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Introduction

The purpose of this special issue is to provide a contribution to the increasing interest in knowledge transfer (KT) and organizational performance and business process. In this perspective, past, present and future issues discussing the relationships between the transferability of knowledge and company performance management and outcomes emerged. Thus, the aim of this special issue is to advance existing theories in the field of KT.

The increasing trend in studying KT started at the beginning of the twenty-first century. KT became the hottest topic for several disciplines among which business, management and accounting studies. Searching for KT on the Scopus database (www.scopus.com), results are very impressive and significant for the academic community and practitioners. Over 11,000 documents results are found in which more than 3,100 documents in the field of business, management and accounting studies.

Major contributions on KT (until the first 15 universities affiliation on Scopus) resulted from Europe, Asia and Australia. Additionally, identifying documents by countries, Scopus results highlight the prominence of USA and UK at the top of the classification. However, journals publishing on KT are generalist and specialist scientific journals. Additionally, a search in Google Scholar (June 2018) on KT reveals that over 500,000 documents exist, recognizing a high level of citations.

The relevance of knowledge in obtaining high and positive results in the company system has been analyzed from several perspectives in the international literature: the knowledge creation and transfer in and between organizations have been covered in several studies (Argote and Guo, 2016; Gil and Carrillo, 2016). Although positive results by KT are in the increasing competitive advantages of the firms and organizational performance and improvement of business performance, KT is not always without critical issues (Argote and Ingram, 2000). However, the current knowledge economy highlights the relevance of understanding if knowledge is transferable as well as which are the variables influencing organizational performance in all types of companies, including start-ups companies requiring new forms of financial funds (Lombardi et al., 2016).

Thus, KT into the organization and business processes is relevant to achieve high performance, innovation processes and competitive advantages. Organizational performance needs to be managed (Jones and Mahon, 2018; Lombardi et al., 2014) and monitored in order to control, address, communicate companies’ outcomes: the improvement of organizational performance derives also from sharing target knowledge. In this direction, the proposition of adequate methods and conceptual models is strategically relevant for management and organizational purposes, as they permit to draw positive outcomes in organizations and competitive business processes. Thus, the current scenario led to new advanced knowledge and modern companies became competitive on the market through the sectorial and specific knowledge, determining their success, total value and performance in the long term.

This special issue is the results of collaborative activities with several people. First, the author would like to thank Professor Majed Al-Mashari, the Chief Editor of the journal, for having accepted this special issue proposal on a thrilling and interesting topic. Second, the author would like to express gratitude to the editorial team of BPMJ. Third, the author would like to thank all the authors and reviewers involved in this special issue for their valuable contributions supporting the aim to advance knowledge in the field of KT.
Thus, this special issue is mainly directed to propose advances on which are organizational performance and business process’s main issues in the past, present and future perspectives influenced by KT. Contributions of this special issue answer some questions such as: “What is the influence and the role of knowledge in organizational performance and business process?” and/or “What are the connections between knowledge transfer and organizational performance and business process?” and/or “What conditions, factors and contexts help knowledge to be transferable, for contemporary companies?” Overall, I point out that papers of this special issue are theoretical and empirical studies of high quality. Adopting several methods (qualitative, quantitative or mixed) to develop studies of this special issue, the authors analyzed relevant issues of KT and organizational performance and business process.

In presenting this special issue, I have chosen a logical order of the papers starting from some theoretical models to sectorial-based analysis (e.g. education, healthcare, food). In doing so, the papers of this special issue included articles focused on several main issues connected to KT. The first three papers propose, respectively, the curve of knowledge as a conceptual model on KT (De Luca and Cano Rubio, 2019), the literature review on KT in inter-organizational partnerships (Milagres and Bucharth, 2019) and emerging issue of KT and organizational performance (Trequattrini et al., 2019).

Further papers investigated the impact of patenting on the performance of academic spin-off firms (Ferri et al., 2019), the role of cultural intelligence in KT process performance (Vlajic et al., 2019), key factors promoting knowledge-intensive business processes (Aureli et al., 2019) and KT and open innovation in the healthcare ecosystems (Secundo et al., 2019). The last four papers analyzed patterns of knowledge dissemination on Lean in the Italian National Healthcare Sector (D’Andreamatteo et al., 2019), the role of relational capital (RC) in university (Paoloni et al., 2019), network rents and KT (Pellegrini et al., 2019) and the role of the entrepreneur in the KT process of a start-up enterprise (Cardoni et al., 2019). The next sections present a synopsis of these papers.

Synopsis of the papers
The first paper by De Luca and Cano Rubio (2019) presents the knowledge transfer curve (KTC) as theoretical model able to evaluate KT process on the basis of its speed rather than the content of the knowledge to be transferred. Thus, the authors attribute to KT a key role in a firm’s capability to compete in the business over time. De Luca and Cano Rubio (2019) point out that one of the most relevant problems in KT is related to the definition and control of the main variables able to give effectiveness and efficiency to the entire process in the business systems. Thus, in the paper by De Luca and Cano Rubio (2019), the maximization of the effectiveness and efficiency of the KT process derives from the content of knowledge to be transferred (the complexity, quality and quantity of the information transferred within the firm), and the speed of the KT process (the time in which the KT can be realized). In this way, the authors summarized the paradigm of the theoretical model KTC as “for a defined level of knowledge to be transferred, the higher the speed of the process is, the higher the efficiency and effectiveness of the entire knowledge transfer process will be” (De Luca and Cano Rubio, 2019). Thus, De Luca and Cano Rubio (2019) provide a theoretical model measuring the effectiveness and efficiency of the entire KT process based mainly on its speed for a defined level of knowledge to be transferred.

Milagres and Bucharth (2019) in their study analyze KT in inter-organizational partnership proposing a thrilling literature review in 2000–2017, collecting information from top 10 journals referring to the fields of strategy and innovation studies. The paper by Milagres and Bucharth (2019) proposes advances on KT starting from the concept of “knowledge” and proposing main factors influencing KT in inter-organizational partnership in the light of macro-environmental (e.g. industrial policy, macroeconomic policies, intellectual property regime), inter-organizational (e.g. cost-sharing and synergy-seeking...
motives), organizational (e.g. capabilities, intangible resources, behavioral aspects and internal processes) and individual levels (e.g. motivation, emotions, learning behavior, resistance). Thus, an original perspective in the paper by Milagres and Bucharth (2019) derives from the proposition of a novel theoretical framework of KT based on antecedents, process and outcomes. Milagres and Bucharth (2019) introduce the KT evaluation issue and propose suggestions for practitioners referred to the environment development for learning in the inter-organizational partnership.

The paper by Trequattrini et al. (2019) deepens the emerging issue of KT and organizational performance in the football industry. The paper aims to study the role of manager transfers in achieving greater organizations’ performance identifying which conditions, factors and contexts help knowledge to be transferred and to contribute to the organizations’ success. Trequattrini et al. (2019) employ a qualitative comparative analysis to analyze 41 cases of coaches that managed clubs competing in the major international leagues in the 2014–2015 season, and that moved to a new club over the past five seasons. Thus, the paper by Trequattrini et al. (2019) is interesting for both the methodology employed and the results obtained. Indeed, the paper integrates the best features of the case-oriented and variable-oriented approaches to show the combinations of variables required to achieve the managers’ skills transferability and performance improvement. Interestingly, findings build on previous studies providing a new perspective on the topic. The paper could be a useful tool to football clubs to understand what configuration of conditions promotes new coaches’ integration and KT.

The paper by Ferri et al. (2019) analyses the interaction among two KT mechanisms-patents and academic spin-off investigating what extent patents – viewed as the incorporation of knowledge transferred by the parent university and academic founders – and what affect the performance of academic spin-offs. Ferri et al. (2019) propose data from 132 academic spin-offs of 67 Italian universities tested through panel data models. Findings by Ferri et al. (2019) support the KT literature along three main ways and provide reflections for future research. First, the study by Ferri et al. (2019) should inform the research agenda of KT scholars by suggesting the opportunity to analyze, in a combined way, two different, but also typical, mechanisms adopted by the university to transfer knowledge: patents and spin-offs. Second, the paper by Ferri et al. (2019) confirms the role of patenting processes as a transfer mechanism of explicit knowledge in academic spin-offs. Third, the authors add a brick to other studies on the trade-off between external knowledge access and internal knowledge protection. Thus, findings shed light on the “dark side” of patenting by providing insights to dissolve the dilemma of academic spin-off founders: the patenting process is a positive driver of spin-offs’ performance. However, the results also push to warn academic entrepreneurs.

The paper by Vlajcic et al. (2019) aims to discover which is the role of cultural intelligence in KT processes analyzing the influence of the geographical distance between headquarters and subsidiaries in MNCs. In this perspective, the tripartite literature review included in the paper by Vlajcic et al. (2019) (KT regarded as a business process; MNC, geographical distance and KT; cultural intelligence and expatriate managers) is directed support the aims of this research explaining interesting research hypothesis. Thus, Vlajcic et al. (2019) propose a relevant analysis of 103 senior expatriate managers from Croatia collecting data through questionnaires and testing results through PLS. The paper by Vlajcic et al. (2019) opens up new research paths revealing the influence of geographical distance between headquarters and subsidiaries, and cultural intelligence assumes a fundamental role in the KT process performance.

In the paper by Aureli et al. (2019), I retrieve an analysis exploring key factors improving knowledge-intensive business processes. Aureli et al. (2019) propose the formulation of creative solutions to management problems through the process of creative problem solving. The study by Aureli et al. (2019) suggests that a fruitful approach to investigate the process of creative problem solving is to focus on the factors that may support and improve
the process itself. Thus, Aureli et al. (2019) propose a research model to examine the impact of selected variables of a firm’s KM infrastructure on creative problem solving. Practical contributions by Aureli et al. (2019) suggest that managers who support a well-structured creative problem-solving process positively affect the quality of decisions and these positively impact competitive performance. Theoretical contributions by Aureli et al. (2019) support the idea that research on BPM can move away from its operational roots when focused on IT systems for process support and aimed to understand how to improve organizational efficiency and efficacy in manufacturing processes.

The conceptual paper by Secundo et al. (2019) proposes an interesting analysis of open innovation at the inter-organizational level in the healthcare ecosystem by adopting a narrative literature review approach. Particularly, Secundo et al. (2019) investigate which is the way to transfer knowledge and what is the flow of KT among key players such as regulators, providers, payers, suppliers, patients by healthcare system supporting open innovation processes. However, the paper by Secundo et al. (2019) provides an innovative and illuminating interpretative framework of KT in open innovation in healthcare ecosystems based on the players’ categories, the exploration and exploitation stages of innovation, KT and flows according to categories of players, the players’ motivations and position for open innovation. The contribution of the paper by Secundo et al. (2019) provides to managers and policy makers a theoretical support in defining organizational models directed to support open innovation in healthcare ecosystems.

In the next paper by D’Andreamatteo et al. (2019), I retrieve an interesting managerial approach to improve existing healthcare processes. D’Andreamatteo et al. (2019) propose an exploration of patterns of dissemination of knowledge on Lean in the Italian National Healthcare Sector, proposing three cases of analysis in the private and public healthcare organizations. The paper by D’Andreamatteo et al. (2019) suggests a range of economic, coercive, mimetic and normative pressures (Di Maggio and Powell, 1983) spreading the implementation of this business process improvement strategy, also proposing how prominent key actors prompted the adoption of Lean. The contribution of the paper by D’Andreamatteo et al. (2019) in the understanding of the transfer of knowledge of Lean from other sectors is two-fold. First, the study explores an under-investigated field and answers to the call of Di Maggio and Powell (1991) for “expanded institutionalism,” highlighting patterns of isomorphic change in the healthcare sector. Further, it reveals the pivotal role played by individuals in the institutionalization process (Dacin, 1997). Managers and policy makers can benefit from the understanding of such dynamics as well as possible modes of implementation as stemmed from the three cases proposed by D’Andreamatteo et al. (2019).

The paper by Paoloni et al. (2019) is directed to show the relevance of RC in university organizations emphasizing how it contributes to the promotion and the effectiveness of the university third mission. The original case study proposed by Paoloni et al. (2019) permits to understand how a new research observatory from an Italian university enhances RC. Additionally, the paper by Paoloni et al. (2019) demonstrates that the creation of relational capital (RC) for the host university represents the result supporting the knowledge transition and transfer of the observatory’s promoters’ relationships. Thus, the main research contribution proposed by Paoloni et al. (2019) is directed to understand how these organizations foster the development of RC analyzing it as a dynamic “path model” and inviting scholars, managers and politicians involved in the higher education to gain a greater understanding of this relevant and innovative topic.

The next paper by Pellegrini et al. (2019) explores the knowledge recombination rents in terms of KT and combination within and across the firm portfolio of inter-organizational relationships. By proposing what is KT and relational rents, Pellegrini et al. (2019) assume “relational rents are typically conceptualized at the level of the dyad and focus on the idiosyncratic matching of jointly owned resources, shared capabilities and the coordinated
efforts of both organizations within a given relationship” (Dyer and Singh, 1998; Lavie, 2006). However, the authors propose both theoretical and practical contributions. First, Pellegrini et al. (2019) provide a theoretical holistic framework supporting knowledge recombination within the firm portfolio of relationships. Second, the authors recognize the holistic framework as “easy to use” tool composed of seven propositions (internal and external fits) supporting the strategic planning process by relationship managers.

The paper by Cardoni et al. (2019) proposes the analysis of the KT process in a craft brewery start-up. Cardoni et al. (2019) aim to identify the relevant knowledge and the transfer steps that led to successful results, investigating the role played by the entrepreneur in this process. Thus, framing the analysis on major literature on knowledge management and KT for SMEs, Cardoni et al. (2019) adopts the Liyanage et al. (2009) analytical approach to interpreting the KT as a social and interactive process based on several components and steps that have to be carefully disaggregated and managed. In the paper by Cardoni et al. (2019), I retrieve the case study of a craft brewery that in few times has achieved remarkable results in terms of turnover, customers and production capacity. Through an interview method, Cardoni et al. (2019) represents which are sources or receivers of the relevant knowledge. The paper by Cardoni et al. (2019) proposes that the right process management of KT is fundamental for the success of the company start-up, requiring the selection of forms of relevant knowledge, identifying the appropriate source(s)/ receiver(s) and coordinating the process interaction. Thus, I retain results by Cardoni et al. (2019), which are useful to show the relevant role of the entrepreneur who acquires knowledge from the external sources and transfer knowledge within the business organization, acting as a passionate knowledge broker. However, the authors argue that, in the growth phase, the role of the entrepreneur must change becoming a controller of the organizational learning process.

The future of KT and organizational performance and business process’s studies

I would like to conclude my viewpoint reflecting on the aims and objectives of this special issue in light of previous valuable contributions by scholars of several countries. Thus, the KT topic and main connected issues are receiving great attention in the worldwide context referring also to several economic fields. However, many issues related to KT and organizational performance and business process remain to be resolved, such as the thorny problem of KT assessment and valuation.

Summarizing results of this special issue’s contributions, I would like to point out the relevance of KT for each type of organization starting from the role of the entrepreneur (Cardoni et al., 2019) in promoting KT and high organizational performance and continuing to the internal role of cultural intelligence in KT process performance (Caputo et al., 2019). Emerging issues of KT and organizational performance are analyzed in some relevant fields, such as football industry (Trequattrini et al., 2019), healthcare sector (D’Andreamatteo et al., 2019) and university system (Paoloni et al., 2019). Innovative models supporting KT are directed to study the curve of knowledge (De Luca and Cano Rubio, 2019) and knowledge recombination rents (Pellegrini et al., 2019).

If, on one hand, the literature review on KT in inter-organizational partnerships (Milagres and Bucharth, 2019) and key factors promoting knowledge-intensive business processes (Aureli et al., 2019) appears very useful to show the way in this issue, then, on the other hand, some topics such KT, patents and academic spin-off (Ferri et al., 2019) and KT and open innovation (Secundo et al., 2019) are hugging each other, proposing interesting insights.

Advances from original contributions of this special issue make me think about what is the future of KT organizational performance and business process’s research. Although many issues remain open and unexplored, I retain the future of KT and organizational
performance and business process’s research may be also directed to investigate promising and thrilling issues in the Internet of Things (IoT), Artificial Intelligence, Big Data, Analytics, Cyber-security, Simulations and Digital Integrations and overall Industry 4.0 environments (Bienhaus and Haddud, 2018; Müller et al., 2018; Schneider, 2018).

For example, the investigation of KT in the field of IoT seems to pervade all economic fields: the design of greenhouse monitoring system based on IoT (SSSIT, 2013), the Brain–Computer Interface system for quadriplegic patients (Kanagasabai et al., 2017), IoT for Supply Chain Management (Gustafson-Pearce and Grant, 2017), and smart and connected machines and products for agricultural sector and all economic sectors adopting IoT (Kellmerreit and Obodovski, 2013; Porter and Heppelmann, 2014; Pye, 2014; Rifkin, 2014). Thus, the IoT is “a dynamic and global Internet-based architecture. It is based on standard communication protocols and has a self-configuring capability, with physical and virtual things having identities and being integrated within the information network (Sundmaeker et al., 2010). The IoT is a vision of the future of Internet that combines communication internet, energy internet and logistics internet (Rifkin, 2014)” (Trequattrini et al., 2016).

At this stage, there are few studies (source: Scopus, June 2018) in the field of business, management and accounting analyzing these innovative research perspectives connecting KT and IoT, Artificial Intelligence, Big Data, Analytics, Cyber-security, Simulations and Digital Integrations and overall Industry 4.0 environments. Additionally, privacy and data protection issues within the context of Industry 4.0 deserve a great attention by contemporary companies deputed to close decision-making processes (Lombardi et al., 2014) on which are their smart solutions by Industry 4.0 as well as their intangible assets (Cuozzo et al., 2017; Lombardi and Dumay, 2017) to compete in the worldwide scenario. Thus, the future research seems directed to discover these interesting streams of Industry 4.0 connected to KT issues through theoretical and practical forthcoming contributions, supporting new challenges of all companies.

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References


**Further reading**

The curve of knowledge transfer: a theoretical model

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Abstract

Purpose – The knowledge transfer plays a key role in the firm’s capability to develop and maintain a strategic competitive advantage over time. The capability of the firm to develop an efficient and effective process of knowledge transfer increases the internal skills and then the capability to compete in the business with positive effects on the performance. In order to maximize the effectiveness and efficiency of the knowledge transfer process it must be consider two main variables: the amount of knowledge to be transferred and the speed of the process. In this context, the purpose of this paper is to developed a theoretical model, defined the knowledge transfer curve, able to evaluate the knowledge transfer process on the basis of its speed.

Design/methodology/approach – The curve of the knowledge transfer is based on the methodology of the learning curve. The curve of the knowledge transfer process can be evaluated on the basis of two main variables: the first is the content of knowledge to be transferred. It refers to the quality and quantity of the information to be transferred within the firm; and the second is the speed of the knowledge transfer process. It refers to the time in which the knowledge transfer can be realized. The function of the knowledge transfer is defined using ordinary differential equation.

Findings – There is an inverse relationship between time $t$ and the variation rate $r$. The higher the variable $r$, the faster the knowledge transfer toward the level $K$. Therefore, the variable $r$ measures the efficiency and effectiveness of the knowledge transfer process. On the basis of these considerations, manager must evaluate their policies about the knowledge transfer on the basis of their effects on the variable $r$: only the policy that increases its value can be considered effective for the knowledge transfer process.

Originality/value – The originality resides in the development of a theoretical model that is able to capture and measure the effectiveness and efficiency of the knowledge transfer. It is possible to define a curve of knowledge transfer on the basis of these two variables: content of the knowledge to be transferred and the time of the transfer process, by using an ordinary differential equation.

Keywords Knowledge transfer

Paper type Research paper

1. Introduction

One of the most relevant sources of a firm’s competitive advantage is knowledge (Chen et al., 2006; Grant, 1996; Kang and Hau, 2014). It increases the skills of the firm’s internal structure and its capability to compete in the business over time by developing and maintaining a strategic competitive resource.

In an increasingly dynamic context, firms need to seize signals from the market to remain competitive (Burgelman, 1991; Covin and Slevin, 1989; Floyd and Lane, 2000; De Clerq et al., 2013).

Therefore, different layers of the market—on the one hand, the sectors that have direct transactions with the firm’s organization, such as competitors, suppliers and customers; on the other hand, the layer that represents general relations affecting firms indirectly, such as legal, social and demographic sectors (Xu et al., 2003)—define the external knowledge (Chen et al., 2006). Understanding of the reference market and strong ties with it make knowledge exchanges easy by decreasing uncertainty during decision-making processes (Hansen, 1999; Hansen et al., 2005; Monteiro et al., 2008; Szulanski et al., 2004; Tsai and Ghoshal, 1998; De Clerq et al., 2013).
The firm capability to create value depends also on the integration of external and internal knowledge (Wadhwia and Kotha, 2006; Grant, 1996). Therefore, knowledge can be created and developed within the firm through improvisation (Krylova et al., 2015), innovation (Macdonald, 1995) and experience (Argote and Miron-Spektor, 2011). Internal knowledge promotes firm’s survival and florid prospects in the future (Argote and Ingram, 2000; Szulanski et al., 2004; Kang and Hau, 2014). It is widely recognized that the information available both inside and outside the firm is critical for the manager to understand different areas of action as well as for organizing internal structure to operate in those areas (Rulke et al., 2000). Once it is acquired, it is crucial that knowledge is transferred to others within the firm; only in this way it can create value for the firm. Therefore, knowledge cannot remain available to only one individual, but it must be spread within the firm by strengthening common values and behaviors. A firm’s capability to transfer knowledge is correlated with its performance (Argote, 2015; Krylova et al., 2015; Argote and Ingram, 2000; Darr et al., 1995; Eppele et al., 1996; Tukel et al., 2008).

If knowledge plays a key role in the firm’s capability to generate value over time, therefore one of the most relevant problems is related to the process by which the knowledge can be transferred to each level of the organization.

Generally, knowledge transfer can be defined as a process of exchange of knowledge between different parties in which the acquired information can be used in several ways (Kumar and Ganesh, 2009, p. 163).

It is relevant to note that knowledge transfer must be considered as a process and not as a simple act (Szulanski, 2000). This approach facilitates an accurate comprehension of different learning activities within the firm (Argote, 2015). All the factors involved in the definition of knowledge transfer are predictors of this process (Argote and Miron-Spektor, 2011).

Specifically, the transfer knowledge process refers to the quality and quantity of information to be transferred; they define the content of knowledge. Therefore, it refers to the nature of knowledge and the ways of communication through which it occurs. The organizational structure of the firm plays a key role for the effectiveness and efficiency of the knowledge transfer process (McKenna, 1995). Generally, this process requires hard and soft skills capable to allow a high level of communication at each level of the organization. Therefore, the transfer process generates an incremental flow of information that increases the individuals’ capabilities to do; thus, the characteristics of human capital such as the absorptive capacity (Cohen and Levinthal, 1990; Liao et al., 2003), skills and expertise (Cross and Sproull, 2004) are the most important variable that must be handled. It is relevant to note that knowledge transfer can go beyond the individual level to higher levels, such as teams, groups, divisions or departments, generating common values and goals in order to enhance the entrepreneurial dimension.

In this context, we develop a theoretical model called knowledge transfer curve (KTC) that it can be used to evaluate the process of the knowledge transfer on the basis of its speed rather than the content of knowledge to be transferred.

The KTC can be defined on the basis of two main variables: the first variable is the content of knowledge to be transferred. It refers to the complexity, the quality and quantity of the information to be transferred within the firm. The second variable is the speed of the knowledge transfer process. It refers to the period-time in which the knowledge transfer can be realized.

The KTC is based on the methodology of the learning curve. The capability of the learning curve to capture the transfer of knowledge is well-known in the literature (Clark, 1991; Eppele et al., 1991; Mazur and Hastie, 1978; Zangwill and Kantor, 1998; Levin, 2000; Tukel et al., 2008).

The KTC can be used to evaluate the efficiency and effectiveness of the knowledge transfer process at each level of the firm’s structure. The baseline assumption is that
the higher the efficiency and effectiveness of the knowledge transfer process at each level of the organization, the higher the firm’s performance. The higher the efficiency and effectiveness of the transfer knowledge process, the greater the skills at each level of the organization, the higher the capability to align the success factors of the business to the strategic resources of the firm, and thus the higher the firm’s performance over time (Argote, 2015; Tukel et al., 2008; Levin, 2000).

The paper is structured in four sections: Section 2 defines knowledge transfer in the literature; Section 3 defines the theoretical model and it draws the KTC; Section 4 shows the relevance of speed in the knowledge transfer process; and Section 5 contains brief conclusions and the main limitations and future research lines of this work. The paper as it was thought and developed responds to the special issue about evaluation methods for the assessment of knowledge transfer.

2. Knowledge transfer: literature review

By defining the transfer of knowledge as a process rather than a simple act, one of the most relevant problems is related to the definition and control of the main variables able to give effectiveness and efficiency to the entire process (Liyanage et al., 2009).

The literature identifies two levels to describe how people can learn: first, lower-level learning which is focused on the repetition of past behaviors and is based on the routine activities formed in the short term; and second, higher-level learning which is focused on the development of new insights with effects in the long term, on the basis of the cognitive process that skilled personnel needs (Fiol and Lyles, 1985). These two different forms are classified in different ways in the literature: “surface” and “deep” learning, “adaptive” and “generative” learning (Gibb, 1995; Senge, 1990), “incremental” and “transformational” learning, “instrumental” and “transformative” learning (Mezirow, 1990). Higher-level learning is at the core of the creation of knowledge. It enhances the performance of the firm by facilitating the acquisition and transmission of knowledge. The quality of intellectual capital is the key of a successful process (Cuozzo et al., 2017; Trequattrini et al., 2016).

The transfer of knowledge becomes necessary because people develop the ability to do things differently (Rae, 2005a, b) through a cognitive process that drives individuals to a full awareness of their learning. Usually the transfer can be realized by formal written information (such as books, hardcopy reading materials) or online materials that refer to technology intervention (Tangaraja et al., 2016). The way in which the knowledge is transferred is not important, both modes of codification are relevant because they allow the conveyance of knowledge.

Moreover, the transfer of knowledge is essential, since the inability to do so becomes the reason why most firms fail (Argyris and Schon, 1996; Senge, 1990). The possession of knowledge alone is not able to guide the firm toward bright prospects of success, but it provides the firm with the capability and will to act (Liao et al., 2003).

Specifically, the firm must identify the signals that come from the market and then it must translate this information to transmit it to the organization. The greater the knowledge collected by the firm in a given period of time, the greater its capability to transfer knowledge and to be more proactive, since the firm is able to take advantage from the environment by exploiting opportunities. Therefore, the firm can avoid obstacles and seize opportunities if it manages to understand and transmit the information within its organizational structure. The contribution of new knowledge inside the firm, coming from the outside market, allows it to achieve better performance, because the firm is perfectly aligned with the interests and demands of the surrounding environment. The acquisition of external knowledge and the transmission of knowledge intrafirm are two main components of the absorptive capacity. It “refers not only to the acquisition or assimilation of information by an organization but also the organization’s ability to
exploit it. Therefore, an organization’s absorptive capacity does not simply depend on the organization’s direct interface with the external environment. It depends also on the transfers of knowledge across and within subunits” (Cohen and Levinthal, 1990).

Thus, two types of relationships are created: a relationship between the firm and the external environment, the knowledge is required to understand the needs of the market, and an internal one between the various subunits of the corporate organization to align the internal structure with the required needs of the surrounding and external environment.

We focus our attention on the transfer of knowledge, and therefore, in general, once knowledge is acquired, it is translated and transmitted to the various individuals.

Indeed, knowledge transfer is a process in which the knowledge is transmitted from one person to another directly or indirectly. Thus, there is a dyadic relationship between the source (the owner of knowledge who sends it) and the recipient (the receiver of knowledge that is transmitted). In this interaction, a recipient’s perception of a source’s expertise plays a key role: if the recipient respects and believes in the source’s competence, the former will accept the knowledge and allow the knowledge transfer (Kang and Hau, 2014). However, if the receiver does not trust and believe in the capabilities of the sender, the transmission of the knowledge will not happen. Trust between all individuals involved in the knowledge transfer process facilitates the conveyance of the flow of information. The trust that connects the sender of the knowledge and his/her recipient helps the knowledge transfer to be achieved, but this is also influenced by strong ties. Specifically, these strong ties are preferred because they outline the intensity of the relationship between the source and the receiver, increasing trust and favoring the transfer (Hansen, 1999; Ingram and Roberts, 2000; Kang and Hau, 2014; Ko et al., 2005; Reagans and McEvily, 2003; Tsai, 2002; Uzzi and Lancaster, 2003). They enable the source to explain and transmit the information clearly and in a personalized way, so that the recipient can understand easily (Kang and Hau, 2014). Maintaining strong ties, rather than weak links, strengthens the sharing of common interests and collective goals in order to achieve the common entrepreneurial mission.

The nature of this relationship is based on direct or indirect contact, or differentiated in formal or informal (Tangaraja et al., 2016; Sammarra and Biggiero, 2008), or it is also called relational and non-relational learning channel (Rulke et al., 2000). Direct contact occurs when the individuals involved in the process of the transmission of the knowledge use face to face communication, such as meetings, training activities or when the transfer of knowledge simply occurs through observation. The second one refers to the flow of information that arises through technological means, such as e-mails, phone messages or the use of social networks.

Several empirical studies and research works (Rulke et al., 2000; Galaskiewicz and Wasserman, 1989; Ghoshal and Bartlett, 1988) establish and express a preference among the different learning channels. In particular, some studies highlight the contribution of the relational and direct contact (Darr et al., 1995; Baum and Ingram, 1998; Galaskiewicz and Wasserman, 1989; Huberman, 1983; Liebenz, 1982; Rulke et al., 2000); on the opposite side, other studies (Burke and Bold, 1986) show the importance of indirect and non-relational learning channels to acquire knowledge. According to several authors, all interactions increase the transfer of knowledge (Tangaraja et al., 2016; Fang et al., 2013; Sammarra and Biggiero, 2008; Chen et al., 2006). Therefore, the learning channels are relevant means of transmitting knowledge because they depend on the interactions that connect individuals within the firm. The different interactions between the subjects involved in the process of knowledge transfer tend to have a common entrepreneurial mission that strengthens conscience and membership in the same company.

