

Entrepreneurial approach for open innovation: opening new opportunities, mapping knowledge and highlighting gaps

Entrepreneurial
opportunities
for open
innovation

1347

Giulia Flamini, Massimiliano Matteo Pellegrini and
Mohammad Fakhhar Manesh

*Department of Management and Law, University of Rome "Tor Vergata",
Rome, Italy, and
Andrea Caputo*

*Department of Economics and Management, University of Trento, Trento, Italy and
Department of Management, University of Lincoln, Lincoln, UK*

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Abstract

Purpose – Since the first definition of open innovation (OI), the indivisible relationship between this concept and entrepreneurship was undeniable. However, the exact mechanisms by which an entrepreneurial approach may benefit OI processes and vice versa are not yet fully understood. The study aims to offer an accurate map of the knowledge evolution of the OI–entrepreneurship relationship and interesting gaps to be filled in the future.

Design/methodology/approach – The study adopted a bibliometric analysis, coupled with a systematic literature review performed over a data set of 106 peer-reviewed articles published from 2005 to 2020 to identify thematic clusters.

Findings – The results show five thematic clusters: entrepreneurial opportunities, organisational opportunities, strategic partnership opportunities, institutional opportunities and digital opportunities for OI. Investigating each of them, the authors created a framework that highlights future avenues for further developing the topic.

Originality/value – This study is the first of its kind to systematise, analyse and critically interpret the literature concerned with the topic of the OI–entrepreneurship.

Keywords Open-innovation, Entrepreneurship, Bibliometrics, Systematic literature review

Paper type Research paper

1. Introduction

The first definition of open innovation (OI) was conceived by Chesbrough (2003), who considers it as a paradigm for technological advancement suggesting how firms should use both internal and external contributions and paths to market. The concept has influenced not only a wide range of managerial disciplines as dealing closely with innovation but also the literature on entrepreneurship has increasingly developed around a framework of openness (e.g. Dahlander and Gann, 2010; Huizingh, 2011; Laursen and Salter, 2006; Rexhepi *et al.*, 2019). Previous studies showed how the open type of innovation holds important implications for entrepreneurial activities, for example, OI enables a full exploitation of a firm (entrepreneurial) ecosystem (e.g. De Brito and Leitão, 2021). Yet, there may also be an



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interesting reverse causality that has received only a residual attention (Eftekhari and Bogers, 2015; Rexhepi *et al.*, 2019): how could entrepreneurship and its characteristics help to promote and manage OI? According to Randhawa *et al.* (2016), the central role of the firm characteristics in OI has been quite enquired, while the entrepreneurs, and their knowledge, skills, and competences, developing business models based on OI strategies (Chesbrough and Garman, 2009) are still the focus of limited attention. Indeed, entrepreneurial skills may be key to fully reading, understanding and exploiting the benefits of OI (Ahn *et al.*, 2017; Kim and Ahn, 2020). In addition, the OI literature still needs to delve more into mechanisms and consequences of the management of OI partnerships/networks and the involvement of customers and communities in co-creation processes (Randhawa *et al.*, 2016). Both processes instead are quite central in an entrepreneurial perspective (e.g. Kraus *et al.*, 2019; Harryson, 2008).

To explore the relationships between entrepreneurship and OI, it is important to consider the recent evolution that both fields of knowledge are undergoing, such as the advent of digital economy and entrepreneurship (Caputo *et al.*, 2021; Kraus *et al.*, 2019). The interactions in this world are faster and not locally bounded, and the involvement of a plethora of actors is opening up many opportunities for entrepreneurship (Allen *et al.*, 2020; Frigotto and Palmi, 2020). These challenges compel a renewed interest in analysing the role and mechanisms through which entrepreneurs and entrepreneurial approaches can facilitate and develop an effective OI strategy. Despite the close relationship between the two concepts, there is still a lack of a precise effort towards a systematisation of such knowledge (Ortiz-de-Urbina-Criado *et al.*, 2018). Consequently, a specific focus on the OI–entrepreneurship relationship is necessary to systematise what exists on the topic and propose valuable insights on the existing gaps to produce valuable bases for entrepreneurs in order to capture all OI opportunities and to push future collaborations (Appio *et al.*, 2014; Pellegrini *et al.*, 2020). To do so, we used a bibliometric approach, completed by a systematic literature review, on 106 peer-reviewed articles published from 2005 to 2020, rendering a very condense structure articulated into five clusters: entrepreneurial, organisational, strategic partnership, institutional and digital opportunities.

The paper makes several contributions. The most prominent is the systematisation of the literature that enquires OI paradigms and entrepreneurship. To the best of our knowledge, so far there has been only one interesting attempt to map the whole field made by Ortiz-de-Urbina-Criado *et al.* (2018). However, their approach was mostly bibliometric, thus presenting only figures of the field. To that, we added a clear interpretation of the topic's several research streams, also updating and expanding their time span of research. A second contribution lies in providing recommendations on how an entrepreneurial framework can be used to advance OI research. These recommendations address research gaps in OI identified through the novel, systematic and objective empirical analyses of the field's structure and content. Furthermore, we propose an analytic framework to interpret promising research areas within these clusters, proposing a set of explorative and exploitative research questions (Pellegrini *et al.*, 2020), forming a clear agenda for the future of OI–entrepreneurship research. Thus in addition to the previous bibliometric study on the topic (Ortiz-de-Urbina-Criado *et al.*, 2018), we developed a clear research framework adding more specific indications for setting the future agenda.

The paper is organised into six sections, including this introduction. The second one describes methodological protocol and issues. Section 3 presents the study results, respectively showing the pure bibliometric results and the cluster analysis outcomes commented using a systematic literature review approach. Section 4 proposes an interpretative framework aimed at suggesting an agenda for future research. The final section summarises the conclusions and limitations of the study.

2. Methods

The research design has been articulated through a mixed-method approach that identifies state of the art and consolidates the dynamics among OI and the entrepreneurship literature. Firstly, a bibliometric examination was executed to set the boundaries of the relationship, and later, its findings were analysed via a systematic review approach. This protocol has already largely validated by relevant investigations both in the entrepreneurial and innovation fields (e.g. [Caputo et al., 2021](#); [Dabić et al., 2020](#); [Fakhar-Manesh et al., 2021](#)).

An *ad hoc* research protocol composed of three steps guided this research. First, an exhaustive query was performed on topmost scientific citation databases. The goal was to fetch the highest spectrum of documents to adequately respond to the research necessities (data collection). Next, the authors held a series of panel meetings to develop the inclusion and exclusion criteria to prepare the final data set of impactful documents (data preparation). Finally, the actual analysis was performed (core analysis).

