Fiam towards the adoption of environmental practices.

The company has indicated fiscal and economic incentives for investments in R&D, as well as in waste collection systems and renewable energies plants, as crucial factors supporting the implementation of sustainable and environmental practices.

By contrast, as pointed out by the CEO:

"Problems related to the reconversion of final products into new ones represent clear examples of factors which can hinder the adoption of such practices".

At an operational level, the sustainable approach of Fiam reveals itself through the adoption of the UNI EN ISO 9001 certification concerning the adoption of a quality system aimed at achieving a zero-defect product objective and providing quality management practices to customers and business counterparts. Further evidence derives from the packaging policies. Most products are currently packed in recycled wood boxes that are marked according to FAO guidelines. All the wooden packages undergo a special treatment, consisting of an 80° sterilization process, in order to obtain a material absolutely free from the presence of bacteria that could be harmful to both products and the environment.

Within this framework, it is important to highlight that the implementation of such practices allowed Fiam not only to reduce the total amount of raw materials, energies and waste produced - with positive impacts on its overall efficiency - but also to realise new furniture items characterised by both design-content and quality and environmental sustainability, as the DV Glass® demonstrates.

4.4. How environmental sustainability drives innovation in Fiam: the case of DV Glass®

DV Glass® has been designed by the firm's founder Vittorio Livi and his son Daniele: this is where the acronym DV Glass® comes from. As the CEO pointed out:

"Our father, Vittorio, always works alongside us. Together, we designed the DV Glass® sheet, which allows us to realise products with different colours and thicknesses, never seen before[3]*".*

Born in 2012 with a project titled "Polychromy", the original idea was that of reinventing glass through the optimization of all stages of the production process, from procurement to consumption, by fully embracing

[3] https://www.pressreader.com/italy/l-economia/20181210/282187947102650 (late access: 26/11/2019).

the principles of environmental sustainability. DV Glass® is an innovative reassembled block of glass stripes, which are juxtaposed and transformed into a structural monolithic one, thanks to a high-temperature melting process. In detail, during the manufacturing process, the scraps from sheets of glass are cut into several pieces and are then assembled into a new sheet, whose thickness matches the width of the band. Later, the new surface undergoes a high-temperature treatment, more specifically a thermal process with temperatures of about 900°C, that allows melting the coloured strips previously selected to be recycled. This innovative manufacturing process leads to a melted glass, masterfully hand-crafted, which perfectly matches with a wide technological research, thus resulting in planned or completely random combinations of colours and thicknesses (until 30mm).

As noted by the CEO:

"It is important to highlight that this process entirely occurs within the company and results in less cheap products as it limits the use of external waste disposal systems."

The contribution of the company's founder and his son was critical for the development of DV Glass®. Both their creativity and entrepreneurial foresight have been important for inspiring the *initial* idea, as well as for driving all the company's departments towards its following implementation. They have been working, for months, alongside their skilled artisans who, day after day, have engaged in the fusion, bending and assembly of pieces of waste glass, until they have merged.

Fiam has carried out several investments and technical attempts for implementing this innovative product. More specifically, after proposing the initial idea, Fiam left designers a high degree of freedom in developing their ideas and projects based on DV Glass®. Several meetings and discussions with engineers, designers, marketers and other specialists, allowed FIAM to involve different skills around the DV Glass® project, with the aim to understand and evaluate its economic and technical feasibility, as well as its potential appreciation from the demand side. Hence, the values of creativity, entrepreneurship and environmental responsibility combined with the family's orientation towards innovation and technology advancements, revealed their importance in defining the company's long-term strategy by acting as a filter of ideas in Fiam's selection projects.

The high-quality of DV Glass® is assured by a rigid quality control system, which allows creating products in accordance with the international standard UNI EN ISO 9001. The uniqueness of outputs is due to the non-repetition of the DV Glass® process execution: the high variability of the melting process, in addition to the strong craftsmanship of the preassembly phase, implies that each new slab is completely different from the previous one, and never identical to the next one. Moreover, this new material allows several variations in measures and colours, which impro-

ves the originality of the final product. Thus, the use of DV Glass® allowed the introduction of new furnishing accessories, characterized by high-quality, uniqueness, and environmental sustainability. With DV Glass®, as the company's founder says:

"The glass enters a new era: it goes together with men's life but also it transforms with elegance and prestige the interior design of our homes, since glass evolves from glacial, minimal and cold material into a warm, elegant and technological one."

Owing to DV Glass®, Fiam is now able to reach a public that requires both high-quality and custom-made glass products. Meanwhile, the use of DV Glass® has strengthened the company's ability to reach a public that highly appreciates additional benefits linked to ethical and environmental values.

The collaborations with designers have revealed their relevance, particularly with new young designers, which are more likely to understand consumers' needs and current expectations. Keynote designers, already working with Fiam from different times, have shown great interest in DV Glass®, and were deeply involved in the production of new ideas and manufacturing products based on the new material.