Therefore, the firm needs managerial capability that inspires higher values and increase awareness of common interest among the individuals of the organization and leads them to
achieve their collective goals. It represents the style of leadership that can be defined as transformational leadership (García-Morales et al., 2012). This ability refers to the possession of skills and competence of communication and, specifically, it relates to the sender of the knowledge. Therefore, the sender of the knowledge, who has good communication skills acquired through experience, is able to explain and transmit the flow of information in a clear and a personalized way, so that the knowledge can be understood easily by the recipient.

Knowledge transfer does not only depend on communication competency but also on the organizational capacity and the decision-making process (Lombardi et al., 2014). It refers to the ability of the manager to design efficient knowledge governance mechanisms that enhance the quality and the quantity of the transferred knowledge. It refers to the hard components of the organizational structure that define its “mechanical operating.” Specifically, it defines the work model of a company which comprises the levels of hierarchy and the mechanism of relationships among all the parts of the organizational structure, both formal and informal. In the traditional structure, the decisions are taken by the top levels and they are communicated to the bottom levels. It describes the formal mechanism of reporting and it is defined as a vertical structure. The communication process usually starts from top levels and it finishes to bottom levels, following an up-down direction. When the vertical structure becomes high, full of many hierarchical levels, it takes a lot of time to acquire and transfer the knowledge from the higher to lower levels because it must overcome a large number of stages. Therefore, the greater the number of hierarchical levels, the greater the time of the transmission of knowledge in the process. Thus, the number of levels of the organizational structure affects knowledge transfer by slowing the speed of the transfer process. This speed represents the time in which the knowledge transfer can be realized. Generally, the lower the time that the process requires to be realized, the greater the speed of the transfer process of knowledge is. Therefore, the speed becomes a very important variable to define and describe the conveyance of the flow of information.

In particular, to reduce the transmission time, the knowledge must be clear in the expression, accurate and simple in the transmission. However, in the transfer process of knowledge, a certain level of ambiguity cannot be deleted (Szulanski, 1996). Regarding the vagueness of the transmission and of knowledge, this is the result of actions, behaviors, culture and traditions that are not available and accessible and that are not transferable. It is defined as tacit knowledge that derives from non-verbalization and non-codification of the transfer process (Inpen and Pien, 2006).

In an effort to avoid ambiguity and changes, the firm creates standard procedures that control the managerial and operating activities of the firm. The set of documented procedures and rules defines the formalization level. It is based on policies, procedures and plans, rather than informal processes (Dyer and Song, 1998; De Clerq et al., 2013). On the positive side, high formalization leads to the increase in efficiency and predictability (Weber, 1924), offering guidelines on how to transfer knowledge into the firm among different individuals in diverse areas. It also restricts uncertainty through clarity about rules and, additionally, responsibilities decrease the managers’ role conflict (Michaels et al., 1988). It limits managerial behavior because it imposes the priority of business interest on individual desires and it eliminates divergent interpretations. Still, formalized systems increase commitment and job satisfaction (Snizek and Bullard, 1983), favoring collaboration within the firm. On the negative side, bureaucracy limits the scope of the decisions because it defines and governs individual behaviors (Burns and Stalker, 1966). In this way, formal procedures and rules reduce the depths of analysis, limiting the managers’ capability of accessing the knowledge accumulated by other areas of the firm. Finally, the creativity and innovation of the individuals are repressed when
high formalization can “ritualize” the transmission of the knowledge (Dougherty and Heller, 1994; Hirst et al., 2011; Miller, 1987). At low levels of formalization, the managers enjoy the flexibility and freedom to combine others’ knowledge with their own (De Clercq et al., 2013) favoring the acquisition and sharing of knowledge. Therefore, overall, the knowledge transfer is made difficult by bureaucracy when the formalized structure is too rigid and complicated. Thus, the greater the level of bureaucracy, the lower the level of learning becomes. It is necessary to have an array of minimal procedures and rules that create order and clarity, but at the same time to give managers the freedom to combine and transfer knowledge.

In conclusion, knowledge transfer is a complex process that is based on the quality and quantity of the knowledge and on the time the process requires to be realized. The first variable to be concerned about is the complexity of the relationship between the individuals involved in the process of the transfer of the acquired knowledge. The second one refers to the speed of the transmission of the knowledge with particular reference to all the procedures and rules that compose the bureaucracy of the firm.

3. The knowledge transfer curve

The curve of the knowledge transfer process can be evaluated on the basis of two main variables:

1. First is the content of the knowledge to be transferred. It refers to the complexity, the quality and quantity of the information to be transferred within the firm.

2. Second is the speed of the knowledge transfer process. It refers to the time in which the knowledge transfer can be realized.

In this context, we focused our attention on the speed of the process rather than the content of the knowledge to be transferred. The paradigm on which the theoretical model defining the KTC is built is the following: for a defined level of knowledge to be transferred, the higher the speed of the process is, the higher the efficiency and effectiveness of the entire knowledge transfer process will be. It can be formalized as following:

\[ W_{KT} = f(I_{KT}; S_{KT}) \]

where \( W_{KT} \): it denotes the quality of the knowledge transfer process in terms of its effectiveness and efficiency; \( I_{KT} \): it denotes the complexity, quality and quantity of the information to be transferred; it defines the content of the knowledge; \( S_{KT} \): it denotes the speed of the knowledge transfer process; it is defined on the basis of the time that process requires to be realized.

We can define the KTC on the basis of these two variables: the content of knowledge to be transferred and the time of the transfer process as shown in Figure 1.

The level \( K \) defines the content of knowledge to be transferred and, thus, it refers to the complexity, quality and quantity of information to be transferred within the firm. Therefore, it refers to the intrinsic characteristics of the information flow that must be acquired or created, transferred and absorbed. In this context, it is assumed as known. Our aim in this paper is to measure the speed of the process rather than its content.

Based on the time variable, \( t \), the slope of the curve measures the speed of the transfer knowledge process. Formally, the higher the slope, the faster the curve reaches the defined level of knowledge to be transferred (\( K \)).

It is worth noticing the assumption that the curve does not start from 0 as shown in Figure 1. It is reasonable to accept that in any time there is always a small part of knowledge transferred without any process and policy.
Our aim is to define this curve and to measure its slope at any time. Therefore, it is necessary to define the function of the knowledge transfer. To this aim, it is possible to use the following ordinary differential equation that leads to this logistic function:

$$x(t) = \frac{r x(t)}{1 + \frac{K}{x(t)}}$$

where \(x(t)\) is the function of the knowledge transfer (\(K\)), \(x(t) \neq 0\) in any given case; \(\dot{x}(t)\) the first derivative in relation to the time \(t\), \(K\) the content of knowledge to be transferred and \(r\) the relative variation rate that is equal to:

$$r = \frac{\dot{x}(t)}{x(t)}$$

It is relevant to pinpoint that whenever the level of knowledge transfer is much lower than the level \(K\) defined, the ratio \((x(t)/K)\) becomes much lower until it gets:

$$\dot{x}(t) \approx r x(t)$$

and, thus, \(x(t)\) increases in an approximately exponential way.

In order to solve Equation (1), it can be useful to introduce the following function (Sydsæter and Hammond, 2012):

$$u(t) = -1 + \frac{K}{x(t)}$$

Therefore, the first derivative is equal to:

$$\dot{u}(t) = -\frac{K x(t)}{[x(t)]^2}$$
and by considering Equation (1), it gets:

\[ \dot{u}(t) = -\frac{K rx(t) \left(1 - \frac{ru(t)}{r} \right)}{[x(t)]^2} \]

and thus:

\[
\dot{u}(t) = -\frac{K}{[x(t)]^2} \left[ rx(t) - \frac{r x(t)^2}{K} \right] = -\frac{K}{[x(t)]^2} \left[ rx(t) - K x(t) \right] = -\frac{K}{[x(t)]^2} \left[ rx(t) - r x(t) \right]
\]

\[
= -r x(t) \left[ K + x(t) \right] = -r K + r x(t) = -r \frac{K}{x(t)} + \frac{r x(t)}{x(t)} = -r \left(1 + \frac{K}{x(t)} \right)
\]

and then by considering Equation (4), it gets:

\[ \dot{u}(t) = -ru(t). \quad (5) \]

In order to solve Equation (5), it is essential to consider the ordinary differential equation:

\[ \dot{u}(t) = ru(t). \quad (6) \]

Assume that the relative variation (\(r\)) is equal to 1. In this case, it gets:

\[ \dot{u}(t) = u(t). \quad (7) \]

By considering that:

\[ u(t) = e^t; \quad \dot{u}(t) = e^t \]

and by generalizing, it achieves the following equation:

\[ u(t) = Ae^{rt} \quad (8) \]

which is able to satisfy Equation (7) for each real value of the parameter \(A\).

On the basis of Equation (8), through procedures based on attempts and errors, it gets:

\[ u(t) = Ae^{rt} \quad (9) \]

and Equation (9) is the solution of Equation (6). Indeed:

\[ u(t) = Ae^{rt} \rightarrow \dot{u}(t) = Ae^{rt} r = r Ae^{rt} = ru(t). \]

On the basis of Equation (9), the solution of Equation (5) is the following:

\[ u(t) = Ae^{-rt} \quad (10) \]

By considering Equation (4) and Equation (10), it gets:

\[ -1 + \frac{K}{x(t)} = Ae^{-rt} \]
and thus:

\[ x(t) = \frac{K}{1 + Ae^{-rt}}. \]  

Equation (11) is known in the literature as logistic function.

By assuming that the function is not equal to 0, as is our case \( x(t) \neq 0 \), for \( t = 0 \) it gets a positive value \( x_0 \), so that \( x(0) = x_0 \). In this case, Equation (11) becomes:

\[ x_0 = \frac{K}{1+A} \]

and thus:

\[ A = \frac{K-x_0}{x_0} \] (12)

and by substituting it in Equation (11), it gets:

\[ x(t) = \frac{K}{1+Ae^{-rt}} = \frac{K}{1 + \left(\frac{K-x_0}{x_0}\right)e^{-rt}} \] (13)

Therefore, for \( 0 < x_0 < K \), where \( t \to +\infty \) the function \( x(t) \to K \) is as follows:

\[ \lim_{t \to +\infty} x(t) = \lim_{t \to +\infty} \frac{K}{1+Ae^{-rt}} = \lim_{t \to +\infty} \frac{K}{1 + \left(\frac{K-x_0}{x_0}\right)} = \frac{K}{1} = K. \]

Note that the function \( x(t) \) is strictly increasing. Indeed, the first derivative is always positive:

\[ \dot{x}(t) > 0 \to r x(t) \left(1 - \frac{x(t)}{K}\right) > 0 \to \left\{ \begin{array}{l} \dot{x}(t) > 0 \to x(t) > 0 \text{ always} \\ 1 - \frac{x(t)}{K} > 0 \to x(t) < K \end{array} \right. \text{ always}. \]

The second derivative of Equation (1) is the following:

\[ \ddot{x}(t) = r \dot{x}(t) \left(1 - \frac{x(t)}{K}\right) + r x(t) \left(1 - \frac{x(t)}{K}\right) = r \dot{x}(t) \left[1 - \frac{2x(t)}{K}\right] \] (14)

and thus:

\[ \ddot{x}(t) = r \dot{x}(t) \left[1 - \frac{2x(t)}{K}\right]. \]

For \( \dot{x}(t) = 0 \), it gets:

\[ r \dot{x}(t) \left[1 - \frac{2x(t)}{K}\right] = 0 \]

and by considering that \( r > 0 \) and \( \dot{x}(t) > 0 \), it gets:

\[ 1 - \frac{2x(t)}{K} = 0 \]
and thus:

\[ x(t) = \frac{K}{2}. \]  

Equation (15) defines a point in which the curve changes from convex to concave.

On the basis of these analyses, Equation (13) draws a curve as in Figure 1.

4. Managerial implication

By using the KTC it is possible to measure the effectiveness and efficiency of the entire knowledge transfer process based on its speed for a defined level of knowledge to be transferred \( K \).

The application of Equation (13) requires the definition of the following variables:

- \( K \): it is the content of the knowledge to be transferred within the company. It can be defined in terms of information to be transferred. The higher the complexity, quality and quantity of the information to be transferred, the higher \( K \). In this context, the level of \( K \) is defined.
- \( x_c \): it is the content part of knowledge that can be transferred per “unit of block.” Therefore, it can be considered as a standard unit of block and it must be defined in the same unit measure of \( K \).
- \( t \): it is the time required for the knowledge transfer process.
- \( r \): it is the speed of the knowledge transfer process.

It is worth noticing that the main problem we have to face is the inverse relationship between the time \( t \) and the speed \( r \) of the knowledge transfer process. Specifically, the higher the \( r \), the lower the time to reach the level \( K \). In other words, the higher \( r \), the faster the knowledge transfer toward the level \( K \).

The trade-off between the time and the speed can be defined by solving Equation (13) for \( r \) or \( t \) as follows:

\[
x(t) = \frac{K}{1 + Ae^{-rt}} \rightarrow rt = -\ln \left( \frac{K}{Ax(t)} - 1 \right) \rightarrow r = \frac{-\ln \left( \frac{\ln \left( \frac{K}{Ax(t)} - 1 \right)}{t} \right)}{t} = \frac{-\ln \left( \frac{\ln \left( \frac{K}{Ax(t)} - 1 \right)}{r} \right)}{r}.
\]  

Therefore, by defining the level of knowledge to be transferred \( (K) \) and the total part of the knowledge to be transferred \( (x_c) \) as a part of \( K(\epsilon = aK) \), it gets:

\[ x(t) \equiv x_c = aK \]

On the basis of this relation, \( r \) and \( t \) as defined by Equation (16) can be defined in operating terms as the following:

\[
r = -\frac{\ln \left[ \frac{1}{2} \left( \frac{1}{2} - 1 \right) \right]}{t} \leftrightarrow t = -\frac{\ln \left[ \frac{1}{2} \left( \frac{1}{2} - 1 \right) \right]}{r} \text{ under condition: } x_c = aK < K.
\]

Therefore, by defining a time-period \( t \) and the part of knowledge \( (x_c = aK) \) to be transferred in this time-period, the variable \( r \) measures the speed of the knowledge transfer process and then its efficiency and effectiveness. By its construction model, the lower the value of \( r \) the higher the speed of the transfer process.
Specifically, by defining a content of knowledge to be transferred (\(K\)) and the content part of knowledge \(x_0 = aK\) to be transmitted in the defined period \(t = t_n\), the speed of the process \(r\) is a function of the part of knowledge per unit of block \(x_0\): the higher the level of \(x_0\), the higher the speed and thus the lower the value of \(r\).

To better understand the matter, we assume that:

- the total content of knowledge to be transferred can be translated in a numerical measure and assumed that it is equal to 100 \((K = 100)\);
- the time reference is two years \((t = 2)\); and
- the part of knowledge to be transferred at the end of the time-period must be equal to 99 percent \((x_0 = aK = 99\%)\).

The speed of the transfer process \((r)\) is a function of the amount of block per unit of knowledge that a firm is able to transfer \((x_0)\).

Specifically, the higher the block per unit of knowledge transferred \((x_0)\), the higher the speed of transfer process and thus the lower the value of \(r\), as it is summarized in Table I.

In order to show the relationship between the speed of the knowledge transfer process \((r)\), the period-time in which the transfer must be realized \((t)\) and the block per unit of knowledge transferred \((x_0)\), it is possible to change the second and the third variables whereas all the other variables are kept equal.

Specifically, we assume a constant speed of the transfer process, where the time decreases when there is an increase of the level of the block per unit of knowledge transferred \((x_0)\) as Table II shows.

Table II shows that for a defined level of speed \((r)\), the increase of the level of the block per unit of knowledge to be transferred \((x_0)\) decreases the period-time of the knowledge transfer process \((t)\).

Similarly, for a defined level of the block per unit of knowledge to be transferred \((x_0)\), the increase of the speed of the process \((r)\) decreases the period-time of the knowledge transfer process \((t)\) as it is shown in Table III.

Tables I-III show how the speed of the knowledge transfer process is a key variable in order to evaluate the effectiveness and efficiency of the entire process.

### 5. Conclusion

The evaluation of the knowledge transfer process is usually focused on the content of the knowledge to be transferred.

<table>
<thead>
<tr>
<th>(K)</th>
<th>(t)</th>
<th>(x_0)</th>
<th>(x_0 = aK)</th>
<th>(r = -\ln[\frac{1}{2}(t-1)]/t)</th>
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</table>

**Table I.** Relationship between the content part of knowledge and the speed of knowledge transfer

**Source:** Own elaboration
Our theoretical model, which is defined as KTC, shows that the content of knowledge to be transferred is as relevant as the speed of the transfer process. Specifically, the model shows that for a defined level of content of knowledge to be transferred, the higher the speed, the higher the effectiveness and efficiency of the process and thus the higher its value.

It has relevant implications for management. When the content of knowledge to be transferred is defined, and the block per unit of this knowledge and the time-period of the transfer process are determined, managers must monitor the process on the basis of its speed: the higher the speed, the lower the time of the transfer process; the higher the efficiency and effectiveness of the knowledge transfer process, the higher the value of the process.

Hence, managers, after defining the content of knowledge to be transferred, can evaluate their policies on knowledge transfer on the basis of their effects on the process’s speed, so that only those policies that increase the speed of the process can be considered effective for the knowledge transfer process.

The limitations of the model are strictly related to its assumption. Specifically, in order to easily apply the model, it is necessary to define: first, the content of knowledge to be transferred in the process; and second the content part of knowledge that can be transferred per unit of block. Therefore, the right application of the model requires the definition of the measurement of its variables. This will be the argument of a future paper.

<table>
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<th>K</th>
<th>r</th>
<th>x₀</th>
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Source: Own elaboration

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Table II. Relationship between the content part of knowledge and the increases of the block per unit of knowledge when the speed of knowledge transfer is constant.

Table III. Relationship between the content part of knowledge and the speed of knowledge transfer when the block per unit of knowledge is constant.
References


Further reading


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Knowledge transfer in interorganizational partnerships: what do we know?

Rosileia Milagres
Fundacao Dom Cabral, Belo Horizonte, Brazil, and
Ana Burcharth
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Abstract

Purpose – The purpose of this paper is to review the literature on knowledge transfer in interorganizational partnerships. The aim is to assess the advances in this field by addressing the questions: What factors impact knowledge transfer in interorganizational partnerships? How do these factors interact with each other?

Design/methodology/approach – The study reports results of a literature review conducted in ten top journals between 2000 and 2017 in the fields of strategy and innovation studies.

Findings – The review identifies three overarching themes, which were organized according to 14 research questions. The first theme discusses knowledge in itself and elaborates on aspects of its attributes. The second theme presents the factors that influence interorganizational knowledge transfer at the macroeconomic, interorganizational, organizational and individual levels. The third theme focuses on the consequences, namely, effectiveness and organizational performance.

Practical implications – Partnership managers may improve and adjust contracts, structures, processes and routines, as well as build support mechanisms and incentives to guarantee effectiveness in knowledge transfer in partnerships.

Originality/value – The study proposes a novel theoretical framework that links antecedents, process and outcomes of knowledge transfer in interorganizational partnerships, while also identifying aspects that are either less well researched or contested and thereby suggesting directions for future research.

Keyword Interorganizational Partnerships, Alliances, Network, Collaboration, Knowledge transfer

Paper type Literature review

1. Introduction

Knowledge transfer across organizations is central to the development of sustainable competitive advantages, as firms rarely innovate in isolation and depend to a large extent on external partners (Coombs and Metcalfe, 1998; Powell et al., 1996; Ring et al., 2005). Defined as a process through which an organization purposefully learns from another, interorganizational knowledge transfer is an important sub-field of research in partnerships, which has undergone noteworthy progress in recent decades (Easterby-Smith et al., 2008; Battistella et al., 2016).

Despite the proliferation of valuable contributions in this tradition, knowledge transfer tops the list of the most complex challenges managers face in interorganizational arrangements (Mazloomi Khamseh and Jolly, 2008). Even if considered a promising strategy, a large number of alliances yield disappointing results (Inkpen, 2008). Of particular interest is the way partners deal collectively with knowledge management and the learning process (Easterby-Smith et al., 2008; Larsson et al., 1998). Knowledge transfer is an intricate process that encompasses a myriad of sub-processes, including search (i.e. the identification of useful knowledge), access (i.e. the acquisition of externally generated knowledge), assimilation (i.e. the processing, understanding and absorption of outside knowledge) and integration (i.e. the combination of new external knowledge with existing internal one) (Filieri and Alguesaui, 2014).

Partnerships demand significant time and effort to find the right partners and to develop routines that support interaction, particularly in contexts where the tension between
competitive and cooperative forces is in play (Fang et al., 2013). They also include a number of operational challenges, such as the commitment of the involved parties and the mechanisms for the congregation, harmonization and integration of the individual contributions (Inkpen and Tsang, 2007). A recurrent conundrum in managing multi-party settings is to ensure fit between knowledge, communication channels and partner characteristics (Hutzschenreuter and Horstkotte, 2010). The inherent characteristics of knowledge, such as context dependency, ambiguity and tacitness, make it sticky, that is, difficult to transfer, once such characteristics require corresponding governance mechanisms (Fang et al., 2013). Another issue refers to the multiplicity of learning processes that occur simultaneously (i.e. learning about the partner, with the partner, from the partner and about alliance management). These imply high complexity due to the differences among partnering organizations in terms of, for instance, technological capabilities, physical distance, culture (Battistella et al., 2016), absorptive capacity[1] (Mazloomi Khamseh and Jolly, 2008) and social capital (Filieri and Alguezaui, 2014). Besides, partnerships encompass a number of risks that range from the leakage of critical knowledge (Khanna et al., 1998) to the conflicts over the division of unexpected returns. Conflicts may arise when new knowledge is generated, as returns may not be clear at the onset of an alliance (Lee et al., 2010). The relationship between the actors is indeed of critical nature for the effectiveness of knowledge transfer, which presupposes trust, intensity of connections, a degree of familiarity and reciprocity (Battistella et al., 2016).

The contrast between the promise partnerships represents as vehicles for knowledge transfer (Faulkner and De Rond, 2000) and the challenges they pose for strategy scholars and managers alike motivates our research:

**RQ1.** What factors impact knowledge transfer in interorganizational partnerships?

**RQ2.** How do these factors interact with each other?

We address these questions by carrying out a systematic literature review. Research in this field draws on various traditions that encompass evolutionary theory, transaction cost theory, theories of the firm, learning, motivation and dynamic capabilities. It is based on multiple methodological approaches, including secondary data, questionnaires, interviews, observations and interventions. Given the conceptual and methodological diversity, as well as the relative fragmentation, a holistic view is needed.

Understanding knowledge transfer in interorganizational contexts is relevant because it has been a widely applied strategy (Mazloomi Khamseh and Jolly, 2008; Lee et al., 2010). Empirical studies point to a significant surge in several countries and sectors, particularly since the 1990s (Hagedoorn, 2002; Schilling, 2015). The phenomenon is interpreted as a response to the growing uncertainty in the economic environment, the intensification of the globalization process, the increase in R&D complexity and costs, the reduction in product life cycles and the technological shocks (Powell et al., 1996; Child et al., 2005; Schilling, 2015). Partnerships help organizations minimize risks, uncertainties and costs, allocate resources more efficiently, access partners’ resources and markets and increase the portfolio of products and services (Schilling, 2015). They are seen as an effective way of transferring, accessing, generating and absorbing knowledge (Inkpen and Dinur, 1998; Lorenzoni and Lipparini, 1999; Inkpen, 2000; Simonin, 2004). Learning is hence an important driver of interorganizational cooperation (Inkpen, 2008; Dyer and Nobeoka, 2000; Kogut, 1988).

We carry out a synthesis of the literature through a systematic review of the top ten journals in the fields of strategy and innovation studies during the 2000–2017 timeframe. Our review is presented in three overarching themes—knowledge in itself, its impacting factors and consequences—which were organized according to 14 research questions. We propose a novel theoretical framework that integrates the three themes at multiple levels: macroeconomic, interorganizational, organizational and individual. Our framework
highlights the importance of the attributes of the knowledge at stake; the organizational context from where knowledge is sent and received; the motivation and the governance of the alliance; the individual behavior and ability in receiving and transferring knowledge; the complexities of the transfer process. Of particular interest is the need to advance our understanding of the relations between the different levels and their outcomes, especially those relative to the dynamic mechanisms that arise with time.

Our contribution thus lies in a novel theoretical framework that identifies and links the antecedents, process and outcomes of interorganizational knowledge transfer. It provides a consolidation and a critical evaluation of the findings of this research field, together with an overview of the limitations and less contested issues. Another contribution of our study is to suggest directions for future research, methodological improvements and guidance for practice.

2. Methodology
We carried out a systematic literature review following Massaro et al. (2016), Petticrew and Roberts (2008) and Tranfield et al. (2003). A systematic literature review is a scientific method of making sense of a large body of information that explicitly aims to limit the bias of traditional reviews (e.g. preferences of the author for pet theories), mainly by attempting to detect, appraise and synthesize all relevant studies that address a particular set of questions (Petticrew and Roberts, 2008). As to ensure rigor, objectivity and relevance to our methodology, we first developed a literature review protocol that laid out the course of the study, which we detail below. This structured process guided the identification, selection and assessment of the relevant literature and it is efficient and effective (Watson, 2015). In addition to a description of our research topic, our protocol stated the questions we wanted to explore: How is research on knowledge transfer in interorganizational contexts (i.e. partnerships, alliances, networks, joint ventures, etc.) evolving? What do we know about it (the focus) and what do we need to explore (the critique)? What recommendations can we offer to practitioners who face the task of developing a favorable learning environment for alliance partners?

The protocol also included our search strategy, which was designed to be transparent, replicable and focused (Massaro et al., 2016). We aimed at achieving this by screening the most relevant outlets in the highly accredited EBSCO database (hosted by Business Source Premier) and by employing an exhaustive list of keywords and search terms (Tranfield et al., 2003). Once we wanted to prioritize the inclusion of highly impactful research, we selected ten top journals in the fields of strategy and innovation studies according to the impact factor calculated by Journal of Citation Reports 2013/2014. After selecting the relevant journals (see Table I), we searched for papers in the title or in the abstract using a number of keywords that expressed our research field in a far-reaching and comprehensive fashion[2]. Even if semantically distinct, knowledge and technology are often used interchangeably in scholarly work. Hence, we added both “knowledge transfer” and “technology transfer” as our search terms. Besides, since the phenomenon of interorganizational collaboration is referred to in the literature by a number of related concepts and labels (i.e. partnership, alliance, network, joint venture, consortia, among others), we used a series of keywords that the research team had identified as relevant synonyms[3]. We considered the period 2000–2017, once we wanted to capture recent contributions. This search retrieved a total of 5,685 papers.

After excluding papers that were either duplicated or constituted non-novel contributions (such as book reviews and editorial pieces), we independently examined the remaining abstracts and filtered them according to fit. Two authors carried out this classification process simultaneously to establish clarity about the selection criteria and to reassure reliability and rigor (Petticrew and Roberts, 2008). Our review protocol included a number of inclusion/exclusion criteria regarding the topics of interest, since all study designs were welcome. As we were particularly concerned with research addressing
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<th>Journal</th>
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<th>Analytical level</th>
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<td>Jarvenpaa and Majchrzak (2016)</td>
<td>Interorganizational/individual</td>
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Table I. papers included in the literature review (continued)
knowledge transfer and/or integration between organizations, we eliminated papers that investigated other aspects of partnership management or that did not relate to phenomena at the interorganizational level[4]. Specifically, we removed papers dealing with personnel mobility, mergers and acquisitions and cross-business unit (intra-organizational) interactions. Besides, given our focus on managerial issues, we discarded papers at the aggregate level emphasizing a regional development perspective, such as cluster policy, agglomerations and industrial districts. Studies on the university–industry linkages, the outcomes of scientific production or the commercial engagement of academics were covered by only two articles, as we did not intend to evaluate universities as specific players. In a similar vein, international knowledge transfer in the context of multinational corporations or foreign direct investment was disregarded. Besides, papers related to the structural or morphological aspects of social networks (i.e. nature of ties and configuration), as well as to supply chain integration were considered off-topic. Using the above-mentioned criteria for relevance, we eliminated 5,458 articles. Both authors separately inspected the full text of the remaining 227 articles and then jointly examined the decision to include or exclude each one until agreement was reached. At this stage, we also excluded studies that did not address knowledge exchange in collaborative multi-party settings. As a result, we classified 174 papers inappropriate.

We subsequently read the 53 papers that met all inclusion criteria and discussed them in a detailed fashion during evaluation meetings, where the whole research team was present. We coded the papers and synthesized them in data-extraction forms that encompassed general information (author and publication details), key topic, study features (analytical level, empirical context, method, partnership form and data) and main results to facilitate our joint interpretation. Table I provides an overview of the papers selected, alongside their corresponding analytical level and type of methodology[5]. More detailed information can be found in Table AI.

The majority of articles (62 percent) were published in two journals, namely, Strategic Management Journal and Research Policy. Regarding the yearly distribution of articles presented in Figure 1, we did not recognize any pattern; it seems that the topic maintained the same rate of interest during these 17 years.

The literature can be further broken down into different levels of analysis, namely, macroeconomic, interorganizational, organizational and individual. As Figure 2 portrays, the interorganizational and organizational are the most central levels, which amount to 85 percent of the investigated papers, taking into account that some papers addressed

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Source: Authors’ elaboration
multiple levels of analysis. It means that scholars are particularly concerned with factors such as structure of the partnership, motivation, alliance capability, absorptive capacity and trust. Surprisingly, the other levels of analysis, i.e. macro context and individual, received scant attention in the field. Regarding the methodological choice, quantitative methods are clearly favored over qualitative, conceptual and other study designs, once 64 percent of the papers applied a quantitative approach (see Figure 3).