2.1 Data collection

At the beginning of June 2020, a preliminary query was launched to come up with an initial list of meaningful items. Several string attempts have been made to create a shared understanding about the specificity of the topic and set a preliminary inclusion or exclusion criteria. The initial queries were performed both on Web of Science and Scopus databases as the most extensive and credible sources for bibliometric analyses ([Ding et al., 2016](#)). The cross-validation of the results, however, favoured Web of Science database listing most relevant studies and without notable differences from Scopus. Consequently, Web of Science was selected as the primary citation source.

At the end of the initial attempts, the research team decided to keep balance in being inclusive but also specific. Employing a Boolean search, the search string query was the following:

$$TS = ("open\ innovation" AND "entrepren*")$$

The "TS" operator offers a search on title, abstract or keywords. The asterisk (*) was accommodated to encompass latent variations and approved accumulating the largest feasible number of contributions related to both concepts. We did not further refine these broad concepts to be more inclusive as possible, but, on the other hand, we wanted to only focus on contributions addressing OI paradigms and not related concepts. The search focuses exclusively on "articles" and "reviews" written in English ([Ramos-Rodríguez and Ruiz-Navarro, 2004](#)). The final query was executed on 22 June 2020, and as a result, 290 documents were initially collected.

2.2 Data preparation

Accounting for of an extensive range of documents, the dataset preparation was planned using the strategy suggested by [Tranfield et al. \(2003\)](#). All obtained contributions were transformed into an electronic worksheet with the inclusion of their metadata, and next, all authors screened separately the entire collection of documents, concentrating on the title, abstract and keyword. After that the authors arrived unanimously to agree upon three final criteria for the exclusion: (1) the items which did not address issues related to both concepts (74 items); (2) the items which merely reported irrelevant issues with no direct attention on the role of the entrepreneur for OI (83 items); (3) the items that did not contribute to advancing insights into the interplay between OI and entrepreneurship (27 items). This examination was aimed at removing from the analysis those items which, although consistent with the contents of the research string elaborated to collect relevant scientific contributions, did not provide adequate evidence and/or understandings into the main issues which were addressed in this research. Applying these criteria, 184 contributions were found to as irrelevant and left the data set, making it composed of 106 papers for the core analysis.

2.3 Core analysis

The core analysis was developed using a bibliometric approach based on the visualisation of similarities (VOS) technique (Van Eck *et al.*, 2006). The analytic software used is VOS viewer v.1.6.10 (Van Eck and Waltman, 2010), which principally functions on the VOS method as its aggregation mechanism (Van Eck and Waltman, 2007). More precisely, this research selected the bibliographic coupling as the aggregation pattern to elucidate about research streams (Kessler, 1963; Van Eck and Waltman, 2010). The bibliographic coupling analysis facilitates examining the current research activities and distinguishing the latest knowledge trends, which are associated with earlier research streams or extend from pre-existing knowledge (Hervas-Oliver *et al.*, 2015). This method favours this study by providing two views: (1) prospective view: an accurate evaluation of the relationship between entrepreneurship and OI; (2) retrospective view: primary contributions through reconstruction of the intellectual process towards identifying the modern trends and future priorities as reflected by the research forefronts. In particular, bibliographic coupling examines if two items commonly possess one or more shared references; the larger the number of shared references between the two sources, the higher chance these two items belong to the same group (Boyack and Klavans, 2010). Theoretically speaking, this indicates the possibility that the two contributions belong to the same research stream. Specifically, the VOS viewer generates a matrix through a mathematical procedure that normalises the co-occurrence of all items' references (Van Eck and Waltman, 2007); consequently, it forms a two-dimensional graph for the entire set of items located according to their similarity measures, or in other words, the similarity in their references sets. Therefore, the given graph is a plot in which the items' distance from one another refers to their relatedness, and VOS groups them based on their highest number of shared references. The items that belong to an identical group are indeed positively associated and, as a result, could classify a loosely-connected block of knowledge and serve as a unitary discourse for further research (Van Eck and Waltman, 2010). The bibliometric coupling analysis was developed using some controls for the VOS viewer's parameters to assure consistency among identical patterns and assist in adjusting each group to a sufficient similarity level (Small, 2009; Glänzel and Thijs, 2012). The bibliographical coupling threshold was set at minimum, just one citation connection, to provide the highest chance for documents to be engaged in clusterization. However, whether the link strength of an item was zero, it should be omitted from the analysis due to a lack of relationships with any other record. Consequently, only 103 articles were involved in the VOS viewer clustering analysis. The cluster analysis was also double-checked in relation to the fit of the analysis. Specifically, all authors screened the papers inside each cluster to acknowledge the consistency in the VOS clusterization results. Consistently with the most suitable methodological approach (Tranfield *et al.*, 2003), the selected contributions were separately scored using their total and normalised citation numbers and were then scanned based on their meaningfulness for previewing the main topics of each cluster. This step was crucial to identify a viable number of contributions that fully correspond to the main research objectives.

The final procedure was a systematisation of the VOS viewer results. The clustering analysis results were put forward to interpret concepts and the current intellectual structure, via a systematic literature review.

3. Results

3.1 Descriptive analysis of the bibliographic data

The descriptive analysis acknowledges a constant growth of attention to the OI-entrepreneurship relationship. This analysis permits articulation of different indicators which contribute to address the underpinning concerns about the interplay between open innovation and entrepreneurship. Firstly, the attention is given to the distribution patterns of

the documents over the year. Figure 1 shows that the first paper collected was published in 2005, and probably related to the first development of the whole OI paradigm (Chesbrough, 2003). However, only about a decade later (year 2016) represents the real “leap” for the field with a significant rise of contributions (14), almost three times more than the year before. The number of publications were almost equal for the year 2017. Finally, the last three years are the most intense in terms of the number of publications. This added particular value to our research that expanded previous preliminary summarising efforts including the most relevant years.

Secondly, the descriptive analysis presents information about the top authors who contributed most and the highly impactful contributions. In this vein, Kyungbae Park and Jinhyo Joseph Yun are the two authors with four publications and Kaja Rangus, with three publications who profoundly devoted their attempts to the extant debate thus far and are conceived of the most productive contributors (Table 1). Considering the highly cited contributions, an essential portion of these articles involves OI topics although the entrepreneurship issues are significantly addressed. Some have taken their approach to better realise the interaction among entrepreneurship and open innovation concerns (Table 2).

Lastly, the most influential journal for the topic is realised as *Research Policy*, even if with just three papers, but with a total of 505 citations (Table 3). However, *Technological Forecasting and Social Change* (7 publications) and *R&D Management* (6 publications) journals have the highest number of publications. In the remaining list, most of journals belong to the innovation field, for example, *Journal of Product Innovation Management*, *Technovation* and *International Journal of Technology Management*, referring that OI scholars pay significant attention to the entrepreneurship domain.