A critical factor influencing the success of DV Glass® has been recognized in the company's ability to adequately communicate its innovation and the relative new collections to the market. It has been firstly presented at the *Salone del mobile 2018*, thus strengthening the innovativeness of Fiam within the furniture sector and its overall environmental-saving orientation. The founder and his family continuously disclose their values and ideas in press releases and other forms of communication. Several interviews with designers were also organised during the last edition of the *Salone del Mobile 2019,* with the aim to reveal how the creative idea was born, how the relationships between the company and designers have evolved and how it could be exploited in new products for the future. These interviews have been also shared with the company's social media official channels, in order to improve their visibility.

As concerning the difficulties that Fiam had to face during the development of DV Glass®, the owners interviewed pointed out some technical issues related to the composition of the raw material, which requires an appropriate industrial equipment to work with. Thus, technical investments have had to be made, requiring important financial supports as well as training activities aimed at informing and educating the existing staff.

5. Discussion and Implications

This qualitative study identifies unexplored dimensions of FFs' innovation by considering how environmental issues can be adopted for developing new products and how the product innovation can take place in a family business. By doing so, this study adds different improvements to prior literature on FFs' innovation, while suggesting also practical implications for FFs' managers. From a theoretical standpoint, three main contributions arise from this study. First, it investigates how innovation is carried out by FFs, instead of analysing only antecedents and outcomes of the innovation process (Calabrò et al., 2019; De Massis et al., 2013; Roed, 2016). By observing the development of the DV Glass®, the research goes deep into this process, analysing the main steps and figures involved. In this regard, the case study reveals its value in enriching the theoretical debate on the role of the ownership in affecting the innovative behaviour of a FF (De Massis et al., 2013) and confirms the existence of a positive relationship between family involvement and innovation outputs. Consistent with prior studies (e.g., Miller and Le Breton-Miller, 2005; Sirmon and Hitt, 2003), indeed, our findings show that the founder and his sons' involvement represents a critical factor for innovation. With respect to DV Glass®, they inspired the original idea, thus moving the innovation process, and further provided financial, managerial, as well as technical and operational supports to its realization. Second, this study contributes to the theoretical discussion concerning the relationship between FFs and environmental issues. Our findings are in line with previous researches highlighting that FFs are often engaged in environmental practices (Craig and Dibrell, 2006; Núñez-Cacho et al., 2018). Fiam, in fact, has always paid great attention to environmental sustainability, basing its core business on glass processing. Moreover, it gradually improved the adoption of environmental certifications and practices aimed at enhancing its ecological efficiency. As the DV Glass® project demonstrates, the company has enhanced its ability to integrate environmental practices into product design elements. Following the eco-design principles, Fiam has involved all stages of the value chain, in order to realize a new product that is both innovative and environmentally sustainable. Therefore, the Fiam case study provides an insightful example of how the implementation of eco-design practices could result in the realisation of innovative design-based products within a FFs setting, which has been scarcely investigated by previous research (Núñez-Cacho et al., 2018). Furthermore, by considering the concept of eco-design as one of the pillars on which the circular economy is based (European Commission, 2015; European Environmental Bureau, 2015; Ellen Macarthur Foundation, 2013), this study provides evidence that also FFs can move towards a circular business model, by exploiting the potential benefits that are linked to

reduce, reuse and recycle practises (Barbaritano et al., 2019).

The third contribution of this study concerns the theoretical debate on FFs and the execution of open innovation (Casprini et al, 2017). Despite prior studies (e.g.: Classen et al., 2012) suggested that FFs often prefer a closed approach to innovation, by using internal knowledge, our analysis reveals that Fiam is a very "open" firm. It collaborates with a number of national and international designers as well as with other companies operating in different industries, such as wood. These collaborations improve the company's innovativeness and its ability to successfully compete with increasingly innovative products, incorporating new materials and technologies.

As concerning the practical implications, various suggestions can be drawn from this study. In line with previous researches (e.g., De Massis et al, 2013; Llach and Nordqvist, 2010), entrepreneurial inventiveness emerged as critical for affecting FFs' willingness to innovate, as well as to integrate environmental issues within innovative processes and products. If the owner/s strongly believe in the potential that can arise from the implementation of environmental practices, a considerable involvement within the company, like in this case, can facilitate the management of the innovation process by transmitting common values and goals through more personal relationships, not only working ones. Managers, employees, and workers thus recognize in the owner/s a critical role, and this could also result in better company's performances, as they all feel belonging to a unique entity. However, as the analysis of Fiam suggests, a slender and functional organisation should be developed to encourage and enhance collaborations, both within the company, and with external actors and stakeholders. Inside the company, Fiam highlights that an adequate communication, along with informal and planned meetings between family members and between them and employees are helpful for stimulating and managing the innovation, sharing new ideas and enriching the personnel involvement in environmental projects and practices. Outside the company, this study strengthens the importance of industry clusters based on strategic partnerships between actors and stakeholders (Schuler and Buehlmann, 2003). Fiam declared to be involved in several partnerships within the furniture district where it operates, which reveal their importance for managing environmental practices and related innovations. Again, the role of the family owner emerges as critical, since its relationship networks are essential for involving financial, technology and innovation resources, as well as commercial capabilities, such as communication and/or sales skills. Another suggestion concerns the economic limitations and the lack of investments in R&D that sometimes characterize family businesses like Fiam (Terziovski, 2010). The case study confirms their importance, since they could limit the practical implementation of sustainable inno-