As a final step of our analysis, we applied two techniques to support our research synthesis. As recommended by Petticrew and Roberts (2008), we first organized the description of the studies into logical categories. For this purpose, we identified common research questions throughout the articles and grouped them accordingly, with the view of summarizing the essence of this literature. The second stage was to analyze the findings within each category of research question and produce tables that succinctly systematized them. In the third phase, we strived to synthesize and integrate the findings across the different studies. Specifically, we codified the findings into three different dimensions – antecedents, process and outcomes – with
a number of sub-codings for each dimension. In line with Tranfield et al. (2003), we supplemented this structured and deductive protocol-based process with an inductive approach for the resulting interpretation of findings.

### 3. Literature review

Our review shows that the literature covers three overarching themes. The first theme discusses knowledge in itself and elaborates on the types and characteristics. The second theme presents the factors that impact knowledge transfer, either in the decision to form a partnership or during its operation. The third theme encompasses aspects related to the consequences of interorganizational knowledge transfer, i.e. effectiveness and organizational performance. We formulated 14 research questions that reflect these overarching themes, as described in Table II[6]. Next, we discuss the research questions in detail.

#### 3.1 Theme 1: knowledge

Interorganizational transfer is the migration of knowledge between partnering firms (Beamish and Berdrow, 2003). Yet, it is not a uniform process that may be classified according to diverse approaches. Williams (2007) differentiated two mechanisms related to knowledge transfer, which may be utilized simultaneously: replication and adaptation. While replication is the attempt to recreate identical activities in two localities, adaptation is the attempt to modify or combine practices of the source organization. Zhao et al. (2004) and Zhao and Anand (2009) proposed a further differentiation between collective and individual transfer. They distinguished learning at the individual level from the group (organization) level as regards their nature, strategic importance and level of difficulty. The transfer of collective knowledge is the most valuable, difficult and prone to error, since it is restricted to tacit knowledge shared among employees, which often occurs in a veiled and unconscious way.

#### 3.1.1 Knowledge attributes

The characteristics and types of knowledge, as well as how and why they influence the transfer process are among the most debated topics in the literature. Nearly one-third of reviewed papers (32 percent) deal with this issue in one way or the other. Tables III and IV organize our main findings in relation to these aspects – What type of knowledge is being transferred? What are the characteristics of the knowledge being transferred?
The characteristics and types of knowledge are thus highly relevant. The more tacit (Bhagat et al., 2002; Osterloh and Frey, 2000), complex (Bhagat et al., 2002), technological (Kotabe et al., 2003; Hagedoorn et al., 2009), collective (Zhao et al., 2004) and systemic (Bhagat et al., 2002) knowledge is, the more difficult is its transfer. Also relational knowledge, which is developed within the boundaries of the dyad, sets up transfer barriers (Mesquita et al., 2008). Regarding characteristics of knowledge, the degree of similarity (Inkpen, 2000), cumulativeness and appropriability (Herstad et al., 2014) facilitates use and assimilation, whereas causal ambiguity (Dyer and Hatch, 2006; Williams, 2007; Inkpen, 2008), context dependency (Bhagat et al., 2002; Williams, 2007), viscosity (Inkpen, 2008), stickiness (Bhagat et al., 2002) and sensitivity (Jarvenpaa and Majchrzak, 2016) interfere negatively, in the sense of making knowledge transfer more challenging.

3.2 Theme 2: factors impacting knowledge transfer
The second theme related to factors impacting knowledge transfer gathers the most discussed topics in the literature, particularly those at the interorganizational and organizational (divided into the source and the recipient firm) levels of analysis. Besides, we grouped factors pertaining to the macroeconomic and individual levels too. Table V lays out our classification and key underlying variables.

3.2.1 Macro-environmental factors. Among the reviewed papers, few deal with the macro context in which partnerships are situated. This should nevertheless be considered with caution given our choice of journals, the majority of which are focused on business and management.
Technical transfer vs technological transfer

Technical transfer is relatively simple and includes knowledge to solve a specific operational problem. Technological transfer involves a wide range of activities, requiring dedicated coordination and interaction between groups for long time periods. It demands a more sophisticated collaboration process involving communication and codification abilities. The greater the project scope and the more complex the knowledge, the greater will be the costs and difficulties for transfer. This is because technological knowledge tends to be tacit and embedded in a specific context.

Kotabe et al. (2003)

Relational vs redeployable

Redeployable knowledge may be reproduced by partners, so that competitive gains may be appropriated in other relations. Relational knowledge may not be applied outside the alliance context, since it is based on informal agreements and codes of conduct. The routines, capabilities and specific resources of the relationship act as barriers to the transfer and reduce the risk of copying. Consequently, firms can create sustainable competitive advantages through their networks of relationships.

Mesquita et al. (2008), Dyer and Hatch (2006)

About vs from the partner

Knowledge about the partner is related to understanding its organizational characteristics – culture, values, strategic objectives, history, structure, leadership, etc. As it is accumulated, it facilitates cooperative relations and knowledge transfer. Knowledge from the partner is related to the technical know-how and technologies that may be appropriated by the recipient organization.


Human vs social vs structured

Human knowledge describes what the individual knows and is generally both tacit and explicit. Social knowledge is embedded in the relationships between individuals and groups and can be largely described as tacit. It is informed by cultural norms and depends on a joint effort. Structured knowledge refers to organizational processes, rules, routines and systems.

Bhagat et al. (2002)

Individual vs collective

There are skills that are individual and belong to them. Skills, when aggregated, become something greater than the sum of their parts, i.e. collective knowledge. This is embedded in the norms and routines shared by all organization members. Its nature is eminently tacit and, therefore, more difficult to transfer.

Zhao et al. (2004)

Tacit vs explicit

Explicit knowledge may be expressed by written language and symbols. Tacit knowledge is acquired and accumulated by the individual, it is embedded in an organization’s culture, values and routines.

Osterloh and Frey (2000), Bhagat et al. (2002)

Simple vs complex

Complex knowledge encompasses a wide variety of interrelated parts, which cannot be easily ungrouped. It involves greater causal ambiguity and requires greater volume of information and skills to be transferred. Simple knowledge requires a low volume of information and is easier to be transferred.

Bhagat et al. (2002), Dyer and Hatch (2006)

Independent vs systemic

Independent knowledge can be described by itself, whereas systemic knowledge must be described in relation to the overall knowledge base of the source organization.

Bhagat et al. (2002)

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<th>Type</th>
<th>What it is, why and how it affects the transfer process</th>
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<td>Human vs social vs structured</td>
<td>Human knowledge describes what the individual knows and is generally both tacit and explicit. Social knowledge is embedded in the relationships between individuals and groups and can be largely described as tacit. It is informed by cultural norms and depends on a joint effort. Structured knowledge refers to organizational processes, rules, routines and systems.</td>
<td>Bhagat et al. (2002)</td>
</tr>
<tr>
<td>Individual vs collective</td>
<td>There are skills that are individual and belong to them. Skills, when aggregated, become something greater than the sum of their parts, i.e. collective knowledge. This is embedded in the norms and routines shared by all organization members. Its nature is eminently tacit and, therefore, more difficult to transfer.</td>
<td>Zhao et al. (2004)</td>
</tr>
<tr>
<td>Tacit vs explicit</td>
<td>Explicit knowledge may be expressed by written language and symbols. Tacit knowledge is acquired and accumulated by the individual, it is embedded in an organization’s culture, values and routines.</td>
<td>Osterloh and Frey (2000), Bhagat et al. (2002)</td>
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<tr>
<td>Simple vs complex</td>
<td>Complex knowledge encompasses a wide variety of interrelated parts, which cannot be easily ungrouped. It involves greater causal ambiguity and requires greater volume of information and skills to be transferred. Simple knowledge requires a low volume of information and is easier to be transferred.</td>
<td>Bhagat et al. (2002), Dyer and Hatch (2006)</td>
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<tr>
<td>Independent vs systemic</td>
<td>Independent knowledge can be described by itself, whereas systemic knowledge must be described in relation to the overall knowledge base of the source organization.</td>
<td>Bhagat et al. (2002)</td>
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Source: Authors’ elaboration

Table III. Knowledge types
What factors of the macro environment affect the motivation to form partnerships for knowledge transfer? According to Guennif and Ramani (2012), the factors to be considered are industrial policy, competition policies, macroeconomic policies, intellectual property regime and price regulation. They stressed the role of the State as a generator of “windows of opportunity” and of positive externalities similar to the radical technological changes that lead to the formation of partnerships. The outcome of public policies depends on the perception of stakeholders. The expectations of the companies define if the window of opportunity will be sensed and exploited, initiating the formation of partnerships. In evaluating catching up processes, Guennif and Ramani (2012) concluded that it is determined by the interaction between organizations, institutions and policies in the National Innovation System: State, public laboratories, universities, companies, financial organizations, consumers and civil society groups. Following the same line of reasoning, Bozeman et al. (2014) stressed the role of the State as an inducer of demand for a specific type of knowledge.

In turn, Hagedoorn et al. (2009), together with Grimpe and Sofka (2016), highlighted industry characteristics, specifically appropriability regime and the level of technological sophistication, which they considered to affect firm preferences for the type of partnership contract. The more
<table>
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<tr>
<th>Macro context</th>
<th>Interorganizational</th>
<th>Recipient organization</th>
<th>Organizational</th>
<th>Source organization</th>
<th>Individual</th>
</tr>
</thead>
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<tr>
<td>Demand (Bozeman et al., 2014)</td>
<td>Structural governance (Jiang and Li, 2009; Oxley and Sampson, 2004; Dussage et al., 2000; García-Canal et al., 2008)</td>
<td>Absorptive capacity (Dyer and Hatch, 2006; Schildt et al., 2012)</td>
<td>Credibility (Dyer and Hatch, 2006; Kotabe et al., 2003)</td>
<td>Alliance management capability (Draulans et al., 2003; Schilke and Goerzen, 2010)</td>
<td>Learning behavior (Janowicz-Panjaitan and Noorderhaven, 2008)</td>
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<tr>
<td>Technological regimes, technological sophistication and technology and market opportunities (Hagedoorn et al., 2009; Herstad et al., 2014)</td>
<td>Procedural governance (Zollo et al., 2002; Dyer and Hatch, 2006; Inkpen, 2008; Ireland et al., 2002, Kotabe et al., 2003; Howard et al., 2016; Cheung et al., 2011; Lazaric and Marengo, 2000)</td>
<td>Alliance management capability (Draulans et al., 2003; Schilke and Goerzen, 2010; Frankort et al., 2011)</td>
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<td></td>
<td>Relative absorptive capacity (Schildt et al., 2012)</td>
<td>Partner-specific learning capability (Yang et al., 2015)</td>
<td>Prior alliance experience (Tzabar et al., 2013; Draulans et al., 2003; Hagedoorn et al., 2011; Inkpen and Tsang, 2005; Vandieie and Zaheer, 2015; Kavusan et al., 2016) and prior openness (Love et al., 2014)</td>
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<td>Relational and cognitive governance (Luo, 2005; Inkpen and Currall, 2004; Amesse and Cohendet, 2001; Segrestin, 2005; Cheung et al., 2011; Lane et al., 2001; Mesquita et al., 2008; Cheung et al., 2011; Inkpen and Tsang, 2005)</td>
<td>Partner-specific learning capability (Yang et al., 2015)</td>
<td>Prior alliance experience (Tzabar et al., 2013; Draulans et al., 2003; Hagedoorn et al., 2011; Inkpen and Tsang, 2005; Vandieie and Zaheer, 2015; Kavusan et al., 2016)</td>
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<td>Prior partner experience (Zollo et al., 2002)</td>
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<td>R&amp;D centralization and breadth of knowledge base (Zhang et al., 2007)</td>
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<td>Network constraints and internal processes (Dyer and Hatch, 2006)</td>
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<td>Trust (Lane et al., 2001)</td>
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<td>Culture (Kotabe et al., 2003; Bhagat et al., 2002; Ireland et al., 2002; Inkpen and Tsang, 2005; Cheung et al., 2011)</td>
<td>Culture (Kotabe et al., 2003; Bhagat et al., 2002; Ireland et al., 2002; Inkpen and Tsang, 2005; Cheung et al., 2011)</td>
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<td>Managerial involvement and strategic relevance (Tsang, 2002)</td>
<td>Managerial involvement and strategic relevance (Tsang, 2002)</td>
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Source: Authors' elaboration
sophisticated and R&D intensive the industry is, and the greater the efficacy of appropriability secrets, the greater will be the propensity of companies to choose technology transfers through partnerships. This is because partnerships allow for high degree of involvement between partners, as well as monitoring and controlling technology transfer (Hagedoorn et al., 2009). Equally, the more shallow the markets for technology in an industry are, the more likely firms will be to opt for relational collaboration in the form of alliances (Grimpe and Sofka, 2016).

Knowledge characteristics may also impact the choice of firms to establish collaboration agreements. In contexts where knowledge is analytical, presents high appropriability and low cumulativeness, as well as opens new market and technological opportunities, it increases preferences for partnerships[7]. As this kind of knowledge presupposes formal and systematic R&D processes, it may be supported by reports, electronic files and patent descriptions. This set of tools tends to be less sensitive to distance effects, once they build on common language and criteria. Consequently, global innovation partnerships are positively associated with the availability and the use of IPR protection measures in a given industry (Herstad et al., 2014).

The macro-environmental factors therefore impact knowledge transfer indirectly by influencing the motivation of organizations to form partnerships with this purpose.

3.2.2 Interorganizational factors. Part of the literature is dedicated to investigating how motivation and governance affect knowledge transfer.

How do the drivers of partnership formation affect knowledge transfer? Two kinds of drivers for entry into partnerships are identified: cost-sharing and synergy-seeking motives (Lee et al., 2010). Unexpectedly, accessing knowledge and new skills (i.e. synergy) turn out to be secondary motives to market positioning against competitors and sharing risks (i.e. cost sharing) (Beamish and Berdrow, 2003). In alliances where partners are in a position of substitution and not of complementarity, the costs arising from conflicts are greater and partners have higher incentives to appropriate benefits in an exclusive fashion. As a consequence, they do not invest in the development of mutual trust. The result may be the unforeseen end of the partnership or ineffective results – understood here as not achieving synergies and complementarities. In other words, partners do not succeed in accessing each other’s complementary assets and capabilities. Partnerships are hence not very attractive for knowledge transfer when partners have cost sharing as key motivation (Lee et al., 2010).

How do partnership structures affect knowledge transfer? The characteristics that determine the design of partnerships (structural governance), such as their contractual form and scope, are understood as fundamental for knowledge transfer.

A key finding is that knowledge is transferred and shared more effectively in equity-based partnerships (i.e. joint ventures), if compared to non-equity-based ones. As equity-based partnerships promote direct and frequent interaction, they produce better mutual understanding and favor the adoption of transfer practices at lower cost. Furthermore, their hierarchical structures guarantee de facto incorporation of partners’ knowledge and stimulate mutual trust (Jiang and Li, 2009), thereby constraining opportunism and unintended knowledge leakage (Yang et al., 2015). This is especially true for situations where technology flows turn the monitoring of partnership activities and the distribution of cooperation rents hard to control, such as the case of combination of already existing technologies (García-Canal et al., 2008).

Remarkably, formal contracts facilitate knowledge transfer between partners that collaborate remotely and are geographically distant. Such governance mechanisms counterbalance the absence of other interaction forms, such as personnel mobility, socialization, face-to-face exchanges and informal ties (Berchicci et al., 2016).

Defined as the extent to which partners combine multiple and sequential functions or value chain activities such as R&D, production or marketing, scope shows a positive
relationship with knowledge transfer. The greater the scope, the greater will be the
opportunities for interaction, the sharing of ideas and the development of mutual trust
(Jiang and Li, 2009). In investigating the option of partners to reduce the scope of
international alliances in face of the risk of technological leakage, Oxley and Sampson (2004)
corroborated the relevance of scope for the effectiveness of knowledge transfer. What is
more, partnerships in which actors contribute asymmetrically to knowledge tend to favor
skill transfers (Dussage et al., 2000).

How do routines affect knowledge transfer? The structural elements are complemented
with a perspective that emphasizes the coordination mechanisms through which
interactions between partners occur, i.e. processes and routines. Such coordination
mechanisms are part of the so-called procedural governance – instruments that regulate the
day-to-day aspects of interactions.

Zollo et al. (2002) introduced the concept of interorganizational routines, defined as stable
patterns of structural governance interactions developed between partners over repeated
collaboration agreements. Prior experience with specific partners favors the formation of such
routines. As they facilitate information sharing, communication, decision making and conflict
resolution, they contribute to the achievement of expected results. This aspect applies
particularly to non-equity-based alliances. Companies that have a background of partnerships
with specific allies have less need of formal structures to align incentives and monitor
activities. In this way, interorganizational routines can be seen as substitutes of the more
formal mechanisms of coordination, which are generally found in equity-based partnerships.
Social interactions between partners play an important role in this regard, particularly when a
partnership involves a more experienced firm in alliance management. More intensive and
frequent interactions provide room for the development of mutual trust and enhance tacit
information exchange, thereby contributing to the exposition of the routines of the more
experienced partner, including those related to external collaboration (Howard et al., 2016).

Alliance management routines perform a coordination function (Ireland et al., 2002;
Kotabe et al., 2003), whose primordial role is to support the flow of information between
partners, facilitate learning and, at the same time, protect strategic knowledge. Managers
need to understand the partner’s objectives relative to learning and to establish appropriate
monitoring mechanisms as to achieve alignment at the strategic, relational and operational
levels. The coordination activities involve observing whether the partnership meets
particular objectives; whether there is balance in the degree of importance given by the
partners; whether the partnership will deliver the expected value; what will be the response
of the stakeholders; and whether there are differences between the organizational structures
and how possible conflicts will be managed (Ireland et al., 2002).

An example of the importance of alliance management routines is presented in Inkpen’s
(2008) study of the joint venture formed between GM and Toyota, NUMMI. The case details
the creation of the mechanisms supporting each partner’s learning process, which proved to
be fundamental for the exploitation of the opportunities of knowledge application and for
the breakdown of transfer barriers related to causal ambiguity. Examples include training,
visits, documentation and consulting services. It was the establishment of these specific
mechanisms and the involvement of a large number of staff that guaranteed systematic and
continuous knowledge transfer.

However, interorganizational routines may also act as barriers. According to Dyer and
Hatch (2006), knowledge embedded in routines can only be transferred if a new set of
routines is implemented by the recipient organization, what makes the process considerably
more difficult.

Beyond routines, other coordinating tools include the integration of systems and
databases and market knowledge related to customers (Cheung et al., 2011).
How do relations in a partnership affect knowledge transfer? In addition to structures and processes, there are important relational and cognitive factors that affect knowledge transfer. Among the relational governance factors, the literature emphasizes the role of trust, control and the perception of justice. Among the cognitive factors, it highlights cultural differences, collective identity and the formation of interorganizational teams.

Trust and control influence not only the definition of objectives, such as knowledge transfer, but also the choice of the type of contract and the establishment of rules (Ireland et al., 2002). Amesse and Cohendet (2001) argued that the functioning of partnerships depends to a large extent on mutual trust, as it reduces the risk of super specialization and facilitates cooperation. In general, empirical studies point to a positive relationship between trust and partnership performance (Ireland et al., 2002; Lane et al., 2001). Trust determines the effort spent in collaboration, the commitment and the disposition to take risks, thereby reducing transaction costs (Inkpen and Tsang, 2005). Defined as the conviction and belief in another party in a risk situation in which the possibility of opportunistic behavior exists, trust is an outcome of the relationship between actors and the institutional context. Control relates to the process utilized by a player to influence others to behave in a determined manner, using power, authority, bureaucracy or peer pressure (Inkpen and Currall, 2004). In partnerships, controls may be formal – judicial actions, directives and periodical meetings – or informal – values, unwritten codes of conduct, norms and culture. The latter is known as relational governance (Mesquita et al., 2008). Inkpen and Currall (2004) proposed a dynamic relation of substitution between trust and control. The presence of trust minimizes the need for control and vice versa. As time goes by, partners learn about each other and partnerships become operational entities, changing the level of trust. The authors portrayed trust as a non-static and evolutionary element, which is by-product of the interactions between the parties involved.

The common sense of justice is another outcome of the relationship between partners that produces effects akin to trust. It improves efficiency, increases engagement and reduces operational and administrative costs. Conceptualized as “procedural justice” (Luo, 2005), it concerns the criteria adopted in decision-making and execution processes such as impartiality, representativeness, transparency and ethics. By diminishing the need for control and conferring stability to the relationship, procedural justice affects positively knowledge exchange. Luo (2005) found that profitability is greater when there is a common understanding of procedural justice. His empirical evidence reveals that the shared sense of justice becomes more important for partnerships portraying a high degree of uncertainty and internationalization, that is, when the cultural distance between partners is large.

Research further highlights the importance of building a collective identity – the development of a common objective, as well as of joint rules and regulations. The case of the joint venture formed between Renault and Nissan, which started from an unstable relationship with dubious potential for synergy, reveals the role of managerial support for the consolidation of a collective identity as a means of conferring legitimacy to the collaboration (Segrestin, 2005). A key driver in the process of building a collective identity is interorganizational teams, to the extent that they promote the formation of shared meanings about the partnership’s strategy and objectives. In this regard, Mesquita et al. (2008) and Cheung et al. (2011) emphasized the investment in relation-specific assets as mechanisms of knowledge integration, information exchange and joint problem solving. Such investment supports the development of a shared memory where values and beliefs are stored and later incorporated into routines and other formal and informal processes.

How does knowledge absorption occur in a partnership? The literature identifies the abilities of partners to learn from each other, conceptualizing it as “relative absorptive capacity” (Schildt et al., 2012). The capability of an organization to assimilate and
utilize outside knowledge is neither absolute nor stable, but depends on the knowledge source, once it is specific to each relationship. Relative absorptive capacity is determined by the degree of similarity between partners from a technological (i.e. knowledge base), a cultural – i.e. formalization, centralization and compensation practices (Ireland et al., 2002) and an institutional standpoint – compatible norms and values and similar operational priorities or dominant logics (Lane et al., 2001). By the same token, knowledge exchanges between partners may be asymmetrical. Yang et al. (2015) introduced the concept of “partner-specific learning capability” as to highlight the competitive dimensions of learning in a multi-party setting. One firm may out-learn a partner by developing processes and routines that enable the acquisition of partner’s know-how quicker than the partner, while simultaneously using safeguards against unintended transfer of information.

Recent studies show that the evolution of relative absorptive capacity is rather intricate. Schildt et al. (2012) found that it takes the format of an inverted U-shaped curve, thereby introducing dynamics into the construct. While there is a lot of knowledge exchange in the initial period of a partnership, when relative absorptive capacity is under development, it decreases with time, as the partner’s knowledge loses relevance. Interorganizational relationships thus evolve with time: as collaboration matures, ties and routines for knowledge transfer are developed together with partner-specific knowledge, which, in turn, transform the initial relative absorptive capacity.

Another mechanism used for knowledge absorption is managerial involvement via supervision and daily operation; the latter being most effective. This holds true especially in young joint ventures, where exchange flows and information-processing channels are not yet development, turning knowledge acquisition via direct channels difficult. The more strategic a joint venture is, the higher the investment of managers’ time and, consequently, the higher the learning (Tsang, 2002).

3.2.3 Organizational factors. A significant part of this research body is dedicated to investigating how firm-level characteristics – of the source and the recipient organizations – affect knowledge transfer. It discusses capabilities (e.g. alliance management and alliance learning capability), intangible resources (e.g. credibility, previous experience), behavioral aspects (e.g. motivation, credibility and trust) and internal processes.

Which organizational characteristics affect knowledge transfer? A fundamental characteristic examined in various studies refers to the experience of the company in forming partnerships, which determines its ability to recognize, assimilate and apply external knowledge (Draulans et al., 2003). Previous alliance experience also contributes to the speed of knowledge integration on the part of the recipient organization, in particular when sourced knowledge is distant from the company’s knowledge base or when partners are unknown to each other (Tzabbar et al., 2013). Openness to external knowledge partners is an outcome of the evolution of past experiences, in the sense that it encompasses an interactive process of information processing for the selection of adequate partners and for the development of management systems designed to handle relationships (Love et al., 2014). In addition to general experience, experience with a specific partner is also relevant (Hagedoorn et al., 2011; Inkpen and Tsang, 2005), to the extent that it facilitates the development of interorganizational routines and diminishes the probability of opportunistic behavior (Zollo et al., 2002). According to Liu and Ravichandran (2015), information technologies (ITs) enhance learning from past experiences, once they both support knowledge spillovers and mitigate the barriers in such spillovers. IT supports knowledge sharing and distribution and thereby contributes to overcome the challenges of handling tacit knowledge. On the one hand, learning from past experiences demands des-contextualization and the ability to generalize from acquired knowledge. On the other hand, knowledge reutilization requires the search and the selection of appropriate routines for the new context. Once managers are subject to cognitive limitations, IT contributes to diminish potential biases.
Numerous studies emphasize the importance of accumulating experience with a broad range of partners for firms to develop an alliance management capability (Kavusan et al., 2016), defined as the mechanisms and routines utilized to accumulate, stock, integrate and disclose relevant organizational knowledge on alliance administration (Draulans et al., 2003). An organization’s success increases as it enters more partnerships, however, at a decreasing rate, suggesting the existence of an optimum portfolio size (Frankort et al., 2011; Vandaie and Zaheer, 2015). This evidences the existence of an alliance management capability, but at the same time points to its limit, which is around six alliances. In line with Draulans et al. (2003), Schilke and Goerzen (2010) and Ireland et al. (2002) also discussed the concept of alliance management capability and found similar empirical results.

For Frankort et al. (2011), a firm reaches the greatest knowledge inflows with a portfolio of intermediate size and with a balanced mix of novel and repeated partners, Vandaie and Zaheer (2015) also noted the negative consequences of a broad portfolio of partnerships with respect to knowledge absorption stemming from partnerships with resource-rich and resource-poor partners. This is attributed to the frustration of the expectations of the resource-rich firm in relation to the facilitating role a resource-poor partner is able to play in the collaboration. Since the resource-poor partner has a broad portfolio of partnerships, the resource-rich firm realizes that its investment capacity in the partnership will be divided between diverse partners.

Experience thus seems to promote interest alignment and facilitate the exploitation of complementarities. In this regard, partner repetition allows the firm to benefit from established routines supporting knowledge exchange. Yet, new partners bring in novel inputs that expand the partnership’s learning potential. In face of technological uncertainty, firms profit mostly from leveraging established routines, since they limit eventual problems related to the understanding, identification and recognition of new knowledge. For this reason, a firm tends to form partnerships with repeated partners or with partners of its partners in contexts of high uncertainty, as long as there is still knowledge to be explored (Hagedoorn et al., 2011).

In the view of Schilke and Goerzen (2010), alliance management capability is a second-order construct, formed by a set of routines connected to interorganizational coordination, alliance portfolio coordination, interorganizational learning and market proactivity (i.e. the capacity to understand the environment and identify new market opportunities). These authors found that a dedicated function to alliance management has a positive effect on final performance. For Ireland et al. (2002), alliance management capability is equally qualified as fundamental to gaining competitive advantage and creating value with collaborative arrangements. Effective alliance management includes a thorough consideration of the benefits an alliance aims to obtain and a careful selection of appropriate partners.

In addition to management systems, there are behavioral factors to be considered, such as motivation and credibility. The lack of motivation, either from the source or the recipient organization, sets up barriers that make the learning process challenging. This can be ascertained through the time spent in the knowledge transfer process. In the case of Toyota, for instance, the longer the company exchanged knowledge in its supplier’s factory, the quicker it improved performance. The lack of credibility refers to the source organization and arises out of a subjective evaluation made by the partner and is connected to the trust established between them (Dyer and Hatch, 2006).

Several authors have dealt with cultural differences. Bhagat et al. (2002) studied the influence of culture on knowledge transfer, particularly when partnering organizations come from different countries. They proposed a theoretical model based on the premise that each society transfers and absorbs knowledge in a distinctive manner, depending on the standards of cultural action that characterize it: individualism–collectivism and verticality–horizontality.
Such standards determine the forms and preferences for the various types of knowledge (explicit vs tacit, human vs social vs structured). Their key argument is that interorganizational knowledge transfer is most efficient when partners are located in contexts with identical cultural standards. Also for Ireland et al. (2002) and Inkpen and Tsang (2005), the less the cultural distance between the partners, the easier it is the exchange of any type of knowledge.

Kotabe et al. (2003) corroborated this argument by showing that the effort of transferring knowledge from one country to another is difficult and potentially unfruitful. In an investigation of American and Japanese suppliers of the automobile industry, they found that the specificities of each country must be observed. In Japan, companies are more reluctant to exchange partners and encounter difficulty in benefiting from short-term relationships for the exchange of technical knowledge. In the USA, companies take longer to reap the benefits of technological transfer as compared to Japan, but achieve short-term gains in the exchange of technical knowledge. The time duration of the relationship is an important mediator between knowledge transfer and the performance of the recipient organization.

Conversely, the findings of Cheung et al. (2011) point to a decrease of relevance of cultural differences. The reason is attributed to one of the most important outcomes of globalization, namely, the cross-pollination beyond national borders, which has fostered a cohort of multicultural managers.

What is necessary for an organization to receive external knowledge? An organization needs absorptive capacity, autonomy (to circumvent network restrictions), flexibility (from the point of view of production), internal processes of knowledge dissemination and training.

Possibly one of the most studied constructs in this literature absorptive capacity refers to the capability of the recipient firm to recognize, transform and assimilate external knowledge. One first important differentiation is between individual and collective absorptive capacity. Collective absorptive capacity is the sum of individuals’ absorptive capacities and of organizational characteristics such as coordination and motivation. In order to absorb new external knowledge, individuals need to change the way they think, act and conduct their activities, as well as how they communicate with colleagues. A second characteristic is the resistance of individuals to new knowledge, which brings uncertainty and the possibility of the loss of privileges. Consequently, motivation must be present. A high degree of collective absorptive capacity helps overcome the challenges connected to coordination and motivation (Zhao and Anand, 2009).