3.2 Results of cluster analysis

From the cluster map, the VOS analysis result (Figure 2), the field’s intellectual structure can be seen and appreciated (Pellegrini et al., 2020). The structure possesses a particularly dense network that indicates the extremely intertwined nature of the several research streams. Despite this dense network, five clusters emerged that could be seen as a centre– periphery structure. The blue

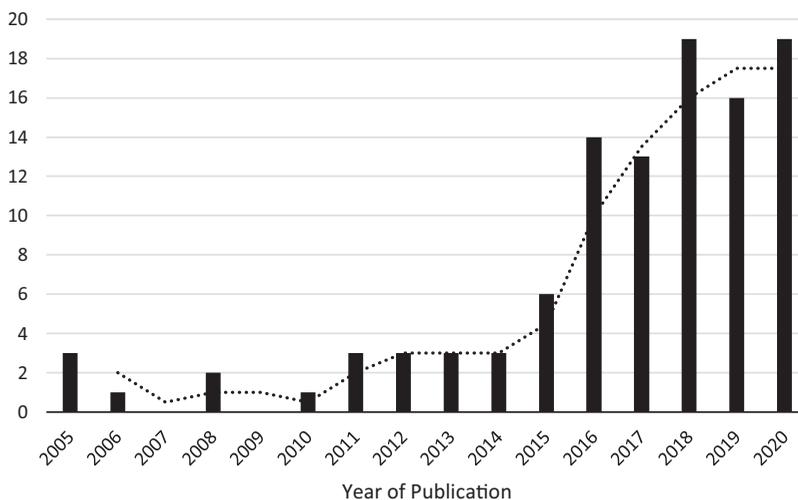


Figure 1.
The distribution of
documents over
the years

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Table 1.
Most productive
authors

Author	No. of publication	Total citation
Kyungbae Park	4	31
Jinhyo Joseph Yun	4	31
Kaja Rangus	3	3
Ross Brown	2	55
Letizia Mortara	2	46
Joon Mo Ahn	2	26
Jeongho Yang	2	16
Alenka Slavec Gomezel	2	3
Anna Claudia Pellicelli	2	2
Gabriele Santoro	2	2

Table 2.
Most cited articles

Article	Title	Total citations (TC)	TC per year
Christensen <i>et al.</i> (2005)	The industrial dynamics of Open Innovation-Evidence from the transformation of consumer electronics	290	18.12
Cooke (2005)	Regionally asymmetric knowledge capabilities and open innovation exploring 'Globalisation 2' - A new model of industry organisation	214	13.37
Cheng <i>et al.</i> (2014)	When Is Open Innovation Beneficial? The Role of Strategic Orientation	118	16.85
Chaston <i>et al.</i> (2012)	Entrepreneurship and open innovation in an emerging economy	76	8.44
Van der borgh <i>et al.</i> (2012)	Value creation by knowledge-based ecosystems: evidence from a field study	65	7.22
Gruber and Henkel (2006)	New ventures based on open innovation-an empirical analysis of start-up firms in embedded Linux	64	4.26
Kohler (2016)	Corporate accelerators: Building bridges between corporations and startups	52	10.4
Brown and Mason (2014)	Inside the high-tech black box: A critique of technology entrepreneurship policy	49	7
Cohen <i>et al.</i> (2016)	The city as a lab: open innovation meets the collaborative economy	45	9

Table 3.
Most important journal
outlets

Journal	No. of publication	Total citations
<i>Research Policy</i>	3	505
<i>R&D Management</i>	6	125
<i>Journal of Product Innovation Management</i>	1	118
<i>Research-Technology Management</i>	1	112
<i>International Journal of Technology Management</i>	2	106
<i>Technological Forecasting and Social Change</i>	7	101
<i>Management Decision</i>	3	79
<i>Technovation</i>	2	77
<i>Asia Pacific Journal of Management</i>	2	61
<i>Business Horizons</i>	1	52
<i>California Management Review</i>	1	45
<i>Strategic Entrepreneurship Journal</i>	3	45
<i>Economic Development Quarterly</i>	1	41
<i>Creativity and Innovation Management</i>	2	34
<i>European Planning Studies</i>	3	31

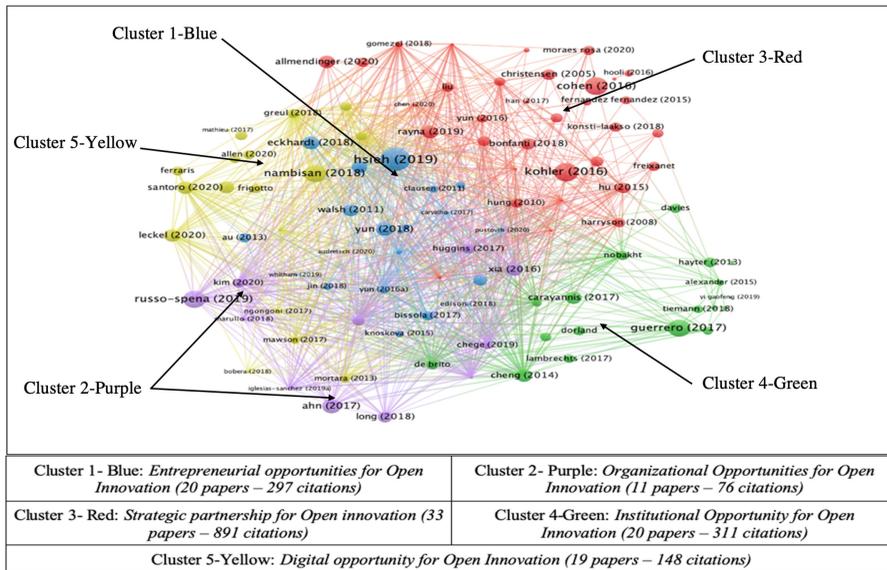


Figure 2. Cluster analysis map

cluster is the central one, with slightly blurred borders and several overlaps with all other clusters. These characteristics confer the status of “bridge” to the blue cluster and, consequently, the logical basis for the others. The other four clusters, that is, purple, red, green and yellow, are better defined. To assess the several thematic areas, which are comprehensively reviewed in the following sub-sections, we used a central concept in entrepreneurship, such as the one of opportunity to interpret the role and meanings of different sources and contexts from which an entrepreneur or an entrepreneurial leader may drive insights to create a more efficient OI strategy and system for her/his company.

To add further interpretative power to our results, we analyse each cluster that resulted in a nested keyword analysis. In particular, each cluster has been further analysed in term of keywords, that is, aggregation of them presented in its documents. Each cluster shows two central topics that quite obviously are the query terms: open innovation and entrepreneurship. However, what characterises the cluster are the additional topics that helped to define the whole interpretation.