vative practices. The development and subsequent monitoring of the DV Glass® project have required appropriate equipment, as well as several investments in R&D, technology and marketing. They were fundamental to carry out some experiments and were hard to deal with, but without them DVGlass® would never have been developed. Here, the possible role of Governments and public institutions occurs, as it could be critical to provide economic and financial incentives and measures that support the family companies' efforts towards environmentally sustainable innovation.

Additionally, an adequate level of consumers' awareness about environmental issues has shown its importance in this study, as it can motivate FFs' efforts to innovate. Fiam clearly believed, and declared, that innovation should be able to satisfy consumers' expectations both in terms of environmental sustainability and design. Therefore, innovation should always be oriented towards the the market demand. Thus, the crucial role of marketing is highlighted, as it can enhance the internal communication and the sharing of the consumer culture across different company's departments (Srivastava et al., 2001). In this regard, functions with customer-facing responsibilities (such as sales, customer service, product/service delivery, etc.) should be in the best position to ensure that customers' needs are listened and translated by the FF into new products. Finally, external communication was found to be another critical area for the success of innovation. Fiam was very effective in communicating the DV Glass® innovation and related collections. The communication strategy was deeply based on relational and direct activities, such as the participation in sectoral fairs by family members and exhibitions at museums, which provide customers the opportunity to learn more about the company and its offerings (Millán and Díaz, 2014). This kind of communication could be recommended since it engages and enhances collaborations with consumers, as well as to develop brand-attachment and to share the brand values. Thus, it should be preferred for communicating exclusive brands, which are design-intensive, meanwhile they integrate some ethical values like environmental compatibility. In this regard, as suggested by Fiam, also the use of social media platforms could be considered as a powerful and flexible tool, as well as the personal communication developed by the retail system, which can contribute to reveal the innovative skills of the company in a way than is better that the conventional communication.

6. Conclusions, limits and future research direction

This study provides empirical evidence that environmental sustainability can be considered among the innovative and powerful forces generating new products and processes within FFs (Dai et al., 2015).

Starting from one of the main principles of the circular economy, namely *recycle*, Fiam recently developed the idea of recycling waste arising from manufacturing processes in order to realize innovative products, while preserving their design and quality. This resulted in a new type of glass, never seen before for its depth and colours, introduced in the market in 2018 (i.e. DV Glass®). It helped Fiam in achieving interesting economic results, especially in the current scenario, where an increase in consumers' awareness towards these topics has been observed.

Undoubtedly, the single case study approach presents some limitations mainly related to the results' generalizability, as well as to the subjectivity of the researchers' interpretation (Grant and Verona, 2015; Vissak, 2010). Such limitations, combined with the inconclusiveness of prior research investigating the relationship between FFs, innovation and environmental practices, certainly call for future studies in this area.

Further qualitative analysis with explorative purposes could be drawn using a cross-case comparison. Multiple case studies, indeed, while being particularly suited to address "how" and "why" questions (Einsenhardt and Graebner, 2007), also allow the identification of similarities and differences among different cases (Yin, 1981), thus improving the comprehension of the phenomenon.

This could be particularly useful given the heterogeneity of FFs, resulting from different structural and organisational conditions. Future research could focus on such peculiarities, including age, generation level, degree of family involvement in ownership, internationalization, with the aim to provide further evidence of their effects on FFs' behaviour during the implementation of innovative processes and, more generally, on their propensity toward environmental innovation. This could provide novel perspectives to understand the innovation dynamics and activities within FFs. Given the critical role of the family involvement in the innovation process, another suggestion for future research concerns the development of a longitudinal study aimed at investigating how innovation and eco-design adoption can evolve over the time if the family ownership changes during succession processes or is diluted through an equity sale or new equity issuance. Finally, starting from contradictory findings emerged in prior research concerning open innovation in FFs (Feranita et al., 2017), and given the success of the Fiam's open approach that was found in this study, it is in our future intentions to explore how specific FFs' attributes can facilitate or hinder open innovation, by investigating the role of some factors, such as non-economic goals and/or type of ownership.

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