Zhang et al. (2007) examined how resources and structures affect knowledge transfer. They argued that absorptive capacity is not determined exclusively by R&D expenditure, but also by management. The breadth of the knowledge base and the centrality of the R&D department influence positively a firm’s absorptive capacity and, consequently, its propensity to form partnerships. Defined as the number of knowledge fields covered, the breadth of the knowledge base confers greater ability to recognize and assimilate the development of potentially new technologies. Likewise, when R&D is centralized (concentrated in few business units), central planning and control take place at the corporate level. This results in faster decision-making processes, greater capacity to renew knowledge, as well as economies of scale and scope that are beneficial to alliances. In a similar vein, Lane et al. (2001) noted that new knowledge acquired from a partner in a joint venture only impacts learning if combined with high levels of training provided by the source organization. Through training the source organization helps the partner to understand the applicability and meaning of this knowledge, thereby minimizing ambiguity and tacitness.

Likewise, the management of the recipient organization plays a role in the internal process of knowledge dissemination (Inkpen, 2008). In the case of NUMMI, GM learned how
to capture and share internally the knowledge obtained through the joint venture. It established a well-informed process that included, among other mechanisms, the choice of appropriate personnel and specific training. It is not enough to expose individuals to new knowledge; the creation of internal mechanisms of knowledge dissemination is necessary too. Experimentation by the recipient organization is similarly crucial. As learning processes are marked by trial and error, it is only through the course of collaboration that the opportunities for knowledge exploitation become clear (Inkpen, 2008).

The lack of adaptability in organizations is considered a barrier to knowledge transfer. For Dyer and Hatch (2006), barriers exist even when partners are motivated and the recipient organization shows high levels of absorptive capacity. Knowledge transfer may become difficult and costly in the presence of network restrictions and of rigidity in the internal processes. Network restrictions are the policies or specific demands of each partner that determine the production process. In the case of the automobile industry, suppliers are subject to marked differences in the specifications of each client. These restrictions limit the adoption of best practices for all the buyers. In an analogous fashion, the rigidity of internal processes refers to the lack of flexibility of the recipient organization in changing its production line. For example, in highly automated factories, suppliers do not always manage to adapt their productive process due to the pre-established layout (Dyer and Hatch, 2006).

3.2.4 Individual factors. There is relatively limited research about the behavior of people involved in partnerships. The majority of papers deal with interorganizational knowledge transfer from a collective and non-personalized perspective. The few studies that work at this level of analysis identified the following variables as relevant: motivation, cognitive styles, emotions, learning behavior, individual absorptive capacity and resistance.

What leads individuals to transfer knowledge? Individual motivation, be it intrinsic or extrinsic, is related to distinct forms of knowledge transfer. Since the transfer of tacit knowledge can neither be observed directly nor attributed to one person, it cannot be rewarded. It depends, therefore, on the intrinsic motivation of individuals. The challenge resides in the fact that companies have little control over this aspect. Contrariwise, the transfer of explicit knowledge is visible and may be rewarded and encouraged. It is therefore better leveraged by extrinsic motivation. However, both incentive mechanisms cannot coexist due to the prevalence of a crowding-out effect. An individual intrinsically motivated to perform a determined task may lose such motivation if he or she receives a financial reward, leading him or her to depend on extrinsic mechanisms in the future. This makes the management of motivation a complex issue and, at the same time, a fundamental one (Osterloh and Frey, 2000).

Emotions are another variable that impact how individuals behave in interorganizational settings, as to cope with the uncertainties related to partners’ behavior. In a context in which some knowledge needs to be shared and some knowledge needs to be protected, emotions provide the cues to individuals to interpret events and to decide whether or not to “segment” knowledge of sensitive nature, that is, to switch from not sharing knowledge to sharing gradually knowledge bites in a self-regulated dynamics (Jarvenpaa and Majchrzak, 2016).

How do individuals learn? Knowledge transfer across organizations necessarily encompasses the process through which individuals assimilate knowledge. Bhagat et al. (2002) elaborated on this issue by drawing on the concept of cognitive styles. They identified three distinct individual styles: tolerance for ambiguity, signature skills and mode of thinking. In their view, each cultural context favors certain cognitive styles to the detriment of others. Individuals with a high tolerance of ambiguity deal better with tacit, complex and systemic knowledge. Signature skills refer to favorite problem solving and information-seeking styles developed by each person, including his or her cognitive approach (the way of structuring a question) and preference for certain tasks, tools and methodologies. Individuals with very
distinct signature skills will experience greater difficulty in exchanging knowledge. Mode of thinking refers to how an individual analyzes information. Those taking a holistic perspective analyze the whole spectrum of available information in an associative manner before using it, while those taking the analytical perspective scrutinize each portion of information separately. Bhagat et al. (2002) contended that individuals with different modes of thinking will encounter greater challenges in learning from each other.

In addition to the diversity of styles, individual learning behavior can be formal (via planned events) or informal (via spontaneous interactions). Both formal and informal learning behaviors have positive effects on learning that are complementary. Formal behavior through projects and visits encourages informal behavior, that is, socialization beyond organizational boundaries. The latter, in turn, facilitates the overall exchange of tacit knowledge. There is nevertheless a limit to this relation, once a high degree of formalization restricts learning to the extent that it stifles informality (Janowicz-Panjaitan and Noorderhaven, 2008).

Also Zhao and Anand (2009) identified the importance of individual absorptive capacity and the necessity of individuals to change their mindset, the way of acting and conducting their daily activities, as well their communication style. They further pinpointed the resistance of individuals to new knowledge, which brings uncertainty and the possibility of loss of privileges.

3.3 Theme 3: consequences of interorganizational knowledge transfer
In addition to the results obtained by the partnership as a whole, there is a vivid discussion about how to measure learning outputs and their effects on individual organizations.

How to evaluate knowledge transfer? A fundamental issue from the perspective of partners is the evaluation of the effectiveness of knowledge transfer. Nevertheless, most scholars do not explicitly refer to this aspect and seem to infer a dichotomous judgment, based on whether or not knowledge transfer took place. The works of Bozeman (2000) and Bozeman et al. (2014) expand this evaluation in proposing seven parameters and indicators.

The first criterion – “out of the door” – evaluates whether the organization received (or not) knowledge from the partner, without considering its impact. Because of its practicality and ease of measurement, it is the most used criterion. Bozeman (2000) called attention to its limitations, because the recipient organization may or may not have implemented external knowledge de facto. The second criterion refers to the market impact in terms of commercial outputs such as profitability and market share. The third one is economic development and contemplates similar effects to the previous criterion, but from a collective perspective that goes beyond the gains achieved by an organization individually. It considers, for example, the financial impact of knowledge transfer on the economy of a region. The political criterion is the fourth one and is based on the expectation of non-financial rewards. It may translate into support for a social group, the legitimization of a policy or for the expansion of political influence. The opportunity cost criterion examines the choices for the utilization of resources employed and their possible impact on other knowledge transfer tasks. The criterion of human, technological and scientific capital takes into account the gains accrued in the development of the people implicated in the process, that is, if there has been technically relevant learning for a determined work group. Finally, the criterion of public value analyzes more wide-ranging objectives of public interest connected to societal grand challenges, e.g. sustainability of the planet (Bozeman et al., 2014).

How does knowledge transfer affect organizational performance? The types of performance improvements organizations achieve through partnerships are subject to extensive debate and a myriad of empirical exercises. Mesquita et al. (2008) proposed an interesting distinction between redeployable and relational performance. They called
“redeployable performance” the gains that improve general firm performance as to refer to the learning that is not adapted to the needs of a specific partner and that can be used in other contexts. Contrariwise, they referred to “relational performance” as the specific gains of the intimate and symbiotic interaction brought about by the dyad. Relational performance may not be appropriated by organizations outside the partnership, as it arises from dyad-specific investments in assets and capabilities and from the acquisition of know-how within and the dyad. The study of Cheung et al. (2011) corroborates the relationship effects for performance too, while emphasizing that outcomes differ for each party in buyer–supplier agreements. Yet, evidence is not entirely positive. Beamish and Berdrow (2003) suggested that there is no direct relationship between learning and joint venture performance in terms of operational and financial gains.

Regarding the consequences of partnerships for organizational performance relative to innovation output, the work of Frenz and Ietto-Gillies (2009) noted that the acquisition of knowledge through alliances is less efficient than the acquisition of knowledge through own investments, R&D purchase and intra-firm transfer. For international collaboration, the effects are positive for internal networks; while very small for external networks. That is, collaboration between units produces more benefits relative to innovation. One possible explanation is the sharing of organizational culture, which may facilitate the exchange of knowledge within the same company (e.g. expatriate programs guarantee face-to-face interaction). In contrast, Herstad et al. (2014) found that global innovation linkages are positively associated with technology and markets opportunities, since they generate more sales from innovation. Grimpe and Sofka (2016) detected complementary effects between relational collaboration that involves partner-specific investments and transactional collaboration occurring via external R&D contracts and in-licenses in markets for technology. Only the joint adoption of both collaboration strategies enhances innovation performance, as they allow firms to simultaneously overcome the disadvantages of each approach and to leverage scarce absorptive capacities most efficiently. The complementarity effect is stronger in industries with less developed markets for technology.

Following a similar reasoning, other contributions discovered a more nuanced relationship between technological collaboration and product innovation, where the effect is contingent on market competition, sectoral characteristics (Wu, 2012), absorptive capacity (Tsai, 2009) and technological or market relatedness (Frankort, 2016). Intense market competition diminishes the positive outcomes of interorganizational collaboration, as short-termism and opportunism prevail (Wu, 2012), whereas absorptive capacity enhances effective learning between collaborating firms resulting in new product development outcomes (Tsai, 2009), especially when partners are active in similar technological domains but operate in distinct product markets (Frankort, 2016).

4. Analysis
With the view of coherently integrating our findings, we adopt an antecedents-process-outcomes framework, in line with Bengtsson and Raza-Ullah (2016) and Oliver and Ebers (1998). We therefore organize our analysis in three blocks: factors that antecede knowledge transfer, the process of transference itself and the outcomes. We classified the antecedents as factors that precede knowledge transfer, either driving the formation of the partnership or throughout it. These are variables that influence an organization’s decision to establish a partnership, like appropriability regimes, technology sophistication (macro context) and the existing internal processes of the recipient firm. In turn, process variables are those directly connected to the operational dimensions of knowledge transfer, such as routines, managerial supervision and social relations. Outcomes refer to the results (gains and losses) obtained through the partnership.
Our interpretation of the systematic literature review indicates that there are six dimensions anteceding knowledge transfer processes in partnerships, namely, knowledge attributes, the macro context, interorganizational factors, the source organization, the recipient organization and individual factors. With respect to the knowledge transfer process, it is determined by procedural governance, relational and cognitive governance and dynamics, which are the learning effects over time. We further observe that the literature includes two dimensions connected to outcomes: effectiveness and organizational performance. All these dimensions are linked in a novel theoretical framework, depicted in Figure 4. The framework offers an overarching explanation of knowledge transfer in interorganizational contexts, permeated by a myriad of cause-and-effect relationships among multilevel factors.

The links between the antecedents and the process suggest that the same set of antecedents can stimulate knowledge transfer in distinctive ways. For instance, formal contracts (structural governance) may or may not support the development of knowledge sharing routines (procedural governance) (Inkpen, 2008), depending on the level of initial trust among partners, the cultural context they are embedded in (Kotabe et al., 2003), their alliance management capabilities (Draulans et al., 2003; Tzabbar et al., 2013; Zollo et al., 2002), as well as the preference of interacting individuals for formal or informal exchanges (Janowicz-Panjaitan and Noorderhaven, 2008). In a similar rationale, the lack of credibility of the source organization (Dyer and Hatch, 2006) in the partner-specific competence to deliver what was agreed upon influences the investments and effort dispensed by the source firm in the transfer process.

As knowledge attributes and the macro context are independent (not impacted by other variables) and affect other antecedents (as well as each other), they are represented in the
outer part of our theoretical framework. Knowledge attributes determine appropriability regimes and technological sophistication of the industry (Hagedoorn et al., 2009), as well as the intellectual property regime (Guennif and Ramani, 2012) and the demand of the State (Bozeman et al., 2014), which, in turn, influence companies’ decisions to form partnerships driven by synergy-seeking motives (Lee et al., 2010). Knowledge attributes similarly influence interorganizational variables such as governance. Jiang and Li (2009), for example, argued that tacitness favors joint ventures. At the individual level, tacit knowledge influences the intrinsic motivation to handle external sources (Osterloh and Frey, 2000). Besides, complex and systemic knowledge are privileged in the cognitive styles with greater tolerance of ambiguity (Bhagat et al., 2002).

The knowledge transfer process lies at the center of the framework as to suggest that it is necessary to understand it as a multilevel phenomenon. Characteristics such as causal ambiguity and context dependency determine to a large extent the transfer mechanisms employed. Inkpen (2008) advocated that, as context-dependent and collective knowledge is embedded in routines, it can only be transferred when a new set of routines is implemented. It is during the partners’ interaction via mechanisms of knowledge replication and adaptation (Williams, 2007), routines (Inkpen, 2008), training (Lane et al., 2001) and managerial involvement (Tsang, 2002) that partner-specific knowledge advances, and consequently transforms the initial relative absorptive capacity (Schildt et al., 2012). This further indicates that, despite the initial conditions given by the antecedents, the quality of the transfer process determines the outcomes. The efforts and investments made by the source and recipient organizations in adjusting the process in accordance with knowledge attributes (Hagedoorn et al., 2009; Bhagat et al., 2002; Osterloh and Frey, 2000; Schildt et al., 2012); in accommodating different types of governance (Jiang and Li, 2009; García-Canal et al., 2008; Berschicci et al., 2015); in modifying internal structures (Dyer and Hatch, 2006; Tsang, 2002); and in developing and adapting routines (Zollo et al., 2002) facilitate or hinder the achievement of the expected outcomes. Individual learning behaviors are relevant to the form in which the knowledge should be transferred too. For instance, certain knowledge attributes such as tacitness call for more social interactions and mentoring.

When comparing the different facets, it seems noteworthy that antecedent variables assume more central focus within the field than outcomes. The effectiveness of knowledge transfer remains a marginal concern, since most studies (with the exceptions of Bozeman, 2000; Bozeman et al., 2014) assume an implicit dichotomous evaluation of whether or not knowledge was moved, irrespective of its applicability and other intangible by-products, such as the advancement of human capital. Still there seems to be an increasing focus on the performance outcomes, particularly with respect to innovation in more recent years. Existing evidence on performance outcomes of partnerships is overall mixed (Frenz and Ietto-Gillies, 2009; Grimpe and Sofka, 2016; Herstad et al., 2014), suggesting great heterogeneity in the extent to which firms are able to capture value from interorganizational knowledge transfer. Several empirical contributions demonstrate that these seemingly contradictory findings stem from a complex and nuanced causal relationship, moderated by a number of contextual variables: markets for technology, sectoral characteristics, market competition and absorptive capacity (Grimpe and Sofka, 2016; Frankort, 2016; Tsai, 2009; Wu, 2012).

As our framework demonstrates, absorptive capacity is a highly relevant concept treated not only as an antecedent (at the interorganizational, organizational and individual levels), but also as part of the knowledge transfer process itself and as a moderator of the relationship between collaboration and innovation outcomes. The literature is, however, not conclusive with respect to the dominating influence of this variable or to which extent the various effects overlap with each other. These are issues that clearly deserve more careful consideration in future studies.
In addition to these cause-and-effect relations, it is worth mentioning that we found relevant time effects, which bring dynamics to the analysis and which we illustrate by the gray circular arrow. Dynamics represent the changing effects of learning upon variables as time goes by. Several authors pinpoint the role of time. Kotabe et al. (2003) discussed the importance of the duration of the alliance, which, depending on the culture, may impact knowledge transfer in a positive or negative fashion. Dyer and Hatch (2006) pointed out the need to invest time in the knowledge transfer process, as integration demands commitment (Tzabbar et al., 2013). Segrestin (2005) and Mesquita et al. (2008) highlighted the importance of building a collective identity, while Inkpen and Currall (2004) contended that partners learn about each other and change the level of trust as collaboration matures. Likewise, time changes the macro context, and the combination of both can modify the motivation to join partnerships at different levels – interorganizational, organizational and individual. Individual factors, such as resistance, emotions and individual absorptive capacity, also evolve with time. For instance, if uncertainties related to partner’s behavior are mitigated, knowledge sharing may be improved (Jarvenpaa and Majchrzak, 2016).

By elucidating the cause-and-effect relationships and the interactive character driven by time, our framework thus not only illuminates the encompassing picture of knowledge transfer, but also enlightens the role of learning and provides an evolutionary perspective of the process.

5. Opportunities for future research

Our literature review and framework reveal that the study of knowledge transfer requires distinct analytical and methodological approaches. Since interorganizational partnerships are arrangements characterized by different forms of governance and involve at least two organizations, which, in turn, are composed by innumerable individuals, the understanding of knowledge transfer process claims a multilevel analysis. Aspects such as the motivation of individuals and organizations to engage in collaboration along with formal and informal governance instruments require different conceptual backgrounds. As our framework was organized around antecedents, process and outcome factors, it elucidated that the understanding of relationship between levels and variables is a vital issue. Moreover, since our framework unravels the dynamic character of collaboration, it calls for longitudinal studies in addition of quantitative cross-sectional methods that prevail in this research stream.

Our literature review discloses that most part of the articles is concentrated in one level of analysis and used quantitative methods. In fact, this concentration poses limitations in terms of inferring causal relationships between variables situated at different levels and hinders the comprehension of their evolution. The papers that discuss dynamics do so in a conceptual manner (with few exceptions such as Schildt et al., 2012; Tzabbar et al., 2013); the empirical evidence being scanty. Even if this is a challenging task due to the inherent efforts in data collection, it is crucial for the future development of research in this field. There is room for multiple approaches that draw on qualitative data more intensely. Case studies may expand our understanding of contextual aspects and uncover less contested issues such as structural governance. Regarding the relationship among different levels, we propose some questions for future investigations. For instance, how does alliance governance – structural, procedural, relational and cognitive—shape individual learning? Does the formation of a collective identity increase or diminish the predisposition of agents to collaborate and share knowledge?

Likewise, our study uncovers that scant attention is devoted to the individuals involved in the knowledge transfer process. Although this may be a reflection of our choice of journals (which have a limited tradition of studies at this level of analysis) and of the dominating concern on the collective level that has traditionally pervaded the strategy and
innovation research fields, the role of individuals is naturally a key point. As a matter of fact, until the novel contribution of Felin and Foss (2005) calling for contributions on the micro-foundations of aggregate concepts, the role of individuals has been largely disregarded. In a recent review on the topic of interorganizational R&D, Smith (2012) also discovered a predominant tendency of researchers to focus on the management and firm level of analysis with few pioneering studies investigating the phenomenon at the micro-level, i.e. the level where knowledge creation and innovation take place. For a special issue on behavioral foundations, Powell et al. (2011) similarly contended that the strategy field lacks adequate psychological grounding. Since the field’s central concern has been to explain firm heterogeneity, there is a restricted number of studies dealing with individuals and related behavioral aspects.

We also see individual-level investigations as a fruitful and much needed avenue for further research in the area of interorganizational knowledge transfer. We welcome studies focused on individuals to complement and extend the learning mechanisms identified at aggregate levels. A promising question is, for instance: what leads a person to collaborate de facto in an interorganizational alliance? In particular, the not-invented-here syndrome (Katz and Allen, 1982) – the negative attitude to knowledge sourcing defined at the individual and the team levels – which may potentially affect interorganizational knowledge transfer, did not appear in the studies investigated in our review.

From an empirical standpoint, as demonstrated in Table A1, the literature prioritizes the context of industry (especially the automobile, pharmaceuticals, IT and telecommunications industries), while the service sector is examined to a limited extent. Whereas many studies focus on the relations between buyers and suppliers, few look into partnerships between competitors. Besides, the majority favors joint ventures and R&D agreements, with limited attention to other forms of collaboration. In the current political agenda where public–private partnerships are highly valuable as objects of public policy in many countries, this would be a subject of great practical interest. The bulk of the literature investigated in this review focuses on private companies, without questioning the legitimacy of the results for partnerships involving public organizations. We therefore encourage the development of studies in this empirical context too.

6. Conclusions
Knowledge transfer is central to the development of competitive advantages, as organizations increasingly depend on partnerships with external partners. However, this is far from a trivial task, especially when it takes place in interorganizational arrangements. Our systematic literature review aims at uncovering the state-of-the-art on this topic by addressing the following questions: What factors impact knowledge transfer in interorganizational alliances? How do these factors interact with each other? Our study extends existing literature in three ways. First, we offer a synthesis of the variables, how and why they influence knowledge transfer in partnerships. Given the complexity and heterogeneity of the field, we point out the position of individual variables and their segmentation, emphasizing areas of divergence and convergence that had not been self-evident in the literature. We also identify themes that are less well investigated and contested, indicate methodological deficiencies and other weaknesses. We particularly pinpointed the need for multilevel inquiries since, in our view, important interactions have so far not received the attention they deserve. In this way, we have suggested an agenda for future research.

Second, we bring together our main findings in a novel theoretical framework that integrates antecedents, process and outcomes. In the framework we elucidate the cause-and-effect relationships among factors and their interactive and dynamic character. Therefore, our model not only illuminates the systemic picture of the knowledge transfer process, but
also enlightens the role of learning and provides an evolutionary perspective of the process. In this way, we hope to facilitate the dialogue between otherwise unconnected approaches.

Third, we offer recommendations for practitioners who face the challenge of developing a suitable environment for learning in an interorganizational partnership. A possible reason for the high failure rate of partnerships may be the lack of a holistic picture of knowledge transfer. Positive outcomes hinge on the ability of managers of the partnering firms to see how multiple levels affect one another throughout the collaboration process. Alliance managers may make use of our study to improve and adjust contracts, structures, processes and routines, as well as to build the support mechanisms that guarantee effectiveness in knowledge transfer.

Although there exists limited understanding about the practical implications, since research results offer a restricted set of insights on the “how-to-do,” some takeaways are worth mentioning. As a starting point, partnership managers should try to characterize and understand in depth the attributes of the knowledge at stake. This initial characterization may help him or her to dimension the challenge in question and find adequate transfer mechanisms. In striving to achieve fit between knowledge, partner characteristics and appropriate governance, managers should think hard which transfer processes to implement, including routines, training, visits and informal social interactions. As regards the partner, managers ought to observe his motivations and previous experiences that indicate his capability to manage alliances, thereby favoring partners with whom they enjoy prior experience and a trustworthy relationship. Partners of partners may also be considered, particularly in cases where novel inputs are needed and there exists limited technological uncertainty. Yet, expanding too far the number of collaborations in play at a given point of time is a risky endeavor. A very extensive portfolio of partnerships likely diminishes a firm’s ability to capture value from interorganizational knowledge transfer. The organizational structure with respect to the position of the partner’s R&D department may be a valuable indication (and a fairly easily one to assess) of proficiency in using external knowledge, alongside the breadth of the knowledge base. Regarding his or her own organization, managers should evaluate motivation, absorptive capacity and flexibility of existing structures. An honest and careful appraisal of his/her capability to manage partnerships is recommended too. Another aspect to consider is time. The duration of the agreement, the time dedicated to knowledge transfer, the evolution of absorptive capacity and trust, and the time needed for knowledge integration are some crucial issues. Finally, the individual motivations, as well as their cognitive styles and learning behaviors should be assessed.

Our results are relevant for policy makers too; in special those formulating policies in countries that have opted for partnerships as a way of promoting technological catch-up in selected sectors. For policy makers, it is crucial to disentangle the drivers of the learning process, as to be able to design more effective mechanisms and incentives for a stimulating environment where the choice to form partnerships for knowledge transfer is made.

Having said this, we are aware that our study could have been improved in various ways. The papers from the ten journals we examined certainly do not exhaust the population of papers on interorganizational knowledge transfer. As we covered the leading journals in the fields of strategy and innovation studies, we are nevertheless confident that we covered a representative sample of the most influential research; albeit not fully comprehensive. Our choice of journals also limits our capacity to make proposals for public policy, as there are few studies dedicated to this issue. The selection of keywords represents another limitation worth mentioning. Even if we included a broad range of search terms encompassing relevant synonyms of “knowledge transfer” and “partnership,” some have been left out. The keyword cluster, for instance, was not added; even though it might represent an important phenomenon connecting the interorganizational and macro levels. Finally, our triangulation strategy was limited to coder triangulation, as both authors carried out an independent classification of papers. Yet, it did not include other reliability measures such as a citation analysis.
Notes

1. For a detailed review of the literature on absorptive capacity, see Lane et al. (2006) and Volberda et al. (2010).

2. Search term used in the EBSCOhost Search Screen – Advanced Search Database – Business Source Premier: JN “journal name” AND (AB keyword1 OR TI keyword1). Date from 2000 to 2017.

3. Keywords used in the literature search: knowledge transfer, technology transfer, alliance, network, consort*, collaborat*, co-opet*, coope*, interorgan*, inter-organi*, inter-firm, inter-firm, joint venture and partnership.

4. Our paper quite solely focuses on “knowledge transfer,” which includes the search, acquisition, assimilation and integration of knowledge (Filieri and Alguacil, 2014). Other perspectives emphasize that knowledge is not only transferred, but also co-created in interorganizational contexts.

5. We included in our search the journal Administrative Science Quarterly too; yet none of the retrieved paper was selected.

6. Variables relative to time are treated across themes.

7. Cumulativeness is associated with complexity and system embeddedness, which implies the necessity of more communication and opens the possibility of lock-ins to collaboration partners. Regarding appropriability, engaging in collaborative knowledge development entails exposure of proprietary knowledge and opens space for uncertainty concerning the control of jointly developed knowledge assets.