3.2.1 Blue cluster: entrepreneurial opportunities for open innovation. As premised, this is the central cluster and fundamental for the others too. Most of the papers in the blue cluster utilise the theory of Schumpeter (1934), the father of the “creative destruction”, to explain how an innovation is not only technology and science-based but also passes through a firm adoption and elaboration (Yun *et al.*, 2018; Chaston and Scott, 2012; Lundström and Zhou, 2011).

Entrepreneurs need to have knowledge and skills to exploit market information and translate it into possible opportunities (Hsieh and Wu, 2019; Eckhardt *et al.*, 2018; Walsh and Linton, 2011).

The papers in this cluster, seem to have two different approaches to these potential entrepreneurial opportunities: the discovery and creation theory approaches (Alvarez and Barney, 2007). Discovery theories confer a condition of “existence” of opportunities in the environment and therefore place importance to the entrepreneurs’ ability of sensing them. Papers that reconnect with this paradigm are related to the newest outbound theory of OI,

underlining that the main activities of an entrepreneur are to seek and scan the environment so as to discover opportunities aiming to produce new products or services (Eftekhari and Marcel, 2015); in sum her/his ability is to recognise market opportunities. The OI system favours the production of information, and they can be subsequently used by entrepreneurs (Jin and Ji, 2018). Effective entrepreneurs are expert of the market dynamics (Eckhardt *et al.*, 2018), they have a really open mindset and an entrepreneurial orientation that is apt to see and seize opportunities (Yun *et al.*, 2018). An entrepreneurial mindset is essential for OI to identify and exploit opportunities and to develop and shape business models “fetched” with knowledge captured from the external environment (Eftekhari and Bogers, 2015). In these regards, Bissola *et al.* (2017) express that such a mindset is stimulated by an entrepreneurial education able to sustain learning and acquiring entrepreneurial and innovative competencies.

Contrary to this, creation theories postulate a strong morphogenetic power of the entrepreneurs to shape/create their own opportunities (Alvarez and Barney, 2007). Considering this, in papers using such a paradigm, the entrepreneurial opportunities are related to OI inbound theory, where the opportunities are created by the actions, reactions and enactment of entrepreneurs exploring ways to produce new products or services (Lundström and Zhou, 2011). Indeed, the technology strategy and entrepreneur skills need to act together to create innovative opportunities (Clausen and Rasmussen, 2011; Au *et al.*, 2013). The role and ability of the entrepreneurs and entrepreneurial leaders are to create market opportunities according to the resource at hand and the establishment of lasting relationships with internal and external actors (Au *et al.*, 2013; Bissola *et al.*, 2017). Walsh and Linton (2011) consider that entrepreneurs need skills to manage and organise the firm to take advantage of market opportunities specially mapping their knowledge basis and filling possible gaps. Thus, in addition to market information, internal information about the organisational resources and knowledge are vital to understanding how such internal characteristics can favour and support the OI (Au *et al.*, 2013).

3.2.2 Purple cluster: organisational opportunities for open innovation. The main focus of papers in the purple cluster is centred on describing how the organisational boundaries and internal capabilities are essential for discovering, capturing and embracing the innovation opportunities given by the OI and thus improving innovation performance.

Great research emphasis is given to the concept of absorptive capacity, internal research and development (R&D) resources, new product development and inbound strategies. Indeed, organisations must consciously invest resources to increase their absorptive capacity (Huggins and Thompson, 2016; Kim and Ahn, 2020), especially in relation to the R&D department (Russo and Di Paola, 2019; Xia and Roper, 2016). Through proper human resource management practices (HRMPs), entrepreneurs/entrepreneurial leaders can improve the organisation’s ability to absorb and distribute external knowledge within and outside the organisational boundaries (Chege and Wang, 2019). In addition, entrepreneurs/leaders should also manage flows of knowledge through the definition of a systemic and supportive knowledge management system able to define the relationships between external and internal information and therefore to determine their correct allocation within the organisational structure (Huggins and Thompson, 2016; Chege and Wang, 2019).

To guarantee skills for interpreting, understanding and assimilating external knowledge, organisations should abandon current routines, replacing them with new job roles/functions, and new recruiting, training and compensation practices (Long and Blok, 2018). Furthermore, entrepreneurs/leaders should build a correct and friendly OI climate/culture (Kim and Ahn, 2020) to minimise the internal resistances to change and thus optimising the benefits of OI activities (Ahn *et al.*, 2017). To do so, entrepreneurs/leaders’ personal characteristics are also relevant (Marullo *et al.*, 2018; Russo *et al.*, 2019), especially leadership skills (Ahn *et al.*, 2017; Huggins and Thompson, 2017). However, there are also other relevant factors; the

entrepreneur/leader's attitudes towards OI are considered a good proxy to explain the intention to adopt OI strategies (Ahn *et al.*, 2017; Kim and Ahn, 2020); past experiences, educational background, and technological expertise of the entrepreneur influences the way in which he/she interprets market events and strategic choices (Marullo *et al.*, 2018).

3.2.3 Cluster red: strategic partnership opportunities for open innovation. The concept of OI given by Chesbrough in 2003 is strongly connected to the one on networking, coordination and partnerships (Bonfanti *et al.*, 2018; George *et al.*, 2015; Chesbrough *et al.*, 2006). Papers in the red cluster specifically deal with opportunities that organisations can capture from the construction of an effective innovation partnership portfolio (Pellegrini *et al.*, 2019); specifically, how and why companies choose to participate in innovation partnerships and how they can manage their internal resources to bring value to all the firms involved.