8. For more details, see Wang Y. and Rajagopalan N. (2015) and Andrevski et al. (2016).

References


Further reading

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<th>Article</th>
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<tr>
<td>1 Williams (2007)</td>
<td>The various mechanisms of knowledge transfer</td>
<td>Telecommunication services in various countries</td>
<td>Technology licensing agreements</td>
<td>Survey</td>
<td>Adaptation and replication are distinct mechanisms used simultaneously during the knowledge transfer process. The more causal ambiguity, the more replication. The more context dependency, the more adaptation. Knowledge transfer demands a systematic implementation of mechanisms, which should be seen as part of a process of organizational change with various trials and errors.</td>
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<td>2 Inkpen (2008)</td>
<td>Transfer of knowledge from the perspective of organizational processes</td>
<td>Automobile industry in the USA and Argentina</td>
<td>Joint ventures</td>
<td>Interviews</td>
<td>Knowledge transfer demands a systematic implementation of mechanisms, which should be seen as part of a process of organizational change with various trials and errors. Networks are fundamental for the performance of the firm, even in the presence of restrictions that represent barriers for knowledge transfer between firms. Competitive advantage can be gained through a network of suppliers, as some resources and capabilities are relation specific.</td>
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<td>3 Dyer and Hatch (2006)</td>
<td>The role of network resources in influencing firm performance</td>
<td>Automobile industry in the USA</td>
<td>Vertical between suppliers</td>
<td>Survey/Interviews</td>
<td>Knowledge transfer demands a systematic implementation of mechanisms, which should be seen as part of a process of organizational change with various trials and errors. Networks are fundamental for the performance of the firm, even in the presence of restrictions that represent barriers for knowledge transfer between firms. Competitive advantage can be gained through a network of suppliers, as some resources and capabilities are relation specific.</td>
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<td>4 Mesquita et al. (2008)</td>
<td>The types of competitive advantage brought by vertical alliances</td>
<td>Equipment industry in the USA</td>
<td>Vertical between suppliers</td>
<td>Survey</td>
<td>Knowledge transfer demands a systematic implementation of mechanisms, which should be seen as part of a process of organizational change with various trials and errors. Networks are fundamental for the performance of the firm, even in the presence of restrictions that represent barriers for knowledge transfer between firms. Competitive advantage can be gained through a network of suppliers, as some resources and capabilities are relation specific.</td>
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<td>5 Kotabe et al. (2003)</td>
<td>The sources of operational performance improvement in supplier partnerships</td>
<td>Automobile industry in Japan and USA</td>
<td>Vertical between suppliers</td>
<td>Survey</td>
<td>Knowledge transfer demands a systematic implementation of mechanisms, which should be seen as part of a process of organizational change with various trials and errors. Networks are fundamental for the performance of the firm, even in the presence of restrictions that represent barriers for knowledge transfer between firms. Competitive advantage can be gained through a network of suppliers, as some resources and capabilities are relation specific.</td>
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<tr>
<td>6 Inkpen (2000)</td>
<td>Firms’ learning behavior in alliance through processes, teams, management</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Knowledge transfer demands a systematic implementation of mechanisms, which should be seen as part of a process of organizational change with various trials and errors. Networks are fundamental for the performance of the firm, even in the presence of restrictions that represent barriers for knowledge transfer between firms. Competitive advantage can be gained through a network of suppliers, as some resources and capabilities are relation specific.</td>
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<td>7  Schildt et al. (2012)</td>
<td>Absorptive capacity and its influence in learning of alliances</td>
<td>ICT industry in the USA</td>
<td>Joint ventures</td>
<td>Survey</td>
<td>Knowledge is transferred through long-term routines. Due to the difficulties in sharing learning, the analysis is restricted to the industrial environment, which demands complex knowledge. The partnerships formed seek new opportunities in the acquisition of learning, however, they do not differentiate between the process of alliance formation and the intentions in the acquisition of a new knowledge.</td>
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<td>8  Zhao and Anand (2009)</td>
<td>Collective and individual knowledge transfer, absorptive capacity</td>
<td>Automobile industry in China</td>
<td>Joint ventures and R&amp;D collaboration agreements</td>
<td>Survey</td>
<td>There are important distinctions between the transfer of individual and collective knowledge. The authors uncovered mechanisms that can be compared between different levels, such as collective learning and individual knowledge.</td>
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<td>9  Osterloh and Frey (2000)</td>
<td>Intrinsic and extrinsic motivation for tacit and explicit knowledge transfer</td>
<td>–</td>
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<td>–</td>
<td>Intrinsic motivation plays a key role for the firms because it is strongly related to the need to generate and transfer tacit knowledge.</td>
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<td>10 Zollo et al. (2002)</td>
<td>“Routinization” between the partners and its influence in cooperative agreements.</td>
<td>Biotechnology and pharmaceutical industry</td>
<td>Collaborative agreement for manufacturing/R&amp;D</td>
<td>Survey</td>
<td>The experience with a specific partnership has a positive impact on the performance of the alliance. This effect is stronger in non-equity-based governance. A specific partner or technology influences the results of the alliance in terms creating opportunities and</td>
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<td>11 Inkpen and Currall (2004)</td>
<td>Evolution of trust, control and learning in partnerships</td>
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<td>–</td>
<td>–</td>
<td>supporting partners to reach strategic objectives. Trust and control evolve over time. In collaborative processes, trust creates initially a climate in the partnership that helps to define the interactions between the partners affecting over time the objectives defined <em>a priori</em>.</td>
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<td>12 Bhagat et al. (2002)</td>
<td>Effectiveness of knowledge transfer of the firm in different cultural contexts</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>It identifies four standards of cultural actions, dealing with their potential to moderate the effectiveness of the knowledge transfer beyond organizational boundaries. Culture is defined in terms of individualism–collectivism and verticality–horizontality.</td>
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<td>13 Luo (2005)</td>
<td>Perception of justice (procedural justice) between international cooperative alliances</td>
<td>Industrial sector (manufacturing) in China</td>
<td>Technical/ Productive cooperation agreements</td>
<td>Survey/ Secondary data</td>
<td>The shared sense of justice becomes increasingly important for the gains with the alliance when the latter presents a structure of high uncertainty (characteristic of emerging markets) or when the cultural distance between the partners in the firms is high (characteristic of international cooperative alliances).</td>
</tr>
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<td>14 Lee et al. (2010)</td>
<td>Trade-off between cost-sharing and synergy-seeking drivers for the long-term knowledge transfer</td>
<td>High technology industry (IT, biotechnology, semiconductors) in the USA</td>
<td>R&amp;D collaboration agreements</td>
<td>Secondary data</td>
<td>Collaboration strategies for knowledge transfer are advantageous in the long term when the partners share synergy-seeking motives in accessing complementarities among themselves. The same does hold true when the motive for forming the partnership is cost sharing.</td>
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<td>15</td>
<td>Jiang and Li (2009)</td>
<td>The scope and governance of alliances and their implications for the creation, sharing and innovation of the firm</td>
<td>Joint ventures in Germany</td>
<td>Joint ventures</td>
<td>Joint ventures are more effective and influential in facilitating the creation and sharing of knowledge. This scope of the alliance does not possess a direct relation with the creation of knowledge. Knowledge sharing, its creation and interaction contribute significantly to innovative performance of the partnering firms</td>
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<td>16</td>
<td>Janowicz-Panjaitan and Noorderhaven (2008)</td>
<td>Formal and informal learning behavior of individuals</td>
<td>Joint ventures in Poland</td>
<td>Joint venture between international competitors</td>
<td>Informal learning behavior has a positive effect on knowledge generation and on the formal behavior of learning. A lot of formality in the generation of organizational knowledge obstructs learning. Formal behavior encourages informal learning in creating a barrier beyond the boundaries of the firm. An excess of formality protects knowledge</td>
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<td>17</td>
<td>Bozeman (2000)</td>
<td>Synthesis and critique of multidisciplinary literature on technology transfer between university and industry</td>
<td>R&amp;D collaboration</td>
<td>R&amp;D collaboration agreements</td>
<td>Development of the contingent effectiveness model for technology transfer. Augments the criteria utilized to measure technology transfer in university–company partnerships</td>
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<td>18</td>
<td>Bozeman et al. (2014)</td>
<td>Re-reading of the work of Bozeman (2000) aggregating new tendencies in technology transfer</td>
<td>R&amp;D collaboration</td>
<td>R&amp;D collaboration agreements</td>
<td>Re-reading of the work of Bozeman (2000) including the contingent effectiveness model for technology transfer, the interest in the public and social value that orientates technology transfer</td>
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<td>The process of knowledge transfer depends on how firms and other institutions manage knowledge, in particular the co-evolution of their knowledge</td>
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<td>The relationships, even collaborative, can be very precarious and experimental. A new collective identity requires a specific management model to develop.</td>
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<td>Common purposes, where new types of contract may arise. Indian firms produce more generic products on the basis of the corresponding API – active pharmaceutical ingredient. Brazilian firms have to import API to formulate the medications, paying double the price for having lost the technological catching up and ignoring their internal market.</td>
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<td>Agreement with a partner rather than a standard licensing contract. Alliance management capability is reflected in five types of routines: interorganizational coordination, portfolio coordination, interorganizational learning, alliance proactiveness and alliance transformation. Alliance management capability has positive effects on performance.</td>
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<td>Ireland et al. (2002) The management of strategic alliances using as theoretical lenses transaction cost, social network and resource-based view</td>
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<td>Strategic alliances</td>
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<td>The management of alliances is crucial for firms to reach competitive advantage. Effective alliance management begins with selecting the right partner, building social capital and trust-based relationships.</td>
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<td>30</td>
<td>Yang et al. (2015) The performance outcomes of learning race between partners</td>
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<td>A firm with a higher specific learning capability relative to its partner’s is rewarded with superior stock performance. Equity alliance governance suppresses competitive learning, while market similarity between partners aggravates the learning race.</td>
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<td>32</td>
<td>Jarvenpaa and Majchrzak (2016) The role emotions and cognition play in self-regulatory processes for the knowledge sharing protection tension</td>
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<td>Interacting individuals use emotional cues to dynamically adjust their sharing and protecting behavior according to the complexity of sensitive knowledge in.</td>
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<td>Frankort (2016) The performance consequences of alliances from the perspective of both knowledge acquisition and new product development outcomes</td>
<td>IT industry in the US</td>
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<td>Firms acquiring more technological knowledge from their R&amp;D alliance partners are on average more productive in new product development, particularly when the technological knowledge base of alliance partners are more closely related and when they operate in different product markets</td>
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<td>34</td>
<td>Kavusan et al. (2016) The impact of technological overlap and alliance experience on both knowledge acquisition and complementarity specialization</td>
<td>IT industry in the USA</td>
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<td>Alliances between firms sharing moderate-to-high degrees of technological overlap show high levels of knowledge acquisition, whereas alliances between firms sharing either low or high levels of technological overlap display high levels of complementarity specialization. Prior alliance experience positively moderates these relationships.</td>
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<td>35</td>
<td>Garcia-Canal et al. (2008) The influence of technological flows in the choice of governance forms of technology alliances</td>
<td>Multi-industry setting in European Union countries</td>
<td>Strategic alliances and joint ventures</td>
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<td>There is greater propensity to create joint ventures in alliances in which it is more difficult for the partners involved to control the activities of the alliance and/or where there are more difficulties in distributing cooperation rents according to contributions made individually. The positive effect of technological collaboration on product innovation is weaker at higher levels of market competition, yet this relation is positively moderated by high-tech sectors</td>
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<td>36</td>
<td>Wu (2012) The consequences of strategic alliances for product innovation</td>
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<td>Grimpe and Sofka (2016)</td>
<td>The complementarity between relational and transactional search strategies</td>
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<td>Lane et al. (2001)</td>
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<td>Tsang E. (2002)</td>
<td>How firms learn from their collaborative experience and the amount of knowledge acquired by them</td>
<td>Multi-industry setting in Singapore and Hong Kong</td>
<td>International joint ventures</td>
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<td>Managerial involvement in JVs by the source organization is an important driver for knowledge transfer. This involvement may be through supervision performed by the parent managers or through daily operation; the latter being more important when the JV is new. The greater the strategic importance of a JV, the greater the resources allocated and the greater the learning.</td>
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<td>41 Cheung et al. (2011)</td>
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<td>5 Manufacturing companies in various countries (126 cross-border dyads)</td>
<td>Vertical between suppliers</td>
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<td>Three specific types of relational learning – information sharing, joint sense making and knowledge integration – influence relationship performance</td>
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<td>When partner firms are direct competitors even “protective” governance structures may provide insufficient protection to induce extensive knowledge sharing among alliance participants</td>
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<td>45 Howard et al. (2016)</td>
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<td>Eli Lilly and Company and 55 small biotech partner firms</td>
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<td>The authors found that greater social interaction between partner firm and organization source increases internal collaboration among partner firm’s inventors</td>
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<td>Remote collaboration is positively related with innovation performance, but at low R&amp;D intensity, this relationship vanishes. In practice, however, this may be complicated as personal contacts are more limited so that effective search and</td>
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<td>47 Lazarić and Marengo (2000)</td>
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<td>49 Hagedoorn et al. (2011)</td>
<td>The role of technological uncertainty, redundancy and information heterogeneity for the formation of alliances</td>
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<td>Cooperation agreements with close partners – coming from the same group of partners or partners of their partners – lead to the convergence of the technological profile, reducing learning possibilities. New partners open up better opportunities to reduce technological uncertainty, but the value obtained must be greater than the cost of finding a new partner.</td>
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<td>50 Inkpen and Tsang (2005)</td>
<td>How knowledge moves within networks and how social capital affects the knowledge movement</td>
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<td>The findings emphasize the importance of trust, culture, prior experience and the establishment of clear objectives for knowledge transfer.</td>
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<td>51 Vandaie and Zaheer (2015)</td>
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<td>Independent motion picture production studios in the USA</td>
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<td>The results show that the number of major partners exhibits an inverted U-shaped effect on an independent studio’s capability. The authors also found that both an independent studio’s alliance experience with major partners and its level of specialization intensify (positively moderate) this relationship.</td>
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<td>52 Liu and Ravichandran (2015)</td>
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<td>53 Herstad <em>et al.</em> (2014)</td>
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<td>The study concludes that knowledge characteristics (cumulativeness and appropriability), knowledge type (analytical), as well as market and technological opportunities determine the return rate of partnerships. They also influence decision making in relation to the formation of global networks for innovation.</td>
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*Source: Authors’ elaboration*
Knowledge transfer and managers turnover: impact on team performance

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Abstract
Purpose – The paper aims to investigate the emerging issue of knowledge transfer and organisational performance. The purpose of this paper is to investigate the importance of knowledge transfer in obtaining high and positive results in organisations, in particular, studying the role of managers’ skills transfer and which conditions help to achieve positive performance.

Design/methodology/approach – The research analyses 41 cases of coaches that managed clubs competing in the major international leagues in the 2014–2015 season and that moved to a new club over the past five seasons. The authors employ a qualitative comparative analysis (QCA) methodology. According to the research question, the outcome variable used is the team sport performance improvement. As explanatory variables, the authors focus on five main variables: the history of coach transfers; the staff transferred; the players transferred; investments in new players and the competitiveness.

Findings – The overall results show that when specific conditions are realised simultaneously, they allow team performance improvement, even if the literature states that the coach transfers show a negative impact on outcomes. Interestingly, this work reaches contrasting results because it shows the need for the coexistence of combinations of variables to achieve the transferability of managers’ capabilities and performance.

Originality/value – The paper is novel because it presents a QCA that tries to understand which conditions, factors and contexts help knowledge to be transferred and to contribute to the successful run of organisations.

Keywords Knowledge transfer, Qualitative comparative analysis, Team performance, Football industry, Managers’ capabilities

Paper type Research paper

1. Introduction
The paper aims to investigate the emerging issue of knowledge transfer and organisational performance. The knowledge creation and transfer in and between organisations have been covered in several studies (Ajith Kumar and Ganesh, 2009; Bloodgood, 2012; Guechtoili et al., 2012; Massaro et al., 2017). Our purpose is to investigate the importance of knowledge transfer in obtaining high and positive results in organisations, in particular, studying which conditions help to achieve positive organisational performance.

Many authors (Bertrand and Schoar, 2003; Rosen, 1990) show that the person who leads an organisation can have a substantial effect on its productivity, increasing the transferability of
knowledge as well as the organisational performance. Indeed, companies hire new managers to get abilities and experience needed to build their competitive advantage and performance (Groysberg et al., 2006) but literature achieves conflicting results about the effectiveness of this strategy (Massaro et al., 2015). Indeed, managerial capabilities are difficult to analyse and are strongly related to managers’ knowledge. Interestingly, authors agree that while some capabilities are easy to transfer, others are not (Anderson and Sally, 2014; Groysberg, 2010) and this topic assumes a key relevance in some contexts, such as in the football industry where often clubs hire new managers/coaches to improve their performance.

The football industry has become a sports-related environment connected to a complex set of economic, social, and political structures and with huge cultural and financial impact (Beech and Chadwick, 2004; Collignon and Sultan, 2014; Söderman and Dolles, 2013). The role of the head coach can vary across sports and within a sport across countries, but in the professional football industry coaches typically have the power to recruit football players and to hire backroom support staff, pick the team for each game and decide on match tactics (Carson, 2013). Thus, coaches have a key role in a company’s strategy and its implementation in the football industry. Additionally, the availability of public data and importance in terms of GDP make it an interesting sector to study.

This paper presents a qualitative comparative analysis (QCA) (Ragin, 1987) that tries to understand which conditions, factors and contexts help knowledge to be transferred and contribute to run a football teams organisation successfully. The analysis focuses on managers/coach transfers in the European and South-American Football Championships. The website transfermarkt.com is used as the data source, and forty-one cases are analysed in the 2014–2015 season. All the cases are compared to find similarities and differences across a comparable configuration of conditions (Marx et al., 2013). According to the research question, the outcome variable used is the team sport performance improvement. As explanatory variables, we focus on five main variables: the history of coach transfers, the staff transferred, the players transferred, the investments in new players and the competitiveness of the championship. This paper answers the call of this special issue to explore knowledge transfer, organisational performance and business processes because despite their assumed importance, literature has achieved conflicting results, often based on empirical analyses, without explaining in-depth which conditions help managers’ knowledge transfer.

The structure of this study is as followed: Section 1 examines the theoretical arguments that lead to the research hypotheses. Section 2 explains the data collection and analysis methods. Section 3 presents the main results and the discussion. Lastly, Section 5 contains the conclusions of this study.

2. Literature review and research questions
Managerial capabilities have gained a primary role to understand how to run organisations successfully (Yeardley, 2017) and have been defined as knowledge-sets that can help build a company’s competitive advantage and performance (Leonard-Barton, 1992, p. 113). Managerial capabilities can be characterised as socially complex, history-dependent, intuitive, non-verbalised (Hedlund and Nonaka, 1993; Polanyi, 1969) and can be ambiguous (Lippman and Rumelt, 1982) when, for example, they reside in culture and values (Barney, 1986, 1991; Mosakowski, 1997; Reed and DeFillippi, 1990). Therefore, managerial capabilities are difficult to analyse but strongly relate to managers’ knowledge and can help in building company’s competitive advantage and performance (Bertrand and Mullainathan, 2001; Goodall et al., 2011; Goodall and Pogrebna, 2015).

Literature shows that companies hire new managers to get abilities and experience needed to build their competitive advantage and performance (Farrell and Whidbee, 2003). Interestingly, some general management skills such as setting a vision, motivating employees, organising, budgeting and monitoring performance have been shown to translate well to new
environments. Conventional wisdom holds that the second category of management skills – those specific to a given company, such as knowledge of idiosyncratic processes and management systems – do not transfer as well (Groysberg et al., 2006). The topic of capability transfer assumes relevance in the professional football industry that often hires new managers to improve their performance (Bell et al., 2013). Thus, the literature shows that while some capabilities are easy to transfer, others are not and this topic assumes a key relevance in some contexts such as in the football industry (Frick and Simmons, 2008).

Recently, some researchers (Beech and Chadwick, 2004; Söderman and Dolles, 2013) highlighted that football has become a sports-related environment connected to a complex set of economic, social and political structures and with huge cultural and financial impact. Research conducted by A.T. Kearney Inc. (Collignon and Sultan, 2014) found that the market for sports events in general in 2014 (revenues from tickets, media rights, and sponsorships) will be worth close to $80 billion, with the impressive annual growth of 7 per cent. When you add sporting goods, apparel, equipment and health and fitness spending, the sports industry generates as much as $700 billion yearly or 1 per cent of global GDP. On a sport-by-sport basis, growth occurred nearly across the board, but football remains the runaway leader. Football revenues increased from $25.1 billion in 2009 to $35.3 billion in 2013, a CAGR of 9 per cent. The sport’s revenues in Europe, the Middle East and Africa alone were $27.1 billion in 2013. Authors of the report (Collignon and Sultan, 2014) assert that football will undoubtedly remain the leader in the years to come due to the record level of interest in the 2014 World Cup and, at the more local level, to the rising attendances for many of Europe’s top leagues. Additionally, the field of football presents an interesting area of study because of its extremely interested and active fans, who search for information on every aspect of their clubs (Cooper and Johnston, 2012).

Furthermore, the availability of detailed, comprehensive records of manager transfers and match results implies that an uncontroversial measure of organisational performance is readily accessible in the public domain, making empirical research on the managerial contribution more feasible than with most other private or public-sector organisations (Audas et al., 1997, p. 30). For this reason, many authors have paid attention to the role of the head coach in determining team performance also demonstrating the impact of coaches’ intellectual capital value (Muehlleusser et al., 2016; Tomé et al., 2014). The role of the head coach can vary across sports and within a sport across countries but in the professional football industry coaches typically have the power to recruit football players, hire backroom support staff, pick the team for each game and decide on match tactics (Carson, 2013). Additionally, in the football industry, the programming function performed by the coach involves the formulation of the team’s strategic objectives (positioning in competitions, enhancing football players), determining the resources needed to achieve these goals (investments in the purchases campaign, the ways of developing policies for training youth) and the identification of instrumental and hierarchically subordinate goals to those of strategic nature (Audas et al., 1997). Thus, in the football industry coaches have a key role in a company’s strategy and its implementation, and the availability of public data and importance in terms of GDP make it an interesting sector to study.

Interestingly, despite the important role of football coaches and data availability, literature finds contradictory results on the impact of coach change on team performance. Some studies report evidence of a positive performance effect following a change in head coach (González-Gómez et al., 2011; Madum, 2016). For example, Madum (2016) shows that teams in the premier Danish soccer league appear to have performed significantly better following in-season coaching changes. The results of Madum (2016) are fully in line with De Dios Tena and Forrest (2007), who analyse three seasons of data from Spain and find that teams gain about one-third of a point per match in each of their next seven home matches due to a coaching dismissal. Two interpretations of this finding are that the shock effect of dismissing the coach matters more when players are performing in a familiar
environment where it may be easier to get stuck in unproductive routines and that coaching dismissal are popular with home fans who, in turn, provide players with renewed energy during home matches. Others (De Paola and Scoppa, 2012; Wirl and Sugmeister, 2008) find only weak evidence that performance improves more during home matches following dismissals or find that performance improvements are driven by away matches (Muehlheusser et al., 2016).

 Contradicting the previous results, other studies find that forcing management turnover has no positive effect on firm performance (Audas et al., 1997, 1999; Brown, 1982; D’Addona and Kind, 2014, Farber, 1999; Koning, 2003). According to these studies, the strategy of changing the coach has the sole purpose of finding a “scapegoat” to satisfy the expectations of fans, and the end result is that the team adopts a defensive game (Audas et al., 2002; Brown, 1982; Koning, 2003; Rowe et al., 2005). Thus, the soccer teams do not win more matches, even in the short-term, and the club is not able to benefit from a (new) coach’s capabilities.

 For example, Balduck and Buelens (2007) use data from Belgian soccer and construct two groups of teams who performed similarly on the pitch, but only teams in one group changed their coach; the results of their study shows that any difference in performance following a coaching change is due to regression to the mean. Bruinshoofd and ter Weel (2003) and Koning (2003) find identical results using Dutch data. In all, previous studies based on extensive data from other countries typically find that coaching dismissals have no positive effect on team performance (Van Ours and Van Tuijl, 2016), suggesting that boards’ dismissal decisions could be influenced by pressure from sponsors and the media (Flores et al., 2012). Additionally, Groysberg (2010) argues that in the football sector there are no true standalone players because all footballers must interact with each other. Thus, managers and players transferred must expect a period of adjustment to achieve previous performance.

 Interestingly, most of the studies we analysed use quantitative approaches and focus on different variables. For example, Anderson and Sally (2014) show that promoting integration in clubs could minimise the period of adjustment of managers/players skills transfer. Therefore, it is possible to consider clubs that have a history of manager turnover as having a systematic plan to add only those outsiders who fit the culture and who are then assimilated deliberately and carefully into the team (Groysberg, 2010). For this reason, football teams tend to execute the process of “lift-out” (Anderson and Sally, 2014), consisting of hiring managers together with a certain percentage of their staff and in hiring players with a certain percentage of their teammates. According to Anderson and Sally (2014), moving groups of people together allows a smoother and more rapid integration within an unfamiliar environment, letting stars to attain prominent levels of performance in a shorter time. Therefore, previous studies focus on variables such as the percentage of teammates and/or coach staff transferred together with the coach to facilitate the knowledge transfer of the coach capabilities.

 Furthermore, another condition analysed by the literature is the competitiveness of the football industry (Forrest and Simmons, 2006; Madalozzo and Villar, 2009). Local rivalries, largely driven by supporters, are important factors underpinning the demand for attendance (Forrest and Simmons, 2006; Madalozzo and Villar, 2009) and a football club’s identity (Benkwitz and Molnar, 2012; Dmowski, 2013). Porter (1998, p. 83) argues that “local rivalry is highly motivating. Peer pressure amplifies competitive pressure within a cluster, even among non-competing or indirectly competing companies. Pride and the desire to look good in the local community spur executives to attempt to outdo one another”. To better compete in a more competitive sector, teams usually increase their investments, and, as Szymanski (2010) and Trequattrini et al. (2017) demonstrate, club’s performance is a function of investments in the purchases campaign, considered as the total amount of wages. Therefore, competitive pressure together with the level of investments is important variables considered in previous studies.
In all, we state that although broad enough, current literature does not achieve unanimous results and a widespread consensus. Additionally, few studies provide an in-depth approach that focuses on the coexistence of multiple variables that can affect the effectiveness of the coach transfer. Our paper aims to investigate the transfer of coaches in the football industry to understand which factors affect the success of knowledge transfer of managers/coach capabilities. Therefore, our research question is the following:

RQ1. What is the combination of conditions that support team performance improvement when managers/coaches are transferred?

3. Research method
This section describes the research method. First, we describe the research context in the following sub-section. Second, we describe the research method, based on the crisp-set QCA methodology (Cs-QCA) (Marx et al. 2013, Mueller 2014). Third, we describe the variables used. Finally, we describe the data collection and analysis of a medium-sized sample.

3.1 Research methodology: the Cs-QCA
To answer the research question, we employ a QCA methodology. According to Ragin (1987, p. 87), the goal of QCA is to “integrate the best features of the case-oriented approach with the best features of the variable-oriented approach”. The Cs-QCA methodology is a case-based approach where each case is considered as a complex entity (Marx et al., 2013) and it is focused on small and medium-sized samples (Mozas-Moral et al., 2016). Cases are compared to find similarities and differences across a comparable configuration of conditions (Marx et al., 2013). Therefore, Cs-QCA represents a relatively new methodology that combines some aspects of qualitative and quantitative research methods.

Although they are traditional quantitative approaches, Cs-QCA search multiple causations that occur together. In Cs-QCA, researchers look for the simultaneous presence of a combination of causes that can be sufficient to explain a resulting outcome (Marx et al., 2013). All the variables are measured using a dummy variable that could assume the value 0 (absence of the condition) or 1 (presence of the condition). For example, Mozas-Moral et al. (2016) recently used Cs-QCA for searching the simultaneous presence of several performance variables in the Spanish organic olive oil sector. The authors focused on managerial university degrees (1 if yes, 0 if no), presence of company website sales (1 if yes, 0 if no), presence of knowledge electronic markets (1 if yes, 0 if no) and company social network presence (1 if yes, 0 if no). The outcome variable was the company export presence (1 if yes, 0 if no). Interestingly, while standard statistical techniques search for the net effect of single dependent variables, Cs-QCA seeks to detect different conjunctions of conditions that all together lead to the same outcome (Grofman and Schneider, 2009). Additionally, QCA has proved to be an efficient approach when more than three interacting variables simultaneously affect an outcome (Fiss, 2007). Finally, the Cs-QCA methodology was previously used to study knowledge transfer problems (Bakker et al., 2011). Therefore, considering the specific complexity of the cases analysed and the specific research context, as well as the limited number of cases of coach transfer available for each year, we believe that Cs-QCA is a good methodology to answer the research question previously stated.

3.2 Variables used
3.2.1 Independent/outcome variable: team sport performance improvement. According to the research question, the outcome variable used is the team sport performance improvement. To measure this, we employ a dummy variable based on the number of points gained in the season 2014 (before the coach transfer) and the number of points gained in the season 2015...
(after the coach transfer). The dummy variable is used assigning the value 1 if there is a sport performance improvement (points of the season 2015 > points of the season 2014), 0 in the case that there is not a sport performance improvement (points of the season 2015 ≤ points of the season 2014).

3.2.2 Dependent variables/causal conditions. As explanatory variables, we focus on five main variables derived from the studies described in the literature review section above.

History of coach transfers. This variable measures the experience the club has in changing coaches. The variable is measured focusing on the number of coach changes the club had in the last five years. The variable is measured as “1” if the club had more than three coach changes.

Staff transferred. This variable measures the staff transferred with the coach. If more than 50 per cent of the staff is transferred with the coach the variable assumes the value of 1. If less than 50 per cent of the coach staff is transferred the variable assumes the value of 0.

Players transferred. This variable measures the number of players transferred with the coach. If players that previously played with the coach are transferred together with the coach the variables assume the value of 1.

Investments in new players. This variable measures the number of new players the club buys on the market together with the new coach. The variable is measured comparing the amount of investments and disinvestments. If the investments are higher than the disinvestments the variable assumes the value of 1.

Competitiveness. This variable measures the championship competitiveness. Comparing 2013 and 2014 the variable assumes the value of 1 if the average points per team increases in the championship.

3.3 Data collection and data analysis

The research uses secondary sources and includes documents, reports, news items, journal articles in open sources, papers, scientific books and databases. Additionally, we used the website transfermarkt.com to collect data for each team, coach and the championship. According to Stanojevic and Gyarmati (2017), “transfermarkt.com is a large online service which follows virtually every professional and semi-professional football team in the world”.

The data analysis procedure is based on three main steps.

First, the data set is gathered manually from transfermarkt.com filling a specific MS-Excel spreadsheet and transformed into dummy variables. This is because Cs-QCA requires building a dummy data table (“1” equal to yes and “0” equal to no) deriving a set of necessary and sufficient conditions that lead to a certain outcome (Bakker et al., 2011).

Second, after developing the data matrix and in order to analyse the data set, we develop a “truth table” (Marx et al., 2013) using the software “R” (R Core Team, 2014). The truth table shows all the possible combinations of causal conditions that occur in the cases supporting the desired outcome (Marx et al., 2013). We searched for all the teams that showed a team performance improvement aggregating them for equal causal conditions. As Balodi (2016) suggests “if two configurations leading to the same outcome differ in only one causal condition, then that causal condition is considered irrelevant and removed to create a parsimonious solution”. Table I depicts results of this analysis and shows that in the case of “Bilic, Enrique, Garcia, Pioli” all the coaches were able to improve the performance of the team after they were transferred. For all these cases, the teams had a history of coach transfers, transferred more than 50 per cent of the staff together with the coach and invested in new players. In all cases, there was a reduction in competitiveness in the national championship. Interestingly, there are no cases where all these causal variables occur that did not have a team sport performance improvement. Therefore, all these causal variables were necessary to assure the outcome (Marx et al., 2013).
<table>
<thead>
<tr>
<th>History of coach transfers</th>
<th>Staff transferred</th>
<th>Players transferred</th>
<th>New investments</th>
<th>Championship decreased competitiveness</th>
<th>Team performance improvement (outcome variable)</th>
<th>Inclusion index</th>
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Notes: History of coach transfer: 1 if the team has transferred more than three coaches in the last five years; staff transferred: 1 if the team has acquired in the year 2014 more than 50 per cent of the staff that previously worked with the coach; players transferred: 1 if the team has acquired at least one player together with the coach; new investments: 1 if the players bought in terms of money spent is higher than the players sold; championship increased competitiveness: 1 if the average team score of the championship in the year 2014 has decreased compared to 2013; team performance improvement: 1 if the total score of the team in 2014 has increased compared to 2013.
Third, using the software “R” (R Core Team, 2014), the results of Table I were analysed to find conditions that are necessary and sufficient to cause a team sport performance improvement first. Findings and discussion of this analysis are reported in the following section.

4. Findings and discussion
In this section, we analyse the conditions that led to the success of knowledge transfer in the cases where teams showed a performance improvement. The sample of cases includes 41 coaches that managed clubs competing in the major international leagues in the 2014–2015 season, and that moved to a new club over the past five seasons. Of the 41 transfers investigated, 11 cases had successful outcomes, considered as the cases in which, after the transfer of the coach, clubs had achieved an improvement of team performance.

As shown in Table I, in the “Bilic, Enrique, Garcia, Pioli” cases, the teams had a history of coach transfers, transferred more than 50 per cent of the staff together with the coach, did not acquire any player together with the coach, invested in new players and championship competitiveness decreased. In the “Favre, Lucescu” cases, the teams did not have a history of coach transfers, did not invest in new players and championship competitiveness decreased. In the “Ancelotti, Schmidt” cases, teams had a history of coach transfers, transferred more than 50 per cent of the staff together with the coach, did not acquire any player together with the coach, invested in new players and championship competitiveness increased. In the “Emery, Koeman” cases, teams had a history of coach transfers, the coach was transferred with more than 50 per cent of his staff, the teams acquired at least one player together with the coach and did not invest in new players and championship competitiveness increased. In the “Benitez” case, the team had a history of coach transfers, transferred more than 50 per cent of the staff together with the coach, acquired at least one player together with the coach, invested in new players and championship competitiveness increased.

In order to find the conditions that are necessary and sufficient to cause a team sport performance improvement, the true table is reduced to simplified combinations of attributes using an algorithm that relies on Boolean algebra. The Boolean minimisation allows logical reduction of numerous, complex causal conditions into a reduced set of configurations that lead to the outcome. Table II depicts the results of Boolean minimisation.

The results show three different sets of cases. In the first set, “Emery, Koeman, Benitez”, in order to get a team performance improvement it is necessary that the following conditions are realised simultaneously: the coaches need to be transferred to teams with a history of coach transfers, with more than 50 per cent of his previous staff, in a context of championship competitiveness increased; moreover, the new teams have to acquire at least one player together with the coach.

In the second set “Bilic, Enrique, Garcia, Pioli, Ancelotti, Schmidt”, the coaches need to be transferred to teams with a history of coach transfers, with more than 50 per cent of their
previous staff. In contrast to the first case, the new teams do not have to acquire at least one player together with the coach but have to invest in new players.

In the last set “Favre, Lucescu”, the coaches need to be transferred to teams without a history of coach transfers, without more than 50 per cent of their previous staff, in a context of championship decreased competitiveness. The new teams do not have to acquire at least one player together with the coach and do not have to invest in new players. This can be the specific case, described in the literature (Groysberg et al., 2006; Groysberg, 2010), where a manager/coach is considered to be a standalone player in a way similar to an equity analyst.

The results shows that there are conditions which, when realised simultaneously allow team performance improvement, even if the major literature states that the coach transfers show a negative impact on outcomes and argue that the process of knowledge transfer does not improve results, even in the short-term, and that clubs are not able to benefit from their experience. Often, some authors (Audas et al., 2002; Brown, 1982; Koning, 2003; Rowe et al., 2005) justify these transfers only with the purpose of finding a “scapegoat” to satisfy the expectations of fans, and the outcome is that the team adopts a defensive game.

In order to achieve an improvement of performance after a managers’ transfer, our results demonstrate in two out of three cases obtained through Boolean minimisation (Emery, Koeman, Benitez cases; Bilic, Enrique, Garcia, Pioli, Ancelotti, Schmidt cases) that the head coach must be transferred to a team with a history of coaches turnover. This finding is in compliance with Anderson and Sally (2014) and related to the possibility of minimising the period of adjustment of managers skills transfer in which clubs do their best to promote integration. Therefore, one may state that clubs with a history of manager turnover have a systematic plan to include new managers into the organisations and this leads to a positive outcome. In these kinds of clubs, managers have incentives to show their expertise and their distinctive style, thus limiting the risk of not being confirmed in their place. With an increase in manager turnover, football teams are more used to facing change and more likely to welcome new players. In order to gain a competitive advantage, clubs develop dynamic capabilities (Teece et al., 1997), consisting of the clubs’ ability to “integrate, build, and reconfigure internal and external competences to address rapidly changing environments”. Focussing on these dynamic capabilities, clubs can produce better performances, especially in globalised environments (Teece, 2009, 2014).

Two out of three cases that were obtained through Boolean minimisation (Emery, Koeman, Benitez cases; Bilic, Enrique, Garcia, Pioli, Ancelotti, Schmidt cases) highlight that where the coach is transferred with bringing in more than 50 per cent of his previous staff, team performance is improved.

The results achieved can be justified by analysing the role of staff in the world of football. Manager’s staff consist of a highly professional and expert management team, capable of backing and assisting the manager in managing the team and in making strategic decisions (Lombardi et al., 2014). Several managers, in their role as football team leaders, consider their staff to be at the heart of their work. The staff are shaped by people with knowledge, charisma and personality, who can pass on their experience in accordance with their philosophy of the game. Managers understand the difficulty and complexity of their position, including the need for technical support and people who can be delegated in various areas of organisational responsibility (Carson, 2013).

In the first set obtained through Boolean minimisation (Emery, Koeman, Benitez cases), the coach is jointly brought in with his former staff and transferred together with at least one player of his previous team. The football teams tend to execute what is known as a “lift-out” (Anderson and Sally, 2014) which is hiring managers with a certain percentage of their staff and players with a certain percentage of their teammates. Moreover, the Emery, Koeman, Benitez cases share an increased championship competitiveness that leads to a greater team performance as stated in the literature (Brandenburger and Nalebuff, 1996; Jones and Cook, 2015; Lardo et al., 2016; Porter, 1998).
Otherwise, in the cases of Bilic, Enrique, Garcia, Pioli, Ancelotti, Schmidt, the championship competitiveness is irrelevant and the transfer of the coach is not accompanied by bringing in at least one player from the previous team. What matters is that clubs invest in new players. Actually, in football clubs, one of the coach’s functions is to formulate the team’s strategic goals and to determine the resources needed to achieve these goals, e.g., player investments (Audas et al., 1997). It has been widely demonstrated that there is a correlation between players investment and performance achieved (Szymanski, 2010; Trequattrini et al., 2017). Among the cases we have analysed, an example is Carlo Ancelotti, one of the most expensive coaches in the last ten years (http://www.itasportpress.it/). Analysing the investments made by the teams he trained after his transfer (Milan, Real Madrid, Chelsea and Paris Saint Germain), they amounted to €881 million, which led the clubs to win numerous trophies.

With regard to conditions that can cause a performance decrease, results show that when competition increases and teams only invest in the coach and staff transfers, performance decreases as in the last case set. These results build on Trequattrini et al. (2017), by showing the importance of new investments to support football team competitiveness and on studies that show that coach knowledge transfer alone cannot improve team performance even though the competitiveness of the championship increases (Audas et al., 1997, 1999; Brown, 1982; Farber, 1999; Koning, 2003). Table III depicts these results.

5. Conclusion

The issue of knowledge transfer into the organisation and business processes is relevant and widely investigated in literature (Guechtouli et al., 2012). At the same time, many authors argue that managers’ capabilities are knowledge-sets that can help build a company’s competitive advantage, successful outcomes and innovative processes (Bertrand and Schoar, 2003; Leonard-Barton, 1992; Rosen, 1990; Yeardley, 2017). Our paper aims to study the role of manager transfers in achieving greater organisations’ performance and, in particular, to identify combinations of conditions that support team performance improvement when managers/coaches are transferred.

Our research started from the assumption of the extant literature (Groysberg et al., 2006; Groysberg, 2010) that companies hire new managers to get abilities and experience needed to build their competitive advantage and performance. This phenomenon is particularly analysed in the football industry, an interesting sector of study (Beech and Chadwick, 2004; Collignon and Sultan, 2014; Söderman and Dolles, 2013) in terms of GDP annual growth rate, availability of public data of the key role played by managers/coaches in defining companies’ strategy and in its implementation. The field of football presents an interesting arena of study because of its extremely interested and active fans who search for information on every aspect of their clubs (Cooper and Johnston, 2012).

In football clubs, the programming function performed by the coach involves the formulation of the team’s strategic objectives, determining the resources needed to achieve these goals and the identification of instrumental goals and of goals that are hierarchically subordinate to those of strategic nature (Audas et al., 1997). However, previous studies achieve conflicting results related to the link between managers/coaches transfer and

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<th>Inclusion index</th>
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<tr>
<td>( ST \times pt \times nw \times CDC )</td>
<td>1.000</td>
<td>1.000</td>
<td>0.074</td>
<td>Favre, Lucescu</td>
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</tbody>
</table>

**Notes:** Output: performance decrease; ST/st, staff transferred = 1 if capital letter)/0 if lowercase; PT/pt, players transferred = 1 if capital letter)/0 if lowercase; NW/nw, new investments = 1 if capital letter)/0 if lowercase; CDC/cdc, championship increased competitiveness = 1 if capital letter)/0 if lowercase
greater organisations performance (Audas et al., 2002; Madum, 2016). Despite the important role of football coaches and data availability, literature finds contradictory results on the impact of coach changes on the team’s performance. Most of the studies use quantitative approaches and focus on different variables, finding that forcing management turnover has no positive effect on firm performance (Audas et al., 1999; Brown, 1982; Farber, 1999; Koning, 2003). Typically, researchers find that coaching dismissals have no positive effect on team performance, suggesting that boards’ dismissal decisions could be influenced by pressure from sponsors and the media.

On the contrary, our research investigates this issue by employing an innovative QCA that identifies which conditions, factors and contexts help knowledge to be transferred and to contribute to the successful management of organisations. We believe that it is not possible to demonstrate in any absolute sense if managers’ capabilities transfer alone affects organisations’ performance because performance is a complex variable that depends on the interaction of several conditions.

Therefore, to answer the research question, we employed a QCA methodology, where the outcome variable used is the team sport performance improvement and the explanatory variables are: the history of coach transfers, the staff transferred, the players transferred, the investments in new players and the competitiveness of the championship. In this case, we searched for all the teams that showed a team performance improvement aggregating them for equal causal conditions. The research analysed 41 cases of coaches that managed clubs competing in the major international leagues in the 2014–2015 season and that moved to a new club over the past five seasons.

Of the 41 transfers investigated, 11 cases had successful outcomes, considered as the cases in which clubs have achieved an improvement of team performance after the transfer of the coach. To find conditions that are necessary and sufficient to cause a team sport performance improvement, the results are reduced to simplified combinations of attributes using an algorithm that relies on Boolean algebra. The results allowed to distinguish between three different types of cases that were thoroughly analysed in the discussion section.

The overall results demonstrate that when specific conditions exist simultaneously, they lead to team performance improvement. This is in contrast to the major literature which states that coach transfers show a negative impact on outcomes, and which explains that the process of knowledge transfer does not improve results, even in the short-term, and that clubs are not able to benefit from their experience. Interestingly, our work presents quite different results. First of all, by adopting a new methodology, we can clarify that it is not meant to establish in any absolute sense whether managers’ capabilities are transferable or not but what matters is the transfer in a certain context with specifically interrelated conditions. Coherently with the conclusions of some studies (Groysberg et al., 2006; Groysberg, 2010; Anderson and Sally, 2014), we have found that there are factors affecting and encouraging managers’ capabilities transfer associated with a greater organisational performance. This paper provides evidence about effective mechanisms for transferring knowledge as well as about barriers to and facilitators of knowledge transfer.

In conclusion, our paper adds to the previous conflicting literature showing that combinations of variables are needed to achieve the transferability of managers’ capabilities and performance. To prove this, we adopted the QCA method that integrates the best features of the case-oriented approach with the best features of the variable-oriented approach. The paper is novel because it does not analyse one variable per time but the coexistence of a set of conditions leading to a greater performance after transfers. Hence, it answers the call of this special issue to explore knowledge transfer, organisational performance and business processes because, despite their assumed importance, literature has not achieved homogenous results without explaining in-depth which are the conditions that support knowledge managers’ capabilities transfer. Thus, from a research point of
view, it is necessary to emphasise that a manager’s performance is a complex variable and cannot be affected by the occurrence of a single condition.

In addition, the paper could be helpful to football clubs for understanding the configuration of conditions that are required to promote new coaches’ integration and knowledge transfer. As Seethamraju and Marjanovic (2009, p. 920) state: “practitioners will be able to better serve their organizations if they concentrate on the improvement of the process by tapping the contextualized process knowledge possessed by the individual actors”. As with any research, this study has some limitations. Results are bound by the conditions included in the study; therefore, it would benefit from adding other conditions that, in past research, appeared to be important for the outcome. Future research could try to deepen the analysis related to the cases of transferability of managers skill that our research – the first research employing the QCA method – has found. To give an example, it could be promising to conduct a case study analysis on the cases that were highlighted here through employing Boolean minimisation. Furthermore, by adopting a different methodology, such as a multiple-factor conditions analysis, future research could investigate the genealogies of failures in the football industry knowledge transfer, highlighting the factors producing negative effects in order to help managers to avoid failures in the sports business.

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Further reading


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Abstract

**Purpose** – The purpose of this paper is to analyze the impact of patenting on the performance of academic spin-off firms (ASOs) in the post-creation stage. Specifically, our study analyses how the combination of knowledge transfer mechanisms by ASOs and patents can foster ASOs’ early growth performance.

**Design/methodology/approach** – The authors explored the relations between patenting processes and spin-off performance through econometric methods applied to a broad sample of Italian ASOs. The research adopts a deductive approach, and the hypotheses are tested using panel data models by considering the sales growth rate as the dependent variable regressed over measures of patenting activity and quality and assuming that firm-specific unobservable drivers of growth are captured by random effects.

**Findings** – The empirical analysis shows that the incorporation of knowledge transferred by the parent university and academic founders through patents affects the performance of ASOs. Specifically, the authors find that the number of patents is a positive driver of ASOs’ performance, whilst patent age does not have a significant impact on growth. Moreover, spin-offs with a larger endowment of patents obtained before foundation, surprisingly, grow less on average.

**Practical implications** – The findings have implications for ASO founders by suggesting that patenting processes reap benefits. However, in the trade-off of external knowledge access vs internal knowledge protection, it may be better to begin patenting after the foundation of ASOs.

**Originality/value** – The authors enrich the on-going debate about the connections between knowledge transfer and organizational performance. This paper combines the concepts of patents and ASOs by providing evidence on the role of patenting processes as a transfer mechanism of explicit knowledge in ASOs. Furthermore, the authors contribute to the literature on costs and benefits of patents by hinting at unexpected findings.

**Keywords** Performance, University, Patents, Knowledge transfer, Academic spin-offs, Start-up

**Paper type** Research paper

**Introduction**

Theoretical conceptions on the role of universities in local development have evolved over the last 20 years, from the innovation systems approach, which highlighted the importance of knowledge spillovers from university educational and research activities to the surrounding knowledge spaces, toward greater focus on the “third role” of universities as an animator of regional economic and social development (Bolzani et al., 2014; Etzkowitz, 2002a, b, 2003; Etzkowitz and Leydesdorff, 1997, 1999; Leydesdorff and Etzkowitz, 1998; Holland, 2001; Chatterton and Goddard, 2000; Goddard and Chatterton, 1999; Trequattrini et al., 2015, Etzkowitz et al., 2000; Etzkowitz, 2003; Grimaldi et al., 2011).

The key processes adopted by entrepreneurial universities in order to contribute to local development involve a spectrum of both “soft” and “hard” knowledge transfer mechanisms (Algieri et al., 2013; Lockett et al., 2005; Philpott et al., 2011; Rothaermel et al., 2007;
van Zeebroeck et al., 2008). On the one hand, hard activities (such as patenting, licensing and spin-off firm formation) are generally perceived as the more tangible outputs (Rasmussen et al., 2006) of mature entrepreneurial universities (Klofsten and Jones-Evans, 2002). On the other hand, softer initiatives (such as academic publishing, grantsmanship and contract research) align themselves better with the traditional academic culture (Klofsten and Jones-Evans, 2002; Louis et al., 1989) and in certain cases may not be viewed as entrepreneurial activities by the wider academic community.

Among the different knowledge transfer mechanisms, the creation of spin-off companies is the most complex but also has the highest potential impact for economic development. In fact, university spin-offs can play an important role in supporting the regional economic development as they can be sources of employment (Perez and Sanchez, 2003), as well as mediators between basic and applied research (Abramson et al., 1997; Autio, 1997), with direct and positive effects on the levels of innovation efficiency (Rothwell and Dodgson, 1993).

Since the positive effects of the spin-offs on the society are not automatic and depend on the capacity of a spin-off to grow and achieve satisfactory performance, there is increasing interest in the factors affecting the spin-offs growth process (Galati et al., 2017; Scholten et al., 2015; Soetanto and Jack, 2016; Treibich et al., 2013; Visintin and Pittino, 2014). Literature analyses academic spin-offs (ASOs) at the firm level to investigate both their features and performance (Ciraco et al., 2013; Ortin-Ángel and Vendrell-Herrero, 2014). These studies focus on specific aspects, such as founding team, spin-offs’ resources and networks (Clarysse et al., 2011; Slavtchev and Goktepe-Hulten, 2015; Visintin and Pittino, 2014). Nevertheless, there is a lack of research on the effect on the performance generated by the incorporation of knowledge transferred by the parent university in the spin-off business process. Patents represent a mechanism to explicitly transfer the knowledge (Nelson and Winter, 1982; Mazzoleni and Nelson, 1998; San and Chung, 2003). Some scholars (e.g., Gilbert and Shapiro, 1990; Nordhaus, 1969) show that patent rights pursue the balance between the advantages of rewarding inventors and the disadvantages from temporary exclusion of others from making, using or selling inventions. Moreover, despite the evident linkage existing between patents and spin-off realization, some scholars (e.g., Visintin and Pittino, 2014; Wagner and Cockburn, 2010) tend to analyze these two knowledge transfer mechanisms separately, considering patents and spin-offs as two different and often alternative mechanisms that university adopt to transfer technology. Some academics tend to protect knowledge through patents before exploiting it through spin-off generation (Van Zeebroeck et al., 2008), while some authors have demonstrated the positive effect of patents on spin-off generation (Ndonzuau et al., 2002; Landry et al., 2006); the impact of patents on spin-offs performance is nearly neglected.

However, the few existing studies on the effects of patents on the performance of ASOs after foundation offer limited evidence and finds contrasting results (Maresch et al., 2016; Niosi, 2006).

To bridge the gap in the literature, our paper aims to empirically investigate to what extent patents, viewed as the incorporation of knowledge transferred by the parent university and academic founders, affect the performance of ASOs.

The research adopts a deductive approach since the hypotheses are formulated on the basis of the literature. We analyze data from 132 Italian ASOs. The original data set, built by the authors, was developed through a survey conducted by means of interviews with administrators of the technology-licensing offices in 67 Italian universities. The collection of information relating to patents was conducted on the Italian Patent and Trademark Office website based on a spin-off founder’s name search. We test the hypothesis that patents enhance the real performance of ASOs through panel data models, considering the sales growth rate as the dependent variable (Agostini et al., 2015; Autio et al., 2000; Clarysse et al., 2011). Specifically, we ask whether patents granted to members of the founding team...
enhance the subsequent growth of the ASO over a time horizon of a maximum of as three years. Our findings show that the incorporation of knowledge transferred by the parent university and academic founders through patents affects the performance of ASOs. Specifically, the number of patents is a positive driver of ASOs’ performance whilst patent’s age does not have a significant impact on growth. Moreover, spin-offs with a larger endowment of patents obtained before foundation, surprisingly, grow less on average.

The paper is structured as follows: in the second section, we analyze the theoretical background about the performance of ASOs; in the third section, we formulate our hypotheses. In the fourth section, we explain the methods with reference to the sample, the data set and the data analysis; in the fifth section, we discuss our findings. In the last section, we provide conclusions in terms of theoretical, methodological and practical contributions, limitations and suggestions for future research.

The performance of academic spin-offs: explanatory factors

From a national economy perspective, ASOs can be viewed as a mechanism providing benefits in terms of knowledge transfer from universities to markets, which encourages economic development and creates new jobs (Wright, 2007). The establishment and success of ASOs is a complex process and, from a firm-level perspective, scholars have found only a few successful cases of ASOs (Chiesa and Piccaluga, 2000).

Scholars have examined several aspects, such as characteristics and programs of parent organizations (Bray and Lee, 2000; Muscio et al., 2016; Rappert and Webster, 1997; Rogers et al., 2001), spin-off/parent conflicts (Steffensen et al., 1999), government policies (Li and Jiang, 2001; Sternberg, 2014), barriers to technology transfer (Geisler and Clements, 1995; Perez and Sanchez, 2001; Van Dierendonck and Debackere, 1988), spin-out processes (Jones-Evans et al., 1998; Roberts and Malone, 1996), founder qualities (Klofsten and Jones-Evans, 2002; Samson and Gurdon, 1993), entrepreneurial team formation (Clarysse and Moray, 2004) and characteristics of technologies, industries and/or markets (Chiesa and Piccaluga, 2000; Nerkar and Shane, 2003; Shen, 2001). Indeed, a broad body of literature examines whether university spin-offs over-perform or under-perform non-academic start-ups, presenting mixed results. Some studies suggest that ASOs have a worse performance than other start-ups (Ensley and Hmieleski, 2005; Ortín-Ángel and Vendrell-Herrero, 2014; Wennberg et al., 2011). Conversely, another stream of studies argues that ASOs over-perform corporate spin-offs (Bonardo et al., 2010; Czarnitzki et al., 2014; Zahra et al., 2007; Zhang, 2009).

These studies have stimulated scholars to explore in more depth the specific field of factors affecting ASOs performance.

Minimal empirical research identifies the drivers that foster the growth and the start-up process of university spin-offs (Mustar et al., 2006; Rasmussen et al., 2014; Walter et al., 2006; Wennberg et al., 2011), although achieving a satisfactory performance is a necessary condition to ensure a positive impact of research spin-offs on local economies. Since prior studies mainly focused on those factors that affect spin-off generation (Berbegal-Mirabent et al., 2015; Grimaldi et al., 2011), there is an increasing interest in the factors stimulating spin-offs’ growth process (Galati et al., 2017; Scholten et al., 2015; Soetanto and Jack, 2016; Treibich et al., 2013; Visintin and Pittino, 2014). Specifically, utilizing several literature streams, scholars focus on knowledge transfer factors by different perspectives: the role of founders’ knowledge and founders’ features; the network knowledge; and the relevant spin-offs resources.

The first literature stream focuses on the role of founders’ knowledge and founders’ features. Specifically, Criaco et al. (2013) investigate the relationship between founders’ human capital characteristics and the survival of university spin-offs. The authors analyze founders’ knowledge, in accordance with the TMEE model (Gimeno et al., 1997), by examining three main dimensions: entrepreneurship, industry and university
human capital. The entrepreneurship human capital is the knowledge acquired in entrepreneurship from both formal education and personal experience in entrepreneurship. Industry human capital is the knowledge learned from previous experience in a specific industry. University human capital is the knowledge developed from previous experience in research and teaching in higher education institutions. The researchers’ findings suggest that the combination of university human capital and entrepreneurship human capital positively affects university spin-offs’ survival. Conversely, Visintin and Pittino (2014) explore the relationship between founding teams and ASOs’ performance by focusing on team heterogeneity, considering the background of the founders and the separation effect between academics and non-academics members within the founding team. The researchers’ findings show that the balance between scientific and business knowledge enhances ASOs’ performance.

The second stream analyses the role of network knowledge. Walter et al. (2006) investigate the impact of network capability and entrepreneurial orientation on ASOs’ performance in a capability-based view. The results suggest that a spin-off’s network capability affects the performance. Specifically, the researchers find that network capability strengthens the relationship between entrepreneurial orientation and ASOs’ performance. Mustar (1997), focusing on spin-off enterprises from research laboratories, shows that networking of different players, such as cooperation with external laboratories and clients, is a precondition for success. Shane and Stuart (2002), in an analysis of high technology firms founded to exploit MIT-assigned inventions, argue that social capital, specifically founders’ social relations with venture investors, is an important driver for the early-stage performance of new ventures.

The third literature stream highlights relevant resources such as technological knowledge and experience in start-up processes. Clarysse et al. (2011), based on the concepts of knowledge exploration and exploitation, analyze the impact of the knowledge base on spin-offs’ sales growth. The researchers’ findings indicate that a broader scope of technology influences the performance at the start-up stage. Scholten et al. (2015) deepen the role played by research and start-up experience in the early growth of ASOs by focusing on the beneficial effects on bridging ties in disconnected networks. The researchers’ findings suggest that a firm’s experience positively affects the impact of bridging ties on early performance.

Although many studies affirm the importance of combining knowledge transfer mechanisms, prior studies do not focus on the performance of new ventures by considering the effect of the combination of ASOs and patents (Geuna and Nesta, 2006). Instead, scholars are focused on the effect of patents on spin-off generation and find contrasting results. Ndonzuau et al. (2002) noted that the potential to valorize an idea through spin-off generation depends on its level of protection. Indeed, the protection issue highlights two main problems: how to clearly identify the owners of results and how to efficiently protect these results from counterfeiting, copying and imitations. Similarly, Landry et al. (2006) affirm that the greater the effort made by researchers in activities striving to protect their intellectual property, the higher the likelihood of spin-off creation by researchers. The potential impact of patenting processes on firm financial performance in the post-creation stage is an important topic for technology-oriented companies (Maresch et al., 2016), albeit there are studies demonstrating the lack of a direct relationship between the patenting processes of the academic founders and the performance of their spin-offs (Webster and Jensen, 2001).

The literature review suggests the relevance to investigate factors affecting the performance of ASOs in the post-creation stage. Accordingly, the debate on the relationship between patents and spin-offs is not sufficiently grounded in solid empirical evidence; therefore, further studies are needed.
How knowledge transfer by patenting affects the performance of academic spin-offs: hypothesis formulation

In the context of academic-related studies, Arora et al. (2001) argue that since university research is generally explicit and codified, knowledge transferred by patenting is easier for universities than other firms. Research on the effects of patents on the performance of ASOs offers limited evidence. Niosi (2006), by analyzing the performance of spin-off companies founded by Canadian universities, suggests that spin-off companies that had grown had also often obtained patents. Clarysse et al. (2007) suggest the importance of patents for ASOs as a basis for success as well as an indicator of early growth. More recently, Clarysse et al. (2011) argue that the development of university technology transfer offices has led to an increase in financial support for the spin-offs based upon these patents. Similarly, Häussler et al. (2009) show that patents are factors which positively affect the capability of research spin-offs to find venture capital. Löfsten (2016), by studying how new technology-based firms’ business and innovation resources affect firm survival, suggests that patent development during firms’ initial years is critical to firm survival.

Given the lack of prior contributions about the effects of patenting on the performance of ASOs, we could also rely on studies based on SMEs, start-ups, new technology-based firms and corporate spin-offs. These studies suggest that the development of knowledge transfer processes based on patents can affect the early performance of new ventures (Helmers and Rogers, 2011). There is a general agreement that patenting processes contribute to improving firm performance mainly because patents can confer monopolistic market rights, protect from competitors, improve the negotiating position of patent holders, and play a signaling role in venture capital financing (Hoenen et al., 2014; Hoenig and Henkel, 2015). Wagner and Cockburn (2010) examine the effect of patenting on the survival of internet-related firms that made an initial public offering. The authors theorize that patents lead to the acquisition of competitive advantages determining that patenting is positively associated with survival. Holgersson (2013), beginning from the commonly accepted idea that patent propensity is lower and that patenting is of less importance among SMEs, suggests that patents are used to attract customers and venture capital. Thus, patenting processes play an important role. Colombelli et al. (2013) analyze the effects of the properties of firms’ knowledge base, focusing on the firms’ patent portfolios, on the survival likelihood. The researchers’ results show that innovation enhances the survival’s likelihood, suggesting that firms that are able to exploit the accumulated technological skills increase their chances to be successful. However, patenting is controversial regarding whether we analyze results on its impact on firm performance. Long waiting times and expensive procedures make patenting processes often inaccessible to start-ups and SMEs, thus leading them to alternative strategies to protect their intellectual property (Hall and Harhoff, 2012). Even when patents are granted, their impact on performance has been questioned on empirical grounds. In particular, as far as it entails excessive litigation, patents do not appear to foster employment growth (Hall et al., 2013). Additionally, there is no consensus regarding whether innovation is stifled (Lemley and Shapiro, 2006) or encouraged (Hussinger, 2006; Hall et al., 2013). Novelli (2015), by an investigation of patent scope implications for the firm’s subsequent inventive performance, finds that, limited to the analysis of patents spanning across a higher number of technological classes, the potential success of knowledge building underlying its own patent is lower. Useche (2015) tests whether patenting activity impacts the likelihood of survival of software companies undertaking IPOs. This research highlights that the number of patents reduces the risk of failure and acquisition, while quality increases their attractiveness as acquisition targets.

These results have led some scholars to refer to the “dark side” of patenting (Boldrin and Levine, 2013). Econometric studies on samples of (non-academic) start-ups have been unable to tease out the causal effect of patenting on firm growth (Balasubramanian
and Sivadasan, 2011; Agostini et al., 2015). Helmers and Rogers (2011), based on a sample of high and medium-tech start-up companies in the UK, find that a start-up firm’s decision to patent is associated with higher asset growth. The researchers’ findings also suggest that the decision to patent improves chances of survival after the first five years of a start-up’s existence.

In accordance with prior studies on SMEs and start-ups, we hypothesize that patents can affect ASO growth. Regardless, this effect must be tested because empirical studies on ASO do not exist, and studies on start-up growth are not immediately applied to ASOs. ASOs differ from other start-ups in terms of their constant need for innovation and their relationship with knowledge providers (McAdam and McAdam, 2008; Nosella and Grimaldi, 2009). For ASOs, lack of legitimacy and market access can be addressed only by consistently innovating through the development of new products, services and business models. For this reason, ASOs are likely to depend on the continued relationship with the university (Bathelt et al., 2010; Johansson et al., 2005), while other start-ups may not share such affection. These characteristics suggest that the effect on the performance generated by the incorporation of knowledge transferred by the parent university in the spin-off business process is more relevant than for other start-ups.

Accordingly, we formulate the following hypothesis:

**H1.** The number of patents awarded to academic founders positively affects the ASO performance.

Nevertheless, the academic founders can complete the patent’s application before or after the spin-off foundation. Coherently, Maresch et al. (2016), with a sample of 975 cases from different industries, suggest the introduction of innovation competition and patent age as moderators of patents’ performance contribution into the on-going debate. A patent’s age can be viewed as a measure of quality, since the longer the time period the patent has been granted, the higher could be its citational impact. At the same time, the risk of circumvention by competing patents also increases, possibly with a negative impact on a firm’s competitive edge (Agostini et al., 2015; Maresch et al., 2016). Thus, we formulate the following hypothesis:

**H2.** Age of patents awarded by the academic founders positively affects the ASO performance.

Moreover, Farre-Mensa and Ljungqvist (2016) have focused on the effect of the first granted patent on firm growth, using instrumental variables to isolate the causal effect and highlighting that patents foster firm growth as they improve the chances of start-ups to access venture capital (a “bright side” of patents). As a means of illustration, obtaining a patent before the spin-off foundation can help the company by increasing its opportunities to access to financing in the first stage of the start-up process. Hence, having patents can, in certain circumstances, be a necessary condition for spin-off foundation (Ndonzuau et al., 2002; Landry et al., 2006).