Digging into the partnerships' "universe", several papers focus on the problem of asymmetrical partnerships. The complementary nature between business models of start-ups and/or SMEs and big companies, if properly leveraged, may represent an important source of innovative opportunities for both entities (Kohler, 2016). To create an effective asymmetric innovation partnership, a fundamental element is the strategic partner's attitude (Harryson, 2008). The feeling of trust helps the initiation and stability of an asymmetry partnership. However, Allmendinger and Berger (2020) also underline the environment's role in influencing the feeling of trust, representing the entrepreneurial decision context, and the entrepreneur/leader's characteristics. In fact, her/his level of openness and entrepreneurial orientation influences the way of perceiving possible partners (Allmendinger and Berger, 2020), especially the evaluation of trustworthiness, willingness to communicate, learning and the extent to which relevant knowledge are made accessible (Hung and Chiang, 2010). However, these feelings and affinities must be reciprocal, so there should be a positive evaluation from both sides of the partnership (Harryson, 2008). This can favour mutual learning, knowledge exchange, effective communication, and effective shared decision-making during the collaboration and, above all, a high expectation of reciprocity (Allmendinger and Berger, 2020) and commitment (Christensen *et al.*, 2005; Hu *et al.*, 2015). Undoubtedly, asymmetry partnerships require formal contracts that determine the terms of collaboration and eliminate the possibility of opportunistic behaviours (Christesen *et al.*, 2005; Kohler, 2016; Van der Borgh *et al.*, 2012), especially from big companies that have a consolidated base of resources and knowledge which allows for appropriation spillovers (Pellegrini *et al.*, 2019). Since creating efficient partnerships is central for this cluster, the selecting and entering activities have particular relevance. Christesen *et al.* (2005) explain that selecting and entering into a partnership is a complex process that requires cognitive skills, high levels of confidence, and excellent adaptability skills, as the practices, strategies and modalities of partnerships may change over time or based on the life cycle of a technology. Simultaneously, entrepreneurs/leaders of small and medium enterprises (SMEs) are trying to increase their visibility, while big companies seek to generate innovation. Corporate accelerators can also be a solution (Kohler, 2016); they are able to combine the economy of scale and scope of large companies and the entrepreneurial spirit of SMEs.

Finally, an effective partnership does not only create opportunities and value for the partnering organisations but also for other stakeholders (Cohen *et al.*, 2016), making a significant social impact (Rayma and Striukova, 2019). Governments should support the growth of these innovative partnerships to facilitate the creation of entrepreneurial ecosystems, flywheels of economic, innovative and social opportunities especially for emerging countries (Cooke, 2005). Effective local partnerships make cities a vibrant environment for innovation and an attractive context for creating other innovation partnerships (Cohen *et al.*, 2016).

3.2.4 Green cluster: institutional opportunities for open innovation. The papers in the green cluster enquire opportunities spurring from an institutional environment, thus not only from

a partnership context as in the previous cluster. The green cluster describes how organisations can transfer technology to each other through institutional actors, such as governments and universities (Guerrero and Urbano, 2017; De Brito and Leitão, 2021). The triple-helix approach (enterprise–university–government) is mostly adopted, and the government assumes a central role (Carayannis *et al.*, 2017; Davies *et al.*, 2020) by not only providing research funds to universities and enterprises but also defining the “rules of the game”, thus shaping directions and abilities to interact for the formed innovative network (Sharifi *et al.*, 2014). Thanks to policymakers’ interventions, universities can provide numerous opportunities to enterprises in relation to technological trajectories, knowledge and resources (Hayter, 2013; Brown and Mason, 2014). However, to do so, universities need an entrepreneurial vision, knowledge and capabilities (Sharifi *et al.*, 2014; Davies *et al.*, 2020). Indeed, for a long time, universities have been recognised as predominant in producing new knowledge and human capital (Hayter, 2013), but nowadays they are required to accelerate the creation of innovation networks, productivity and new jobs (Hayter, 2013). However, universities lacking entrepreneurial acumen should be helped in such a transition also by an active role of partnering enterprises (De Brito and Leitão, 2021). This mutual relationship between triple-helix agents is particularly evident across all contributions.

3.2.5 Yellow cluster: digital opportunities for open innovation. The papers in the yellow cluster analyse how technological progress has enriched the panorama of opportunities for OI strategies. Information communications technology (ICT) have redefined the meanings and ways of an innovative collaboration (Mortara *et al.*, 2013), influencing the very nature of OI (Nambisan *et al.*, 2018), and creating new “physical collaboration spaces” often involving cities and territories (Frigotto and Palmi, 2020), or totally virtual environments such as digital platforms (Allen *et al.*, 2020; Gruber and Henkel, 2006). In this cluster, a wider ecosystem than the traditional OI environment is considered with obvious implications for entrepreneurship. Gruber and Henkel (2006) and Mortara *et al.* (2013) describe the opportunities that entrepreneurs can bring when they come to digital platforms. OI strategies performed in digital platforms allow for lowering barriers to entrance, diversifying the market, creating places for fundraising capital and reducing sunk costs (Nambisan *et al.*, 2018). Indeed, active participation in these digital platforms increases the organisation’s visibility in consumers’ eyes, helps building a technical reputation and bootstraps internal capacities, thanks to the support of outside development (Greul *et al.*, 2018). To do so, and specifically to actively engage with the platform, entrepreneurs must possess skills and abilities. Santoro *et al.* (2020) and Greul *et al.* (2018) propose a micro-foundation approach since factors at the individual level can impact those at the macro or organisational level. In this sense, entrepreneurs’ role is to guide and push the business process towards OI by leading workers towards participation in virtual, informal, and R&D networks (Gruber and Henkel, 2006). Yet, entrepreneurs/leaders should specifically consider relationships with platform leaders, who are able to influence the architecture and structures of participation and the directions of the innovation (Santoro *et al.*, 2020).

Considering the “physical collaboration spaces”, cities are becoming entrepreneurial ecosystems, where investments in human, social and structural/ICT capital develop innovation and where knowledge and digital technology are shared (Frigotto and Palmi, 2020; Leckel *et al.*, 2020; Ferraris *et al.*, 2020).

4. Research agenda and interpretative framework

To provide a comprehensive understanding of the multiple relationships between entrepreneurship and OI, thus proposing future research avenues, we choose to develop an interpretative framework (Tranfield *et al.*, 2003) that “lays out the key factors, constructs, or variables, and presumes relationships among them” (p. 440) (Miles and Huberman, 1994). Following the approach adopted by Pellegrini *et al.* (2020), our framework has been developed

by applying an already existing map of the wider field of OI to the specificity of its features in relation to entrepreneurial activities. In particular, the bibliometric study performed by [Randhawa et al. \(2016\)](#) in the *Journal of Product Innovation Management* shows the conceptual structure with three foci: (1) *Firm-centric aspects of OI* concern the analysis of elements within the firm’s boundaries to assure an organisation and implementation of OI strategies and to enable technology transfer and knowledge exchange; (2) *Management of OI networks* assesses the influence of the environment on an OI strategy. This regards both institutional networks and more focal- and industry-level milieus; and (3) *Role of users and communities in OI*, as intuitively understandable, particularly relates to an important stakeholder such as the costumers and users’ communities and their precious insights to develops new project and ideas. By intersecting our five clusters of the thematic analysis with these OI themes, our framework ([Table 4](#)) highlights how numerous research gaps and possible future research directions emerge. Our dynamic and integrative framework help us to develop a systemic vision not only of the company and the relationship between OI and entrepreneurship but also of being an entrepreneur. A systemic vision helps us to describe all the possible opportunities that OI could offer and so even indicates new research questions and theories that can be used.