In particular, we formulate the following hypothesis:

**H3.** Patents awarded by academic founders before the spin-off foundation are more beneficial for ASOs performance than patents awarded after foundation.

The above hypotheses are expected to hold while maintaining other possible determinants of spin-off growth constant. Specifically, firm growth is usually assumed to depend on previous firm size, as from tests of the Gibrat hypothesis of random-walk growth vs mean reversion (see also Sutton, 1997; Caves, 1989; Dosi, 2005). In addition, cross-firm differences in spin-off capital may map into different growth ambitions and bargaining power in credit relationships (Heirman and Clarysse, 2007; Lockett and Wright, 2005). Age has long been
found among the main determinants of firm growth in empirical studies (Evans, 1987; Coad et al., 2013; Ouimet and Zarutskie, 2014). In our sample, all spin-offs are observed for the first five years of their life; hence, age in our regressions mainly explains the effect of increasing experience over time. Finally, spin-off growth may change depending on the sector, region, foundation year and idiosyncratic features of the spinning universities. For instance, the licensing and IPR strategy of the parent university (Markman et al., 2005) and the relatedness of interests between the spin-off and the parent university (Sorrentino and Williams, 1995; Thornhill and Amit, 2000) may matter. We do not formulate specific hypotheses concerning these variables, which are not the main focus of our analysis and which will be considered control variables in the econometric analysis.

Methods

The hypotheses outlined above are explored through quantitative methods applied to a sample of Italian ASOs. The literature provides different definitions of ASOs because previous studies adopt different approaches to define ASOs by considering the institutional aspect, focusing on its features and its relationship with the founder’s (institutional perspective) or the resources exploited by the spinning company (resource-based perspective, Mustar et al., 2006). Our definition is mainly based on the institutional perspective and begins with the generic definition of research spin-off as a new company that is formed by a faculty member, staff member, or student who left university to found the company, or started the company while still affiliated with the university, and a core technology (or idea) that is transferred from the parent organization (e.g. Roberts and Malone, 1996; Smilor et al., 1990; Steffensen et al., 1999). In particular, we act in accordance with the idea that a research spin-off can be considered a university spin-off only if the following three criteria are met: the company founder or founders must be from a university (faculty, staff or student); the activity of the company must be based on technical ideas generated in the university environment; and the transfer of knowledge from the university to the company must be direct (McQueen and Wallmark, 1982; Klofsten and Jones-Evans, 2002).

Such comprehensive definition is coherent with the Italian Law 297/1999, which classifies a new enterprise as an ASO only if three conditions are met: the company is founded by university personnel with the objective of commercial benefit from academic research results; it is based on a core technology that is transferred from the parent organization; and it is authorized by the originating university, which can also enter into the ownership of the spin-off company. In this respect, we depart from previous papers that use broader definitions of spin-offs.

Therefore, to identify our data set, we began with the legal Italian definition, as delineated in the previously noted Law no. 297/1999. The data set was built through a survey conducted by means of interviews with administrators of the technology-licensing offices in 67 Italian universities. These universities were selected on the sole criteria of having, over the 2001–2010 period, at least ten research staff employed in science and engineering. Within the 67 universities interviewed, 47 were found to have launched at least one spin-off company in the period considered. All universities are not specifically oriented in a specific field of research, with the sole exception of the three polytechics (Milan, Turin and Bari), which are specialized in engineering and architecture. It should be noted that the Italian university system requires that every researcher belongs to a specific “Scientific Disciplinary Sector” (SDS). Each SDS is part of a “University Disciplinary Area” (UDA). Science and engineering are gathered in 9 UDAs (mathematics and computer sciences; physics; chemistry; earth sciences; biology; medicine; agricultural and veterinary sciences; civil engineering and architecture; and industrial and information engineering) and 205 SDSs. For the purposes of our work, limitation to science and engineering is necessary.
because in other fields the researchers usually do not use patents to exploit their research results. This choice does not limit the field of investigation in a significant manner, since researcher-entrepreneurs who belong to disciplines other than science and engineering have been found to represent only 1.6 percent of the total.

The survey identified 326 university spin-offs founded in Italy in the period under observation, from which the following were then excluded: those founded by scientists not holding a formal university faculty position, such as assistant, associate, or full professor as from the Ministry of University and Research database; and those where the founding members all belonged to SDSs that are not included in science and engineering.

The final data set is composed of 284 spin-offs, originating from 47 universities based in every part of the nation, involving decidedly heterogeneous research staffs. This large field of observation contributes to the robustness of the findings compared to previous contributions, which focus on a limited number of institutions selected from a list of the top institutions at a national level.

From the initial database, we have selected those companies that were founded before 2010, thus reducing the data set to 233 companies. This choice is linked to the necessity to have a time horizon of five years to observe the performance of ASOs. Then, after removing spin-offs with missing variables and focusing on survivors, the sample size further decreased to 132 companies.

For each ASO, we collected information on the name of the company, name of the spinning university, names of the founding academic members, founding location, and foundation year. Financial and managerial data are sourced from financial reports, constitutitional acts and company profiles filed with the chambers of commerce for the five years after the foundation date, as well as company websites, financial databases and direct contacts.

The collection of patents-related information was conducted on the Italian Patent and Trademark Office website based on a spin-off founder’s name search. We have thoroughly checked the patent information to avoid cases of homonyms. Finally, by comparing the dates of spin-off foundation with those of patents request, the patents have been categorized as follows:

- patents filed before the date of spin-off foundation; and
- patents filed after the date of spin-off foundation.

**Econometric analysis**

Our measure of spin-off performance, i.e., the dependent variable in our econometric analysis, is the growth rate of sales; for spin-off \(i\), it is hereby defined as the difference between logarithmic sales over a certain time horizon of length \(h\):

\[
g_{i,t,h} = \ln S_{i,t} - \ln S_{i,t-h},
\]

where \(S_i\) indicates sales of spin-off \(i\) at time \(t\), and \(h\) in our data set can at most be equal to 5, since we have a time series of 5 yearly observations for each spin-off. The growth rate of sales is a proxy for the degree of market acceptance of a new venture (Autio et al., 2000; Clarysse et al., 2011) and retains a policy-making interest inasmuch as it signals that the intellectual property produced by the parent university is capable of exercising an impact on the economy. Some previous works on ASOs have indeed focused on sales growth (Lindelof and Lofsten, 2005;Ensley and Hmieleski, 2005; Zahra et al., 2007) as well as on turnover (e.g. Garnsey and Heffernan, 2005; Smith and Ho, 2006; Harrison and Leitch, 2010), which is a proxy very close to sales[1]. Consistent with our research questions, the main explanatory
variable in the paper is the measurement of spin-off patenting activity, used with a lag of $h$ periods, as patents supposedly require time to affect sales growth.

The baseline model of spin-off sales growth to be estimated is the following:

$$g_{i,t,h} = x_0 + x_i + x_s \ln S_{i,t-h} + x_0 \ln A_{i,t-h} + x_k \ln K_{i,t-h} + P_{i,t-h} \beta + u_{i,t},$$  

(2)

where $P_{i,t-h}$ is a vector including the patenting variables, while $\beta$ is the associated coefficient vector. We assume $h = 3$; indeed, we expect patenting to exercise a delayed effect on firm growth, which yearly growth rates would be unable to capture. $a$ and $\beta$ are coefficients to be estimated. In particular, $a_0$ is the coefficient associated with the constant; $\alpha$ is the random effect associated with spin-off $i$, and $u_{i,t}$ is an i.i.d. error term. We assume that the random effect and the error term are uncorrelated and that the random effects of different spin-offs are uncorrelated.

Specifically, matrix $P$ includes the following patent-related variables:

- number of patents awarded to spin-off founders before spin-off $i$’s foundation and included in its assets, which we call pre-foundation patents (time-invariant);
- number of patents awarded to spin-off $i$ up to time $t-h$;
- patents age, equal to the difference between the current year and the year the first patent was awarded to spin-off $i$;
- number of pending patent applications of spin-off $i$ at time $t-h$; and
- an interaction term, equal to the number of patents times the patents age.

While choosing the explanatory variables to include in matrix $P$, we have acted in accordance with the existing literature with respect to the number of patents (as in Agostini et al., 2015; Maresch et al., 2016 among many others) and the patents age (Maresch et al., 2016). The cumulated number of patents granted to a spin-off is supposedly a proxy of its ability to innovate and gain a competitive advantage on the market. However, we acknowledge the well-known limitations of purely quantitative measures of patenting (see Encaoua et al., 2003). A patent’s age interpretation in this context has been illustrated in the section on hypotheses formulation. Variables that are “new” with respect to previous works are the number of pre-foundation patents and the number of pending patent applications. Pre-foundation patents are indicative of the endowment of technological competences held by new spin-offs. On the one hand, pending patent applications certify the ongoing innovative activity conducted by spin-offs, which may later result in marketable intellectual property; on the other hand, it represents a measure for technological dynamism. Finally, the interaction term between patents and patents’ age captures the idea that the longer a patent has been exploited, the higher the likelihood that the patented goods or technologies are imitated or become obsolete (see also Maresch et al., 2016). Since patented innovations take time to spread and to generate positive impact on firm performance, and to mitigate simultaneity biases in estimation, we use the lags of the above-mentioned variables.

Consistent with the hypotheses formulation, the firm growth-patenting relationship is augmented with control variables, namely:

- spin-off $i$’s sales, $h$ periods ahead, $S_{i,t-h}$;
- spin-off $i$’s capital, $h$ periods ahead, $K_{i,t-h}$;
- spin-off $i$’s age at time $t-h$, $A_{i,t-h}$ defined as the number of years elapsed since foundation; and
- dummies to explain differences in foundation years, in sectors, in geographical areas, in spinning universities.
The model in Equation 2 has been estimated using a panel data generalized least squares random effects estimator, with robust standard errors. Random effects allow one to control for unobservable determinants of sales growth, as well as for variables that we omit due to lack of data. We prefer RE to fixed effects estimators because certain variables that provide contextual information, such as foundation year, geographical and sector dummies, and notably the number of pre-foundation patents, are constant across time, eliminating the fixed effects model, which would discard them due to multicollinearity (Bell and Jones, 2015). The time dimension in the panel is the number of years since foundation; choosing the actual years would have implied a highly unbalanced panel (and we control for this by using foundation year dummies). We have estimated models in which the dependent variable is a growth rate computed over a three-year horizon. Using a four-year growth rate as the dependent variable would have yielded only one observation per spin-off. In that case, we could use only cross-sectional estimators, losing the information provided by temporal variation in regressors, since spin-offs in our sample have managed to obtain new patents over their five years of life. We also report pooled OLS estimates for comparison purposes.

Summary statistics for the variables are displayed in Table I. Spin-offs possess a maximum of three patents at foundation, and the spin-off with the highest number of patents has obtained four. The oldest patent is aged 13, and certain spin-offs have as much as four patent applications pending during their 5 years’ activity. Table II shows the cross-correlations between the variables. These correlations are primarily low, except for a high correlation between patents’ age and pre-foundation patents, which is expected by construction. Interestingly, correlations between spin-off age, size and capital, on the one hand, and the number of patents, on the other hand, are very low, meaning that smaller and younger ASOs, from a technological perspective, may be as competitive as the older and larger ones.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs.</th>
<th>Mean</th>
<th>SD</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>969</td>
<td>224,208.6</td>
<td>2,596,140</td>
<td>0</td>
<td>7.79e+07</td>
</tr>
<tr>
<td>One-year sales growth</td>
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<td>0.8369</td>
<td>3.4195</td>
<td>−11.9704</td>
<td>15.9912</td>
</tr>
<tr>
<td>Three-year sales growth</td>
<td>381</td>
<td>2.0887</td>
<td>4.3107</td>
<td>−12.8037</td>
<td>13.8451</td>
</tr>
<tr>
<td>Age</td>
<td>995</td>
<td>3</td>
<td>1.4149</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Capital</td>
<td>720</td>
<td>25,571.17</td>
<td>26,510.96</td>
<td>7,298.746</td>
<td>123,750</td>
</tr>
<tr>
<td>Pre-foundation patents</td>
<td>995</td>
<td>0.1055</td>
<td>0.3935</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Patents</td>
<td>995</td>
<td>0.2171</td>
<td>0.5943</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Patent age</td>
<td>995</td>
<td>0.4734</td>
<td>1.6939</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Pending patent applications</td>
<td>995</td>
<td>0.3688</td>
<td>0.7433</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Table I. Summary statistics for the variables used in the regression analysis

<table>
<thead>
<tr>
<th>g3</th>
<th>S</th>
<th>A</th>
<th>K</th>
<th>Pre-found.</th>
<th>Patents</th>
<th>Pat. age</th>
<th>Pending</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three-year growth rate</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sales</td>
<td>−0.0028</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>−0.3665</td>
<td>0.0332</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital</td>
<td>−0.1146</td>
<td>0.2125</td>
<td>0.0073</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-found.</td>
<td>0.0147</td>
<td>−0.0719</td>
<td>0.0045</td>
<td>−0.0839</td>
<td>1.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patents</td>
<td>−0.0672</td>
<td>−0.0770</td>
<td>0.0951</td>
<td>−0.0915</td>
<td>0.4627</td>
<td>1.0000</td>
<td></td>
</tr>
<tr>
<td>Patent age</td>
<td>−0.0228</td>
<td>−0.0616</td>
<td>0.0541</td>
<td>−0.0497</td>
<td>0.8742</td>
<td>0.5691</td>
<td>1.0000</td>
</tr>
<tr>
<td>Pending patent appl.</td>
<td>−0.0086</td>
<td>−0.0494</td>
<td>−0.0468</td>
<td>−0.1708</td>
<td>−0.0500</td>
<td>0.0861</td>
<td>−0.0719</td>
</tr>
</tbody>
</table>

Table II. Correlation matrix for the variables used in the regression analysis

Notes: g3 = three-years growth rate, S = sales, A = spin-off age, K = capital
Findings

The theoretical hypotheses outlined in this paper are verified if patenting activity is significantly correlated with firm growth. In particular, $H_1$ is confirmed if the coefficient associated with the number of patents is positive and significant. In addition, $H_2$ is confirmed if the coefficient associated with the patent age is significant, whereas a positive and significant coefficient to the number of pre-foundation patents corroborates $H_3$. The interaction-term coefficient, if statistically significant, would testify to the moderating effect of patent age on the stock of patents awarded to the spin-off. Furthermore, we expect $\alpha$ to be negative, signaling mean reversion as often found in samples of SMEs (see Lotti et al., 2003). In addition, $\alpha$ is usually found to be negative in previous literature.

The pooled OLS and RE-GLS estimates of Equation 2 are displayed in Table III. Coefficients associated with dummies are omitted to save space. Pooled OLS estimates, reported in column (1), highlight the mean reversion of the growth process (negative and significant coefficient associated with lagged sales) and the negative effect of spin-off age (negative and significant coefficient). Instead, spin-off capital does not display significant coefficients. Importantly, in these estimates, patents do not affect firm growth. However, despite the presence of sector, foundation year and geographical dummies (whose coefficients are omitted for space), the pooled OLS model does not adequately capture spin-off-level heterogeneity.

In this respect, including individual random effects marks an improvement as it lets the effect of patenting activity emerge. Column (2) shows that, whereas the main OLS results are confirmed (mean reversion, negative effect of age, and lack of effect of capital), now patents have a significant influence on spin-off growth. Columns (3), (4), and (5) restrict the set of patenting activity regressors by removing those that lack statistical significance as a robustness exercise. It can be observed that the estimated coefficients for patents and pre-foundation patents retain their sign and significance; the same is true for control variables. In fact, excluding the non-significant patent regressors strengthens the significance of the coefficients attached to the number of patents and of pre-foundation patents.

The first finding confirms that the number of patents is a positive driver of spin-off sales growth and has a function in the competitive advantage acquisition of ASOs, which is at the heart of $H_1$.

Consequently, our analysis supports the studies that suggest a positive effect of patents on start-up performance. Patenting processes favor the growth and performance of an ASO because patents can confer monopolistic market rights, protect from competitors, improve the negotiating position of patent holders and play a signaling role in venture capital financing (Hoenen et al., 2014; Hoenig and Henkel, 2015).

Indeed, since patent age coefficient (see Table III) is not significant, our results reject $H_2$. Our findings, in contrast to Maresch et al. (2016), do not support the role of patent age in moderating patents’ performance and defending a firm’s competitive advantage (Agostini et al., 2015; Maresch et al., 2016).

When considering the number of pre-foundation patents, the results are more interesting: spin-offs with a larger endowment of patents obtained before foundation grow less on average, although statistical significance is weak. This finding is in contrast with hypothesis $H_3$, according to which a stock of patents previously held by spin-off founders should help the growth of the new venture. Consequently, obtaining patents is beneficial for ASOs, but patenting should follow the foundation date. This result contrasts with the traditional study on ASOs summarized in the hypothesis formulation section. Presumably, having patents before foundation can increase the risk of circumvention by competing patents, possibly with a negative impact on the firm’s competitive edge (Agostini et al., 2015; Maresch et al., 2016). Registering a patent implies disclosing information on the nature of the innovation to competitors before its commercial exploitation (Monteiro et al., 2011); this can
Table III.
Estimates of pooled OLS and RE-GLS models of spino sales growth.

<table>
<thead>
<tr>
<th></th>
<th>Pooled OLS</th>
<th>RE-GLS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>log $S_{t-3}$</td>
<td>-0.520*** (−8.85)</td>
<td>-0.763*** (−15.34)</td>
</tr>
<tr>
<td>log $A_{t-3}$</td>
<td>-4.354*** (−4.15)</td>
<td>-2.775*** (−3.82)</td>
</tr>
<tr>
<td>log $K_{t-3}$</td>
<td>-0.322 (−0.74)</td>
<td>-0.102 (−0.21)</td>
</tr>
<tr>
<td>log pre-found. patents,</td>
<td>-0.745 (−0.15)</td>
<td>-7.264* (−1.86)</td>
</tr>
<tr>
<td>log patents$_{t-3}$</td>
<td>-0.0589 (−0.01)</td>
<td>5.279* (1.90)</td>
</tr>
<tr>
<td>log patent age$_{t-3}$</td>
<td>-1.889 (−0.61)</td>
<td>1.764 (0.42)</td>
</tr>
<tr>
<td>log pending patent applic$_{t-3}$</td>
<td>-0.263 (−0.38)</td>
<td>-0.214 (−0.29)</td>
</tr>
<tr>
<td>log pat$<em>{t-3}$log pat. age$</em>{t-3}$</td>
<td>1.843 (0.57)</td>
<td>-2.688 (−0.49)</td>
</tr>
<tr>
<td>Constant</td>
<td>16.79*** (2.75)</td>
<td>16.24** (2.20)</td>
</tr>
<tr>
<td>Sector dummies</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Foundation year dummies</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Geographical dummies</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>University dummies</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>N. obs.</td>
<td>264</td>
<td>264</td>
</tr>
<tr>
<td>N. spinos</td>
<td>132</td>
<td>132</td>
</tr>
</tbody>
</table>

$t$ statistics in parentheses

Notes: $S =$ sales, $A =$ age, $K =$ capital, $i =$ spino index, $t =$ year index. *$p < 0.10; **p < 0.05; ***p < 0.01$
be an important restriction particularly for the inventions generated by academics that usually have a high level of novelty. Revealing the nature of the inventions before the firm’s foundation can push other companies to invest in the same field of activity (Arundel, 2001), beating on time the founding spin-off and reducing the potential first-mover advantage. Moreover, since requiring a patent is a very expensive procedure, academic founders that needed to confront a high expense to propose a patent’s application (Mazzoleni and Nelson, 1998) could have less financial resources to invest in the spin-off foundation. Alternatively, another possible explanation is that patents with the highest growth potential find acquirers or licensees quickly, before spin-off foundation (Clarysse et al., 2007). Consequently, a sort of negative selection occurs; spin-offs with patents before foundation should physiologically have performance worse than other spin-offs.

A final specification of the model considers heterogeneity among the spinning universities. If the above “negative selection” explanation is correct, controlling for differences in licensing and IPR strategies should weaken the negative effect of pre-foundation patents. Unfortunately, we do not have survey-based data that could explain these issues; hence, we build university-specific dummies and include them in the sales growth model. Such dummies should capture any heterogeneity among universities (in terms of strategies, among others) that is not previously considered by regional dummies.

The additional estimates are reported in Table III (column 6) and show that, except for the lacking significance of pre-foundation patents, all other results are confirmed. In particular, now the positive effect of the number of patents is estimated more precisely (higher statistical significance), corroborating $H1$ more than previously. All the other coefficients retain their sign and significance levels. The lack of support for $H2$ is confirmed, as a patent’s age is not significantly associated with spin-off growth. The coefficient of pre-foundation patents is no longer significant, reducing support for $H3$; however, it retains its negative sign. The growth process is again mean-reverting (negative and significant sign of lagged sales), and younger spin-offs grow faster (negative and significant sign of spin-off age).

Conclusions
Existing studies consider patents and spin-offs as two different and often alternative mechanisms adopted by university to transfer technology. Conversely, while scholars recognized the positive effect of patents on spin-off generation, the impact of patents on spin-offs performance is nearly controversial.

To bridge the gap in the literature, our paper empirically investigates to what extent the incorporation of knowledge transferred by the parent university through patents affects the performance of ASOs; our results confirmed the existence of such relation(s).

Specifically, we find that the number of patents is a positive driver of ASOs’ performance, whilst a patent’s age has no significant impact on growth. Moreover, spin-offs with a larger endowment of patents obtained before foundation, surprisingly, grow less on average.

Our findings contributed to several literature streams. First, we contributed to the literature on research spin-offs by suggesting that patenting is a relevant explanatory factor of spin-offs performance (Galati et al., 2017). Second, we contributed to the literature on knowledge transfer, providing evidence that the patenting processes are effective knowledge transfer processes from universities (Algieri et al., 2013). Indeed, we elucidate a generally neglected issue such as the joint analysis of technology transfer mechanisms such as ASOs and patents (Geuna and Nesta, 2006). We enriched the debate among patents scholars, confirming that patents can support a company’s competitive advantage (Helmers and Rogers, 2011; Löfsten, 2016). Moreover, by focusing on the trade-off between external knowledge access and internal knowledge protection, we provided surprising findings that show that registering patents before spin-off foundation has a negative effect on ASOs, likely because the nature of the invention before the spin-off foundation can increase the
competitive pressure and reduce the novelty and, consequently, the attraction of the spin-off’s activity (Arundel, 2001).

The research can offer several theoretical and practical implications. From a theoretical perspective, the study can provide an original contribution to the literature by enriching the debate on the role of patenting in fostering the early-stage performance of ASOs. From a practical perspective, the work provides important insights for both managers and Italian policy makers. Although Italy created the regulatory conditions to encourage the creation of spin-offs from research organizations, the Italian Government has not yet defined the necessary tools to support the survival of firms spinning out from research organizations. By analyzing the role of patenting, we suggest the implementation of knowledge transfer processes to improve the survival rate of Italian spin-offs. Moreover, by identifying the factors affecting the spin-offs performance, the paper suggests relevant implications for academics engaged in research spin-off to identify the appropriate actions for the venture’s success. In particular, our findings show that, to increase the performance of the research spin-off, requiring a patent can be a useful strategy but it is better to begin patenting after the ASOs’ foundation.

Our paper helps academic entrepreneur to solve the dilemma “Patenting or not?”, also suggesting that it is useful to patent only after the foundation of the company. This finding is for academic and economic reasons. First, academic founders should critically analyze the trade-off between the chance of rapid patenting processes for the success of spin-offs and the opportunity to advance in their academic careers by rapid publication processes (Gurdon and Samsom, 2010; Meyer, 2003). The consideration to be made is threefold. Since patenting is beneficial for ASOs’ growth, scholars should patent their research findings. Since spin-off founders may patent only before divulging the related research findings, the patenting process can slow publishing activities. Since patenting processes may follow the spin-off foundation, scholars should wait to register patents to obtain both results: be successful scientists and academics. Moreover, for economic reasons, patenting after the foundation can help the ASO to avoid possible competitors. Revealing the nature of the invention before the firm’s foundation can push other companies to invest in the same field of activity (Arundel, 2001), surpassing the founding spin-off with respect to time and reducing the potential first-mover advantage.

Anyhow, this study has some limitations. Since scholars have suggested that network dynamics and inter-organizational collaboration may affect the performance of research start-ups (Powell et al., 1996, 2005), future research should analyze the relevance of these external variables. Furthermore, future studies should deepen the investigation of risks related to patenting before spin-off foundation by exploring the means to reduce costs and increase benefits.

Note
1. In the noted articles, the analysis is focused on the turnover level and not on its growth. However, a specification in log-sales is easily obtained by adding log-sales to both sides of Equation 2 without altering the sign and significance of the coefficients associated to the patenting variables. Data on other relevant performance measures analyzed in the ASOs’ literature, such as cash flow (Ensley and Hmieleski, 2005; Zahra et al., 2007) and profitability (Lindelof and Lofsten, 2005), are not available to us.

References


Further reading


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The role of geographical distance on the relationship between cultural intelligence and knowledge transfer

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Abstract
Purpose – The purpose of this paper is to investigate the ways in which the geographical distance between headquarters and subsidiaries moderates the relationship between cultural intelligence and the knowledge transfer process.
Design/methodology/approach – A sample of 103 senior expatriate managers working in Croatia from several European and non-European countries was used to test the hypotheses. Data were collected using questionnaires, while the methodology employed to test the relationship between the variables was partial least square. Furthermore, interaction-moderation effect was utilized to test the impact of geographical distance and, for testing control variables, partial least square multigroup analysis was used.
Findings – Cultural intelligence plays a significant role in the knowledge transfer process performance. However, geographical distance has the power to moderate this relationship based on the direction of knowledge transfer. In conventional knowledge transfer, geographical distance has no significant impact. On the contrary, data have shown that, in reverse knowledge transfer, geographical distance has a moderately relevant effect. The authors supposed that these findings could be connected to the specific location of the knowledge produced by subsidiaries.
Practical implications – Multinational companies should take into consideration that the further away a subsidiary is from the headquarters, and the varying difference between cultures, cannot be completely mitigated by the ability of the manager to deal with cultural differences, namely cultural intelligence. Thus, multinationals need to allocate resources to facilitate the knowledge transfer between subsidiaries.
Originality/value – The present study stresses the importance of cultural intelligence in the knowledge transfer process, opening up a new stream of research inside these two areas of research.
Keywords Knowledge transfer, Cultural intelligence, Croatia, Multinational companies, Geographical distance, Senior manager expatriates
Paper type Research paper

1. Introduction
In a highly complex, interconnected and demanding global environment, understanding organizations’ capabilities to manage scarce resources is of pivotal importance for management scholars and practitioners. This need is particularly important when referring to Multinational Companies (MNCs) because the geographical and cultural disparity of its units heightens the complexity of its governance (Ghemawat and Hout, 2008). Although vast networks of units around the world allow MNCs to gain significant advantages, their geographical distance creates several challenges for their business models in terms of costs associated with physical and cultural disparity (Ambos and
Ambos, 2009; Håkanson and Ambos, 2010; Caputo, Marzi and Pellegrini, 2016; Caputo, Pellegrini, Dabic and Dana, 2016). Another element of complexity arises from the fact that the world becomes more globalized every day, as such diverse cultures are incessantly meeting, thus creating a strong need for cultural adaptation (Peterson, 2004; Rose et al., 2010). In this vein, Earley and Ang (2003) developed the concept of cultural intelligence which is the capability to acclimate, relate to, and work effectively in an unfamiliar and culturally diverse environment or situation (Gonzalez-Loureiro et al., 2015). Since its theorization, scholars have contended that cultural intelligence is essential to successfully communicate across cultures, easing the organizational complexities arising from globalization (Earley and Ang, 2003; Marzi et al., 2017). Therefore, managers that have the capacity to handle the culturally diverse business settings in which they operate are favored very highly and are in strong demand (Groves and Feyerherm, 2011). This is because their abilities enable them to shape performance outcomes (Ang et al., 2007).

Moreover, among the main issues for sustaining competitive advantage in MNCs are the processes of knowledge transfer (Tallman and Phene, 2007; Mudambi and Swift, 2014). Knowledge transfer could generally be observed as a process of communication, wherein the organization’s members learn from each other without integration to environment (Kalling, 2003). This paper deals with the vertical flows in the context of the relationship between the headquarters and a subsidiary. Knowledge transfer between headquarters and a subsidiary can be categorized according to its direction: from the headquarters to the subsidiary (conventional knowledge transfer) and from the subsidiary to the headquarters (reverse knowledge transfer).

Thus, as several previous studies have suggested, there is a connection between cultural intelligence and knowledge transfer (Buckley et al., 2006; Lee and Sukoco, 2010; Boh et al., 2013). As a result of the expatriate manager’s position as a “link” between MNCs and subsidiaries, cultural awareness could be a facilitator in their process of knowledge transfer (López-Duarte et al., 2016). In knowledge transfer process among units of MNCs, geographical distance (the physical distance express in kilometers (Hansen and Løvås, 2004) plays an important role. When the subsidiary and the headquarters are located far away from each other, for example one in Europe and the other in the USA, we can expect cultural differences to arise and hinder the effect of cultural intelligence of expatriate managers on knowledge transfer processes (Van Vianen et al., 2004; Colakoglu and Caligiuri, 2008). Therefore, geographical distance is presented as a barrier (Petruzzelli, 2011; Harzing and Noorderhaven, 2006; Holmstrom et al., 2006), while the expatriate managers and their cultural awareness are presented as facilitators of the knowledge transfer process (Minaeava et al., 2003). The motive of this research is the lack of literature on the combined effect of manager traits and geographical distance in the process of knowledge transfer. To solve this literature gap, this paper investigates senior expatriate managers and their role in solving the issues arising from a more globalized, culturally diverse and distant world of business affecting the knowledge transfer processes in MNCs (Minaeava et al., 2003; Barry Hocking et al., 2004; Minaeava and Michailova, 2004). Given the fact that expatriates live in a different country, they serve as an ideal unit of investigation when attempting to understand the ways in which cultural intelligence and geographical distance relate to the KT processes. This research aims to interrogate the role played by cultural intelligence in the knowledge transfer process, and question the impact of geographical distance on this relationship. Thus, the present research was conducted on 103 senior expatriate managers who are active in subsidiaries of foreign MNCs, and the data are collected using the questionnaire method. Analysis of collected data has been made using a partial least square (PLS) method and processed with SmartPLS 3.0 software.
The paper is structured as follows. In the next section, we provide an extensive literature review about cultural intelligence and several key issues connected with knowledge transfer in MNCs. Then, the Section 3 is dedicated to the development of hypotheses, while Section 4 presents the sample and methodology applied. Section 3 stresses the results that arose from the data and discusses the role of geographical distance and cultural intelligence in conventional KT and reverse KT. The last section presents our conclusions, limitations and insights for future research.