Based on this interpretative framework, for each cluster we propose ([Table 5](#)):

- (1) a set of “exploitative research avenues,” that are, directions that despite having already been investigated, may still present further interesting developments;
- (2) a set of “explorative research avenues,” that is, directions that have not been investigated either or to a minimal extent.

4.1 Future research directions on entrepreneurial opportunities

The cluster focuses on the entrepreneur, for example, on her/his several entrepreneurial and managerial skills, where the organisation is seen as a simple and instrumental context to circulate information within and outside its boundaries ([Eckhardt et al., 2018](#)). Thus, considering the firm-centric aspects of our interpretive framework, the cluster does not enquire the organisation’s active role in managing and creating flows of information and knowledge ([Chaston and Scott, 2012](#)). Future studies have to consider that an organisation, synergistically with its entrepreneur, transforms information into knowledge, manages the different flows of information and knowledge, and influences the innovation process with its capabilities ([Au et al., 2013](#); [Hsieh and Wu, 2019](#)). Thus, one of the research gaps, which

OI trends Clusters	Firm-centric aspects of OI (Randhawa et al., 2016)	Management of OI networks (Randhawa et al., 2016)	Role of users and communities in OI (Randhawa et al., 2016)
Entrepreneurial opportunities (blue)	(x)	(x)	–
Organisational opportunities (purple)	X	–	–
Strategic partnership opportunities (red)	X	X	(x)
Institutional opportunities (green)	(x)	X	(x)
Digital opportunities (yellow)	–	X	X

Note(s): X strong consideration, (x) slight consideration, – lack of a proper consideration

Table 4.
Interpretative
framework

Cluster	Research gap	Potential research questions
Entrepreneurial opportunities (blue)	Explorative RA Entrepreneur–organisation fit (firm-centric aspects)	(1) What are the most important internal information that the entrepreneur needs to know? (2) How can the entrepreneur have a full awareness of the variables s/he must be able to manage? (3) How should entrepreneurs manage human capital to guarantee correct information/knowledge flows inside the organisation?
	Exploitative RA Mutual social influences exerted by OI partners (managing of the network)	(1) How mutual relationships with OI partners influence the sense making and the decision-making of entrepreneurs?
Organisational opportunities (purple)	Explorative RA Improve the management of customer information (consumers' and users' roles)	(1) How could the entrepreneurs improve the relationship with the customer to gain good quality information? (2) How could the entrepreneurs use the big data to improve customer information?
	Exploitative RA Organisational change (firm-centric aspects)	(1) How can OI change the organisational structure? (2) How can entrepreneurs guide an effective OI change inside the organisations? (3) How does OI change distribution and balance of power inside an organisation?
	Explorative RA Motivate workers to improve networking activity (managing of network)	(1) How can HRMP systems help entrepreneurs to improve the motivation of workers involved in OI activities? (2) How can the behaviour of entrepreneurs motivate the worker to improve effort dedicated to OI activities?
Strategic opportunities (red)	Explorative RA Improve the relationship between the organisation and customers (consumers and users roles)	(1) How can organisational culture improve the relationship with customers? (2) How do customers influence the organisational OI culture? (3) How can the relationship with customers influence the OI culture?
	Exploitative RA Fit between organisational structure and partnership (firm-centric aspects)	(1) How can entrepreneurs shape organisational structure in relation to specific OI partnerships? (2) How can the best type of leadership be determined in reason of the characteristics of OI partnerships?
	Exploitative RA Network structure (managing of network)	(1) How do entrepreneurs manage a partnership portfolio structure? (2) How can entrepreneurs negotiate and bargain advantageous deals? (3) How can corporate entrepreneurship increase the efficiency of managing OI partnerships?
	Explorative RA Customer integration (consumers and users roles)	(1) How can entrepreneurs integrate customers' insight and involvement in the OI partnership? (2) How can customers improve the OI management?

Table 5.
Research agenda

(continued)

Cluster	Research gap	Potential research questions	
Institutional opportunities (green)	Exploitative RA Organisational change in public organisations (firm-centric aspects)	(1) How can public administrations manage organisational and cultural change to adopt OI strategy?	
		(2) Which type of organisational change is necessary to adopt OI strategies in public companies?	
		(3) How can institutional actors change their organisational culture to improve OI strategy?	
Digital opportunities (yellow)	Exploitative RA Different interest fit (managing of network)	(1) How can public and private actors align their objectives and interests to partnering in an OI context?	
		(2) How can public and private actors interact effectively?	
		(1) How can citizens ameliorate the public-private relationships?	
Digital opportunities (yellow)	Explorative RA Citizen (consumers and users roles)	(2) What is the best approach to include the citizenship in the helix model?	
		(1) How do digital technologies and revolution impact on organisational processes and business models?	
		(2) How do we evaluate these impacts?	
Digital opportunities (yellow)	Exploitative RA (managing of network)	(1) How can entrepreneurs become leaders in OI digital networks and platforms?	
		Exploitative RA (consumers and users roles)	(1) How can entrepreneurs lead smart city processes?
			(2) How can citizens improve smart city processes?

Table 5.

should be covered in future, is related to the missing link and the complex nexus of relationships between the entrepreneur and the organisation. A contingency approach could help the entrepreneur to explore the possible interrelated internal/external complexities and its fit to build an effective OI strategy. At the same time, according to a purely contingency theory, there is no single best way to design an organisation. Future research directions should underline how entrepreneurs can enhance their OI's performance by achieving a fit between their strategic and organisational choices and the particular external environmental contexts in which they operate (Katsikeas *et al.*, 2006).

In this vein, some considerations should be taken in terms of the fit between entrepreneurial sense-making of organisational characteristics (e.g. size, age, technology base, industry) and the real complexity of the OI opportunities that the entrepreneur has to manage. Besides, relevant opportunities for OI can be spotted, created and appropriated also, thanks to the human capital of the organisation (Eftekhari and Bogers, 2015). However, many times the managerial and operative structure, collaborators and their relative networks, in a word, the overall organisational system, are overshadowed (Chaston and Scott, 2012; Au *et al.*, 2013). A proper organisational system assures a correct flow of information within the organisation and thus a proper implementation of an OI strategy (Russo-Spena and Di Paola, 2019; Chege and Wang, 2019). Thus, all of these could be summarised in a set of overarching explorative research avenues: *What are the most important internal information that the entrepreneur needs to know? How can the entrepreneur have a full awareness of the variables he/she must be able to manage? And how should entrepreneurs manage human capital to guarantee correct information/knowledge flows inside the organisation?*

Instead, talking about the management of network aspects, the cluster recognises the importance of this topic but mostly the entrepreneur's interpersonal skills (Eftekhari and Bogers, 2015). Instead, what is overlooked is an organicist vision of the organisation's socio-technical system. In future, research must explore the mutual and reciprocal social influences that the actors of innovative partnerships may have on each other, also considering the leading actor, the entrepreneur. Partners influence each other's abilities to sense opportunities and decision-making approaches (Pellegrini *et al.*, 2019). Albeit, the topic is well enquired, an additional exploitative research avenue may be: *How do the mutual relationships with OI partners influence the entrepreneurs' sense-making and decision-making?*

Finally, as much as the organisation, consumers in these clusters are merely addressed as passive subjects (Eckhardt *et al.*, 2018; Hsieh and Wu, 2019). They represent a valuable source of information which are not active actors in creating innovation (Jin and Ji, 2018). In this case, interesting future studies should differentiate consumers' roles in reasons of their characteristics, the information or communication channels related to them, and how this information can be managed (Mortara *et al.*, 2013). There are several explorative research avenues to sum up: *How could entrepreneurs improve the relationship with the customer to gain good quality information?* And *how could entrepreneurs use big data to enhance customer information?*

4.2 Future research directions on organisational opportunities

The second cluster has a prominent inward orientation. Thus, it is natural that the most enquired aspect of OI is the firm-centric aspects related to the human capital and the entrepreneurial and strategic ability to gain external knowledge (i.e. absorptive capacity) (Russo-Spena and Di Paola, 2019; Xia and Roper, 2016; Huggins and Thompson, 2016). However, the second cluster does not fully consider how to manage the organisational changes that are necessary for OI strategies (Xia and Roper, 2016; Long and Blok, 2018; D'Angelo and Baroncelli, 2020). Moreover, the activation of OI strategies modifies the organisation's internal power dynamics that must be managed to achieve effective performance. Change is an ever-present feature of organisational life (Burnes, 2004). Therefore, an entrepreneur needs to have the ability to identify where to be in the future and manage the changes required to get there (Senior, 2002). Future studies should use change management theories to help the entrepreneur in managing these challenges effectively and developing the correct managerial capabilities.

Overarching exploitative research avenues could be: *How can the OI change the organisational structure?* *How can entrepreneurs guide an effective OI change inside the organisations?* And *how does the OI change affect the distribution and balance of power inside an organisation?*

Second, the internal management of the OI strategy would also require a proper organisational structure and adaptation to better support the intense knowledge transfer within the OI networks (Iglesias-Sánchez *et al.*, 2019; Marullo *et al.*, 2018). While the entrepreneur is undoubtedly a central figure regarding this matter (Ahn *et al.*, 2017), a firm's internal human capital is also involved (Russo-Spena and Di Paola, 2019; Marullo *et al.*, 2018). Although a cultural aspect is mentioned, a more strategic approach to human resource (HR) practices could be also studied to improve workers' motivation and capacities to support network activities. For example, the social exchange theory (SET) perspectives could help future research to explain the relationships between HRM practices, OI organisational culture and employees' engagement. All these arguments can be summarised in some explorative research avenues: *How can HRMP systems help entrepreneurs improve the motivation of workers involved in OI activities?* And *how can the entrepreneurs' behaviour motivate workers to improve their effort dedicated to OI activities?*

The last aspect is a better consideration of stakeholders' feedback, especially from users and communities. Similar to the previous external aspect, also concerning users, future studies should explain how the interaction with users and communities could reflect on some organisational arrangements. While stakeholders' feedback are already highly regarded in the strategic management of an OI strategy, future studies could explain how these feedback could also offer an indication in supporting the organisational structure and culture. The explorative research avenues and directions related to this gap could be the following: *How can the organisational culture improve the relationship with customers? How do customers influence the organisational OI culture? And how can the relationship with customers affect the OI culture?*

4.3 Future research directions on strategic opportunities

The third cluster covers topics related to characteristics that allow for good partnership management. Thus, it connects the internal environment with the outside (in the close network). However, the literature on strategic and entrepreneurial characteristics and mindsets to govern the process are disregarded. Indeed, the assumption that the entrepreneur has a key role in choosing a particular partnership based on his/her personal characteristics is clear, but future studies need to describe and analyse how he/she could become the master of the organisational system to favour the partnership. Thus, some exploitative research avenues emerge: *How can entrepreneurs shape organisational structure in relation to specific OI partnerships?* And *what could be the right type of leadership based on the characteristics of OI partnerships?*

Despite being partnership-centric, the cluster does not take into consideration inter-organisational aspects of such agreements (alliances, joint ventures, etc.) and the overall structure of the network and portfolio. Future studies should analyse how organisations' characteristics, objectives and bargaining power may reflect upon the overall portfolio strategy (Pellegrini *et al.*, 2019). Yet, the negotiation capability of the entrepreneur is also crucial to strike and manage advantageous deals, especially in the context of SMEs (Hydle and Billington, 2021).

At the same time, there is no consistent evidence from a big company perspective. This is an acceptable reason of the focus on entrepreneurship, leading scholars to study entrepreneurial ventures and innovative start-ups mostly. However, new studies in the corporate entrepreneurship perspective should emphasise the entrepreneurial process in established companies that represents a vital tool of OI partnerships. All of this is summarised in several exploitative research avenues: *How do entrepreneurs manage a partnership portfolio structure? How can entrepreneurs negotiate and bargain advantageous deals? And how can corporate entrepreneurship increase the efficiency of managing OI partnerships?*

Finally, while recognising the relevance and importance of customers, citizens, end-users and beneficiaries in general for a successful partnership, most of the papers do not explain their active role in it. So, these subjects' engagement is considered an outcome rather than an element to achieve innovative results. Possible future directions should cover this missing understanding of consumers' engagement and involvement process, especially considering the improvements achievable. It can be summarised with two explorative research avenues: *How can entrepreneurs integrate customers' insight and involvement in the OI partnership? And how can customers improve the OI management?*

4.4 Future research directions on institutional opportunities

The fourth cluster expands the external dimension of the previous one. The focus is on the triple helix approach and, in particular, on two institutional actors of this triad, that is, mostly

universities and government. Considering this specific configuration, the gaps will be highlighted in relation to pertinent issues of these actors.

The papers encourage the adoption and creation of entrepreneurial mindsets by academics to achieve efficient innovative partnerships between their universities and enterprises. While this has a positive impact on the territory, it also implies organisational changes that universities must adopt, specifically considering the specificity of universities' employees, or in a larger sense, of public ones. Indeed, drivers and logics that move public employees' behaviours are different. To build an effective OI strategy, universities and government cannot simply and blindly adopt best practices and results obtained in the private sector. Future investigations should use theories related to the public service motivation to understand how to motivate public workers in OI activities. This shows further refinement to be expressed in several exploitative research avenues: *How can public administrations manage organisational and cultural change to adopt an OI strategy? Which type of organisational change is necessary to adopt OI strategies in public companies? And how can institutional actors change their organisational culture to improve their OI strategy?*

Public and private actors have different culture, strategies and aims. Still, for an effective OI partnership, they must collaborate actively. However, contributions are scarce considering how difficult it is to achieve a common strategy for OI especially in cross-sectional partnerships. Future studies should cover several explorative research avenues: *How can public and private actors align their objectives and interests to partner in an OI context? And how can public and private actors interact effectively?*

The role of communities and users is stressed in only one paper (Carayannis *et al.*, 2017). It describes the quadruple-helix model, that is, enterprises–government–university–users, conferring a proper role to the latter category. In most papers, communities are seen as mere beneficiaries of an effective triple-helix partnership, and citizens are seen simply as customers. However, for fully understanding the power of the citizenship in the OI process, future studies should describe how the other triple-helix actors could actively involve citizens in creating innovations. Thus summarising, research avenues may be the following: *How can citizens ameliorate the public–private OI relationships? And what is the best approach to include citizenship in the helix model?*

4.5 Future research directions on digital opportunities

ICT and the latest technological evolution changed designing, implementing and networking in OI strategies. Especially on the networking aspect, the digital revolution has opened the market reducing the entry barriers sensibly (Greul *et al.*, 2018).

While it is acknowledged that the entrepreneurs' characteristics in digital networking and the organisational necessities to deal with this new and more interactive way of networking is wholly overlooked. Future studies should underline the impacts that these changes may have on the organisational performance to develop an effective new digital style of communication and coordination. For example, new tools, processes, skills, and roles that an entrepreneur must have or oversight to drive the organisational change connected with the digitalisation, are not identified within the literature. Business model innovation theory could help entrepreneurs understand the new organisational challenges and the impacts of digitalisation. To sum up, the explorative research avenues may be the following: *How do digital technologies and revolution impact organisational processes and business models? And how do we evaluate these impacts?*

As premised, the networking aspect is the main topic, and as much as in other clusters, the entrepreneur's role is central for the creation and development of innovation partnerships. Great attention is given to the opportunities spurring from the digital environment. However, less is known about how, proactively, entrepreneurs can become leaders of a digital platform;

future studies are required to understand the leadership role in a digital space and the correct strategies to achieve this position. Thus an exploitative research avenue is the following: *How can entrepreneurs become leaders in OI digital networks and platforms?*

Finally, with the advent of the digital platform, consumers have finally become central actors in the innovation process and thus for OI. However, the concept of consumers is limited; according to the new paradigm of smart cities and the “new integrated spaces” generated, also citizens use, live, evaluate, contribute, and are willing to participate in the innovation of products and processes. The fifth cluster accurately describes how organisations can exploit consumers’ knowledge and skills to create innovation. Still, future studies need to describe the active role of citizenship. This leads to explorative research avenues such as the following: *How can entrepreneurs lead smart city processes? And how can citizens improve smart city processes?*

5. Conclusions

Since Schumpeter’s (1934) work, the link between innovation and entrepreneurship is clear. Entrepreneurship can represent the bridge between purely corporate issues and those relating to innovation, helping to understand how companies can make and manage OI. While OI creates opportunities for businesses to survive and grow, only an entrepreneurial vision and alertness are able to transform the opportunities. This study thus performed a bibliometric analysis to map this interesting relationship between OI and entrepreneurship. Our results advanced the systematisation of the current knowledge on the topic and, above all, allowed for creating an interpretative framework to set a precise research agenda. Entrepreneurship can help develop OI theories by enriching the concept of innovation with that of entrepreneurial growth. In fact, OI creates new opportunities, but it is only with studies relating to the business system that the opportunities are transformed into value for the business and all the stakeholders. However, the paper is not without limitations; those concerns are similar to all literature-based studies, and in particular, it could be summarised in methodological and interpretative issues. Concerning both, the authors’ team adopted counter strategies to reduce to the minimum of the possible biases. First, the protocol has been validated by all research members, with clear exclusion criteria and further double-checked on the two main databases in management. Second, the used framework has an analytic nature which creates an agenda by crossing both previous results on OI (Randhawa *et al.*, 2016) and that of this study.

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About the authors

Giulia Flamini, Ph.D., is currently a research fellow in the Department of Management and Law of Tor Vergata University. Her research interests include family firms and human resource management systems, with a special interest in the new concepts of managerialization and professionalisation of family businesses. Giulia is now a Professor for the courses on business organisation and organisational choices in family business in business administration at the School of Economics of the Tor Vergata University.

Massimiliano Matteo Pellegrini is an Associate Professor of organisational studies and entrepreneurial behaviours at the University of Rome "Tor Vergata". Previously, he worked at Roehampton University Business School and University of West London. He is the editor of the book series "Entrepreneurial Behaviour" (EmeraldPublishing), Associate Editor at the *International Journal of Transition and Innovation System*, and past Chair of the Strategic Interest Group of Entrepreneurship (E-ship SIG) at the European Academy of Management (EURAM). He published more than 70 contributions in highly-ranked journals, for example, *Journal of Business Research*, *Small Business Economics*, *Journal of Business Ethics*, *IEEE Transaction on Engineering Management*, and *Journal of Managerial Psychology*. Massimiliano Matteo Pellegrini is the corresponding author and can be contacted at: massimiliano.pellegrini@uniroma2.it

Mohammad Fakhar Manesh currently studies at the Department of Management and Law, University of Rome Tor Vergata. He is a Ph.D. candidate in business management and accounting. At present, his main area of research is for the concepts embedded in the fourth stage of industrialisation and entrepreneurship, innovation, knowledge management and individual/organisational behaviour. In particular, he is an expert in bibliometrics analysis, text mining and data analysing research. He presented his works at several international conferences, and he was able to already publish several papers in good journal, for example, *IEEE Transactions on Engineering Management*, *Thunderbird International Review* and *Journal of Family Business Management*.

Andrea Caputo is an Associate Professor in strategy and entrepreneurship at the University of Trento, Italy, and at the University of Lincoln, UK. His main research interests are in entrepreneurship, decision-making, internationalisation, and strategic management. He published in several international journals, including *Human Resource Management Journal*, *Journal of Business Research*, *Small Business Economics*, *International Journal of Conflict Management*, *Journal of Cleaner Productions*, and *IEEE Transactions on Engineering Management* among the others. Andrea is an Associate Editor of the *Journal of Management and Organisation* and a board member of the *International Journal of Conflict Management* and the *International Journal of Entrepreneurship and Small Business*.