2. Literature review

2.1 Knowledge transfer as a business process

According to Forsten-Astikainen (2010), knowledge transfer could generally be observed as a process of communication, wherein the organization’s members learn from each other without integration to environment (Kalling, 2003). The single most important recognition about the knowledge transfer complexity arises from its process, rather than its actual characteristics (Szulanski, 2000), indicating dynamic, instead of static, traits of knowledge transfer. Observing it as a process allows for easier detection of emerging difficulties and, as a result, allows for intervention and the possibility of re-designing organizational mechanisms which support knowledge transfer (Szulanski, 2000). The beginning of the models of the knowledge transfer process can be traced back to the mid-20th century, when knowledge transfer was described using the classical communication model originally presented by Shannon and Weaver (1949). After Shannon and Weaver developed the initial model of knowledge transfer process, other models were proposed (Liyanage et al., 2009) hoping to fulfill the research hunger and explain the knowledge transfer process.

However, the importance of knowledge transfer processes also finds its recognition in international business literature, claiming that one of the primary factors for upsurge in MNCs’ competitive advantage, is its ability to efficiently process knowledge across borders (Tallman and Phene, 2007; Mudambi and Swift, 2014). However, it is exactly this cross-border activity that creates a challenge, since the knowledge tends to often be highly tacit, or part of the environment and culture in which it is developed (Cantwell and Mudambi, 2005). As a result, both internal and external factors can make the process of knowledge transfer difficult to achieve, and its global application can be called into question (Bezerra et al., 2013). As such, the act of transferring knowledge-based assets across borders should not be taken lightly. Throughout years of academic interest in knowledge transfer processes, crude categorization of research streams on intra-MNC knowledge transfer processes have been developed. Along this line, Grosse (1996) maintains that all knowledge transfer processes in MNCs fall into either one of two categories—vertical or horizontal. Vertical knowledge transfer process refers to the transfer of knowledge from the parent firm to its subsidiary, and vice versa (Yang et al., 2008); while horizontal knowledge transfer process denotes the transfer of knowledge from a subsidiary to its peer subsidiaries (Najafi-Tavani et al., 2014).

For this paper, emphasis will be placed on vertical flows in the context of the relationship between the headquarters and a subsidiary, and inside vertical flows of knowledge, where literature establishes a difference between conventional and reverse KT (from now on referred to as conventional KT and reverse KT). Conventional KT presents a process of transferring knowledge from headquarters to subsidiary, and reverse KT presents a process of transferring knowledge from subsidiary to headquarters. The two processes mentioned above are conceptually very similar; however, their transfer logic differs significantly. The former refers to a training process in which the subsidiary is often under compulsion to adapt knowledge from the parent firm through transplantation or supplementation. The latter is a more complex process, based on persuading, where subsidiaries are
motivated to share their knowledge with the parent company in order to improve or strengthen their strategic position (Yang et al., 2008).

The intra-MNC knowledge transfer process started to receive attention in the late 1960s within “home-centric view”, i.e. the Hymer-Kindleberger approach (Hymer, 1976). Knowledge transfer processes were used to search for competitive advantages for subsidiaries based on knowledge received from headquarters (Mudambi et al., 2014; Ambos et al., 2006). Parent companies play an integral role as a source of knowledge for their subsidiaries because they possess valuable intangible assets, influence and capabilities (Piscitello, 2004) that can give subsidiaries considerable advantages, allowing them to prosper and advance in local markets that are highly competitive (Kuemmerle, 1999). For many decades, MNCs have remained the principal providers of knowledge and technology that flow to less developed countries, achieving this by establishing subsidiaries which have developed or acquired capabilities of their own (Salihola and Zanfie, 2009).

Nevertheless, the trend is shifting in the direction of international markets, and MNC’s choices to gain international exposure are partly motivated by the desire to absorb foreign knowledge which, in turn, can lead to improvements or advancements in technology (e.g. Caputo, Marzi and Pellegrini, 2016; Caputo, Pellegrini, Dabic and Dana, 2016; Andersson et al., 2016). Furthermore, a wealth of knowledge produced by subsidiary companies has the potential to be a valuable resource for the headquarters along with other subsidiaries. In this vein, Millar and Choi (2009) define reverse KT as “the process of transfer of tacit and explicit knowledge from a MNC’s subsidiaries to its headquarters” (Millar and Choi, 2009, p. 390).

In addition, current studies confirm and bolster the significance of reverse KT by placing emphasis on the growing dispersion of knowledge creation, which suggests that the notion of headquarters supposed knowledge supremacy is true for fewer and fewer companies today (Ambos et al., 2006), whereas it is highly probable that reverse KT could contribute extensively to the development of an MNC’s competitive advantage in the markets.

2.2 MNC, geographical distance and knowledge transfer
As MNC’s networks have become more and more global, the role of geographical distance in the knowledge transfer process has received inadequate attention in business literature. Few studies have stressed the role of geographical distance between headquarters and subsidiaries on management practices, highlighting interesting results. Thus, geographical distance between MNCs and subsidiaries refers to the physical distance expressed in kilometers or miles between the two firms (Hansen, and Løvås, 2004). A seminal study of Ghoshal and Bartlett (1988) found that the ability of a subsidiary to diffuse knowledge to the rest of the MNC is positively associated with what they call “normative integration.” The extent to which a subsidiary is normatively integrated with the parent company and shares its overall strategy, goals, and values for Ghoshal and Bartlett (1988, p. 371) is associated with practices like “extensive travel and transfer of managers between the headquarters and the subsidiary” and “joint-work in teams, task forces, and committees”. More recently, Gupta and Govindarajan (2000) found that corporate socialization mechanisms influence knowledge inflows and outflows, both to and from headquarters and other subsidiaries. Apparently, expensive communication media allowing for face-to-face communication, informal interaction, and teamwork help to overcome the “transmission losses” that occur when complex knowledge is transferred (Mudambi, 2002). However, the geographical isolation of subsidiaries in the oceanic continent renders this kind of interaction more difficult, impeding the transfer of knowledge (Gupta and Govindarajan, 2000).

Directly connected with the above-mentioned studies, Harzing and Noorderhaven (2006), using a survey covering 169 subsidiaries, stressed the impact of geographical distance in Australian and New Zealander subsidiaries which represent significant
examples of geographical isolation. Surprisingly, they found that, with regard to the knowledge transfer processes in Australian and New Zealander subsidiaries, the level of inflow and outflow knowledge does not differ significantly from other subsidiaries and hence geographical isolation does not seem to prohibit knowledge flows. However, the authors pointed out that a possible explanation could be related to the increasing availability of new communication technologies, in combination with English language proximity. More recently, on the strategic decision side, several studies (Zaheer et al., 2012; Asmussen and Goerzen, 2013; Baaij and Slangen, 2013) have disputed the role of geographic distance between the corporate headquarters of a MNC and a subsidiary, demonstrating its effect on strategic decisions related to plants, distribution centers, sales outlets, research and development (R&D) facilities and regional headquarters. These studies generally demonstrated that larger geographical distances increased the difficulty and the cost in the communication between headquarters and subsidiaries, especially in exchanging knowledge. In fact, transfer of codified knowledge usually takes place over distance, whereas transfer of tacit knowledge generally requires on-site demonstration, and hence face-to-face communication between headquarters and subsidiaries is often crucial (Bresman et al., 1999).

Thus, the available literature clearly shows that the geographical distance could represent a barrier to an effective knowledge transfer. Moreover, several studies have also demonstrated that geographical distance could be a measure of cultural distance (Shenkar, 2001; Siegel et al., 2013; Kogut and Singh, 1988; Hakanson and Ambos, 2010), resulting in another barrier to an efficient knowledge transfer (Thomas, 2006; Johnson et al., 2006). Indeed, the more a place is geographically distant to another, more their respective cultures differ, resulting in transfer complications (Petruzzelli, 2001; Harzing and Noorderhaven, 2006; Holmstrom et al., 2006; Ambos and Ambos, 2009). However, in instances of cultural disparity, managers’ cultural intelligence could be a facilitator to overcome these issues, as the next paragraph shows.

2.3 Cultural intelligence and expatriate managers

In the early 2000s, the entirely new concept of cultural intelligence was defined as a multidimensional construct, encompassing an individual’s capability to function and manage effectively in settings involving cross-cultural interactions (Earley and Ang, 2003). Subsequently, Peterson (2004) further investigated how cultural values and attitudes of individuals interacted, providing the following definition of cultural intelligence: “the ability to engage in a set of behaviors that uses skills (i.e. language or interpersonal skills) and quantities (e.g. tolerance for ambiguity; flexibility) that are tuned appropriately to the culture-based values and attitudes of the people with whom one interacts” (p. 106). Thus, cultural intelligence can be more broadly defined as a person’s evolutionary capability to adapt to a wide range of cultures (Earley and Ang, 2003).

Drawing on the need to understand the role of individual differences in influencing cultural adaptation, Earley and Ang (2003) conceptualized cultural intelligence as a multifaceted characteristic consisting of the following elements: cognitive cultural intelligence, metacognitive cultural intelligence, motivational cultural intelligence and behavioral cultural intelligence.

Cognitive cultural intelligence refers to the specific knowledge of a group’s values, beliefs and practices. Metacognitive cultural intelligence refers to an individual’s level of conscious awareness regarding cultural interactions, along with their ability to strategize when experiencing diverse cultures. Motivational cultural intelligence refers to the ability to channel energy and attention toward gaining knowledge about cultural differences. At last, behavioral cultural intelligence is the ability of an individual to be flexible in modifying behaviors, appropriately using verbal and physical actions, in cross-cultural interactions.
Although cultural intelligence is still in its early stages, empirical evidence is growing within the context of teamwork (Adair et al., 2013; Flaherty, 2008), decision-making (Ang et al., 2007), leadership (Groves and Feyerherm, 2011) and expatriates (Kim et al., 2008; Elenkov and Manev, 2009; Lee and Sukoco, 2010). Thus, Cultural intelligence is a relevant skill needed by managers to compete in a multicultural environment, and several scholars have demonstrated that cultural intelligence has an extensive impact on manager’s performance and tasks, especially in a global and international context (Lee and Sukoco, 2010; Groves and Feyerherm, 2011).

Directly related to expatriates, Rose et al. (2010), have shown that behavioral cultural intelligence positively relates to job performance, especially regarding contextual and assignment-specific performance. The authors theorize that this relationship could be attributed to a manager’s ability to be flexible in their verbal and non-verbal behaviors, in order to meet the expectations of other people. In short, the individual must have a conscious awareness of cultural interactions to allow for better communication. Although cultural intelligence shows that individuals are capable of using their knowledge to actively employ appropriate behaviors in specific cultural contexts, only a few studies have investigated the role of cultural intelligence in expatriate performance and behavior, especially in the knowledge transfer process (Lee and Sukoco, 2010; Wu and Ang, 2011; Boh et al., 2013).

Thus, managers, especially those in higher positions such as senior managers, are responsible for the intermediation between MNCs and subsidiaries in the knowledge transfer process. Consequently, our focus is on the senior expatriate manager (Minbaeva et al., 2003; Barry Hocking et al., 2004; Minbaeva and Michailova, 2004). Accordingly, Lee and Sukoco (2010) studied how cultural intelligence and expatriates’ experience influenced cultural adjustment, cultural effectiveness and expatriates’ performance. The outcomes revealed that the positive influence of cultural intelligence requires mediation by cultural adjustment and cultural effectiveness prior to shaping expatriate performance. Expatriates’ previous international work and travel experiences further moderate the effects of cultural intelligence on cultural adjustment and cultural effectiveness. Moreover, Wu and Ang (2011) tested the relationships between corporate expatriate supporting practices, cross-cultural adjustment, and expatriate performance, employing a sample of 169 expatriate managers in Singapore. Their assessment revealed that expatriate supporting practices are positively connected to both adjustment and performance. Furthermore, while motivational cultural intelligence had a positive moderating effect, metacognitive and cognitive cultural intelligence negatively moderated the links between expatriate supporting practices and adjustment. Finally, only Boh et al. (2013) examined factors that impact knowledge transfer from the parent corporation to subsidiaries when there are differences in the national culture of the parent corporation and the subsidiary. The study analyses how trust, cultural alignment and openness to diversity influence the effectiveness of knowledge transfer from the headquarters to the employees in the subsidiary, and the findings revealed that an individual’s trust of the headquarters and their openness to diversity are crucial factors influencing local employees’ ability to learn and obtain knowledge from foreign headquarters.

Therefore, the role of expatriate cultural intelligence seems to be gaining an increasing importance because they are the “link” connecting MNC headquarters to their respective subsidiaries (Minbaeva et al., 2003; Barry Hocking et al., 2004; Minbaeva and Michailova, 2004). However, there is no mention of cultural intelligence as a crucial factor in expatriates’ competencies in previous studies.

3. Hypothesis development

As highlighted in the previous paragraph, the available literature addressing factors that can have an impact on the success of knowledge transfer is vague in stressing the outcome that a
specific factor has (Caligiuri, 2014). When specifically addressing international business, management literature focuses on individual knowledge transfer facilitators and barriers, emphasizing factors such as motivation (Caligiuri, 2014), leadership (Raab et al., 2014), openness (Boh et al., 2013), gender (Peltokorpi and Vaara, 2014) and autonomy (Rabbiosi, 2011). However, despite the increasing interest in the effect of cultural intelligence on expatriates, the number of studies assessing the role of cultural intelligence in knowledge transfer in MNCs is lacking. However, as several previous studies have suggested, there is a connection between cultural intelligence and knowledge transfer (Buckley et al., 2006; Lee and Sukoco, 2010; Boh et al., 2013), especially with regard to the role of the expatriate manager as acting “link” between MNCs and subsidiaries (Minaeva et al., 2003; Barry Hocking et al., 2004; Minaeva and Michailova, 2004). Moreover, as these seminal studies suggested, the cultural awareness could be a facilitator of the knowledge transfer process, both conventional and reverse. Consequently, it is possible to state the following hypotheses:

\[ H1a. \] Expatriate managers’ cultural intelligence positively affects the conventional KT process performance.

\[ H1b. \] Expatriate managers’ cultural intelligence positively affects the reverse KT process performance.

Additionally, the transferring of knowledge within MNCs’ networks may be influenced by many factors, such as resource profiles, local embeddedness of the subsidiaries, and internal strategic considerations of the MNC headquarters (Birkinshaw and Hood, 1998; Forsgren and Pahlberg, 1992; Young and Tavares, 2004). Numerous studies have also demonstrated that geographical distance, (defined as the physical distance between MNCs and subsidiaries, Hansen and Lovás, 2004), could be a measure of cultural distance (Shenkar, 2001; Siegel et al., 2013; Kogut and Singh, 1988; Håkanson and Ambos, 2010). Indeed, several scholars highlight that the more a place is geographically distant to another, the more it is reasonable to assume that the culture is different (Petruzzelli, 2001; Harzing and Noorderhaven, 2006; Holmstrom et al., 2006; Ambos and Ambos, 2009).

Consequently, as the evidence suggests, we might assume that the more the culture is different, the more the positive effect of cultural intelligence could become fragile and irrelevant. This could negate the positive effect of cultural intelligence in boosting conventional KT and reverse KT processes. Thus, very distant and unfamiliar cultures increase the difficulty and the cost in the communication between headquarters and subsidiaries, especially in exchanging knowledge (Zaheer et al., 2012; Asmussen and Goerzen, 2013; Baaij and Slangen, 2013). Accordingly, the prior statements bring us to the formulation of the following hypotheses:

\[ H2a. \] The increase of geographical distance negatively moderates the relationship between cultural intelligence and the conventional KT process.

\[ H2b. \] The increase of geographical distance negatively moderates the relationship between cultural intelligence and the reverse KT process.

Figure 1 represents the proposed model.

4. Methodology

4.1 Sample and data collection procedure

To investigate the relationships among knowledge transfer (conventional and reverse), geographical distance, and cultural intelligence, expatriate managers working for Croatian subsidiaries of foreign MNCs were surveyed between December 2014 and February 2015 (Vlajcic, 2015). Expatriate managers were chosen as they act as a main connection in the knowledge transfer process between MNCs and subsidiaries, and they are subjected to cultural
complexities (Minbaeva et al., 2003; Barry Hocking et al., 2004; Minbaeva and Michailova, 2004). MNCs were selected according a wide defining, i.e. a company which owns and controls activities in at least two countries (Caves, 1996), and identified using the Orbis database.

All active expatriate managers in Croatia (841) were contacted first by phone and, upon agreement to participate in the study, a questionnaire was sent via e-mail. A total of 108 responses were collected, and 103 were fully completed and able to be used. The sample size and response rate is consistent with previous studies done in the same field (Carbonell and Rodriguez, 2006; Yang et al., 2008; Chevallier et al., 2016).

4.2 Measurement of variables

To test the proposed hypotheses, this study used three categorical variables and one continuous variable.

Independent variable. The cultural intelligence of senior expatriate managers was used as a categorical independent variable. The cultural intelligence variable is focused on four dimensions: metacognitive, cognitive, motivational, and behavioral. The cultural intelligence Scale (CQS, Ang et al., 2007) was adopted to measure cultural intelligence. Items on the scale are self-reported and based on a seven-item Likert scale, ranging from “strongly disagree” to “strongly agree.”

Dependent variables. Conventional KT and reverse KT are the categorical dependent variables. They are conceptually very similar; however, they use different transfer logic (a teaching vs a persuading process). According to Yang et al. (2008), this allows the same measurement instrument to be used for both variables. To measure conventional KT and reverse KT, a seven-item Likert scale ranging from “not at all” to “a very great extent” was used; and a measurement system for these variables was adopted from Yang et al. (2008) and Najafi-Tavani et al. (2012). For measuring conventional KT and reverse KT, six-items were used: managerial capabilities, brand names, sales networks and technical innovation capabilities, financial resources for R&D and know-how in manufacturing.

Moderating variable. This research used Harzing and Noorderhaven’s (2006) methodology for the calculation of moderating continuous variable’s geographical distance, measuring distance between headquarters capital cities and subsidiaries capital cities. We operationalized geographical distance using the European Commission’s distance calculator (Marcon and Puech, 2003).

Control variables. The sample was controlled by age, dividing senior expatriate managers in two groups: younger than 45 years old and older than 45 years old, as well as gender. According to Ang et al. (2007) and Templer et al. (2006), age and gender play an important role in determining the cultural intelligence and cross-cultural adjusting of expatriate managers.
4.3 Estimation procedure

The estimated model is the combination of two sub-models. The first sub-model tests the relationship between cultural intelligence, (the independent variable), and conventional knowledge transfer process, (the dependent variable). The second sub-model tests the relationship between cultural intelligence, (the independent variable), and reverse knowledge transfer (the dependent variable). The model also contains one moderating variable—geographical distance, the effect of which (inducing or mitigating the impact) on two basic relationships that we are testing will be checked.

The PLS (Pratono, 2016; Eikebrokk et al., 2011) technique for testing the models was performed using the software package SmartPLS v. 3.2.6 (Ringle et al., 2017). When testing a researched model, in the context of PLS-SEM, a two-stage approach was used (Hair et al., 2017). The PLS multivariate technique was chosen as it allows testing of multiple dependent and independent latent constructs (Mathwick et al., 2008) which, in our case, is more than necessary as two dependent variables must be evaluated at the same time. Additionally, it calculates the relationship between all variables at the same time, and does not require multivariate normality (Zhou et al., 2012). The research model was framed in a way that, in the first stage, the latent variable scores (LVs) of each cultural intelligence dimension were obtained. This way the number of relationships in the model was reduced, making the model more parsimonious and resistant to collinearity problems (Hair et al., 2016). The second stage consisted of loading LVs on cultural intelligence constructs and, during further analysis, cultural intelligence was treated as one construct. Analysis of the measurement model will provide this research with an estimation of how well data fit the proposed theory (Afthanorhan, 2013). The analysis of the structural model will result in path coefficients of statistical significance (using Bootstrapping procedure; 5,000 sub-samples; Hernández-Perlines et al., 2016). The impact of geographical distance was captured using an interaction-moderation effect (Torres and Sidorova, 2015) and, to control age and gender, PLS-MGA was used.

5. Results

In this section, the descriptive statistics of the respondent’s demographics is presented first, analysis of the measurement model follows, after which the analysis of the structural model is demonstrated, showing the significance of the findings.

The survey respondents were primarily males (79.1 percent), indicating an unequal gender distribution of senior management positions in foreign subsidiaries active in the Republic of Croatia. Most senior expatriates in Croatia belong in the age group of 35–45 year olds (38.4 percent), while other groups (25–35 (24.3 percent) and 45–55 (26.3 percent)) are equally represented. Only 8 percent of respondents belonged to the group 55+. Given the importance of their position in the company, the education level indicates that only 2 percent of the sample is managers with only a high school diploma, while bachelor degrees, master’s degrees, doctoral degrees, or other advanced degrees are distributed 20.0, 56.1, 16.0 and 3.0 percent, respectively. For a large number of senior expatriate managers in this survey, this was the first expatriate assignment which was longer than six months (33.7 percent), while the others in the sample were more experienced in working in international environments, having behind them two (26.3 percent), three (15.8 percent), four (6.3 percent), five or more (17.9 percent) previous assignments abroad for longer than 6 months. Regarding the time spent at the subsidiary, the largest proportions of respondents had already been working more than 36 months in their present subsidiary (44.8 percent), while only 7.3 percent were newcomers (less than 6 months). The rest of the sample was more or less equally distributed: 14.6 percent (6–12 months), 19.8 percent (12–24 months) and 13.5 percent (24–36 months). Finally, industry distribution was quite diverse, having only four groups heavily represented: financial and insurance activities (22.30 percent),
information and communication (9.60 percent), manufacturing (9.60 percent) and wholesale/retail trade and repair of motor vehicles and motorcycles (8.50 percent). The rest were equally distributed among numerous other groups (Table I).

This model contains three reflective constructs (cultural intelligence, conventional KT, and reverse KT), and one continuous variable (geographical distance). Satisfactory loading values, according to Hair et al. (1998), are the ones above 0.7. Analysis of the measurement model indicates that 28 out of 32 items from this research possess satisfactory loading values. Research detected four items in which the loading value was below critical level, two components of CKT (0.698; 0.536), one component of RKT (0.643), and one component of cognitive CQ (0.593). However, because they were not critically low and they had theoretical importance for the construct definition, they were left in the model (Okazaki and Taylor, 2008). As it is one of the most important measures of uni-dimensionality and is a measurement scale of high internal consistency (Kline, 2011; Tsironis and Matthopoulos, 2015), Cronbach’s α for all latent variables was measured. The Cronbach’s α of all latent constructs was above 0.7. Composite reliability, according to Nunnally and Bernstein (1994), has to be above 0.8. This model indicated that all latent constructs were well above this level, demonstrating an internal consistency within the measurement model. To evaluate for convergence validity, according to Hair et al. (2010), the recommended value for average variance extracted (AVE—the level of latent constructs explained variance by indicators) should be above 0.5. This analysis indicated that all latent constructs satisfied this criterion. Finally, the assessment of models’ discriminant validity also relies on AVE, indicating that correlations between each pair of the latent constructs must not exceed the square root of each construct AVE (Fornell and Larcker, 1981), which is the full-field in this model. For details on evaluation of internal consistency data reliability, see estimated parameters in Table II.

**Table I.**
Descriptive statistics of the respondent’s demographics

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age</th>
<th>Education level</th>
<th>Number of expatriate assignments (6 months)</th>
<th>Time spent at the subsidiary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>18.6%</td>
<td>25–35</td>
<td>24.3%</td>
<td>High school</td>
</tr>
<tr>
<td></td>
<td>2.3%</td>
<td>29%</td>
<td>2.9%</td>
<td>College degree</td>
</tr>
<tr>
<td>Male</td>
<td>79.1%</td>
<td>35–45</td>
<td>38.4%</td>
<td>Master’s degree</td>
</tr>
<tr>
<td></td>
<td>45–55</td>
<td>26.3%</td>
<td>Doctoral degree (PhD)</td>
<td>16.0%</td>
</tr>
<tr>
<td></td>
<td>&gt; 55</td>
<td>8.1%</td>
<td>Other</td>
<td>3.0%</td>
</tr>
</tbody>
</table>

**Industry of the subsidiary**
- Accommodation and food service activities: 4.30%
- Administrative and support service activities: 1.10%
- Agriculture, forestry, and fishing: 1.10%
- Construction: 1.10%
- Education: 1.10%
- Financial and insurance activities: 22.30%
- Human health and social work activities: 2.10%
- Information and communication: 9.60%
- Manufacturing: 9.60%
- Other: 28.70%
- Professional, scientific and technical activities: 6.40%
- Real estate activities: 2.10%
- Transportation and storage: 2.10%
- Wholesale and retail trade; repair of motor vehicles and motorcycles: 8.50%
To test the hypothesis on interaction-moderation effect of geographical distance, we first tested the direct relation between cultural intelligence and conventional KT/reverse KT). The relation between cultural intelligence and conventional KT was positive and statistically significant ($\beta = 0.276; t = 2.398; p < 0.05$; see Figure 2). Similarly, the research also demonstrated a positive and statistically significant relationship between cultural intelligence and Reverse KT ($\beta = 0.284; t = 2.829; p < 0.05$; Figure 2). When testing the importance of geographical distance on the relationship between cultural intelligence and knowledge transfer, moderation-interaction effect was used (Hair et al., 2016). Results indicated that the impact of geographical distance on the relationship between cultural intelligence and conventional KT is expectedly negative, but statistically insignificant ($\beta = -0.15; t = 1.246; p > 0.05$; Figure 2). This effect implies that, for any increase of geographical distance, cultural intelligence’s impact on Conventional KT will be reduced by 0.15, setting new impact to 0.126. However, as already stated, these results are not statistically backed up. The impact of geographical distance on the relationship between cultural intelligence and reverse KT is also negative but is statistically significant ($\beta = -0.181; t = 2.453; p < 0.05$; Figure 2). This effect implies that, for the increase of geographical distance for one standard deviation, cultural intelligence’s impact on Reverse KT will be reduced by 0.18 standard deviations, setting new impact to 0.104. For details of tested hypotheses, see Figure 2 or Table III. Additionally, when testing the interaction effect of geographical distance, the sample had 14 missing values, which is more than 5 percent of the overall sample. A deletion method was thus used (Hair et al., 2016).

Finally, when testing control variables (age and gender), PLS-MGA was used. Results of the PLS-MGA indicate that there is no statistically significant difference between two sub-samples (younger vs older; female vs male). Additionally, analysis of structural models

| Table II. Correlation matrix, construct reliability and validity, discriminant validity |
|---------------------------------|-----------------|-----------------|---------------|-----------------|-----------------|
| Cronbach’s $\alpha$             | rho_A           | Composite AVE   | CQ            | CKT             | RKT             |
| Cultural intelligence (CQ)      | 0.726           | 0.755           | 0.815         | 0.526           | 0.725           |
| Conventional knowledge transfer (CKT) | 0.829       | 0.855           | 0.873         | 0.538           | 0.243           | 0.734           |
| Reverse knowledge transfer (RKT) | 0.854           | 0.872           | 0.891         | 0.578           | 0.225           | 0.659           | 0.76           |

**Note:** Diagonal elements, in italic, present the square root of the AVE

**Figure 2.** Analysis of the proposed model

**Notes:** *< 0.05; **< 0.01
also presents the $R^2$ and $Q^2$ as a measure for model consistency and predictive relevance. These measures indicate low consistency ($R^2$ (conventional KT) $= 0.175$; $R^2$ (reverse KT) $= 0.189$) as well as low accuracy and predictive relevance ($Q^2$ (conventional KT) $= 0.055$; $Q^2$ (reverse KT) $= 0.073$) (Neter et al., 1990). These results were expected as the model is relatively small and this is quite common in research on organization’s behaviors (Eastman, 1994; Pieterse et al., 2010; Baron et al., 2016).

6. Discussion

A very important process in business is the ability to successfully transfer knowledge. Successful knowledge transfer increases company performance and provides a company with a competitive advantage over other companies in the same environment (Hsu, 2012; Weaven et al., 2014). This increase in competitive advantage is of special importance in the context of MNCs (Tallman and Phene, 2007; Mudambi and Swift, 2014). In order to improve their competitive advantage, companies must concentrate on knowledge transfer. For this transfer to be successful, each step of this process must be well understood and systematically planned. In the context of MNCs, the process of knowledge transfer is primarily managed by the expatriate managers, sometimes referred to as “Agents of Knowledge Transfer” (Kusumoto, 2014), as they are responsible for leading subsidiaries in accordance with the global MNC’s strategy (Kusumoto, 2014). Knowledge in MNC’s units can be location specific, and the usability of that knowledge developed in specific locations largely depends on specific skill sets, i.e. cultural intelligence and carriers needed for adjusting this knowledge to new environments where it is being transferred. However, are these skills powerful enough to overcome the environmental dissimilarity? The main objective of this study was to observe the effect that geographical distance, i.e. environment dissimilarity, relied on expatriate managers’ skills (cultural intelligence) in the knowledge transfer process.

The research used PLS methodology, and the results of empirical analysis indicated that cultural intelligence is almost equally strong and, in the same positive-direction, affects conventional KT as well as reverse KT. Additionally, the moderating effect of geographical distance demonstrates a negative but statistically insignificant effect on the relationship between cultural intelligence and conventional KT, compared to the negative but statistically significant effect on relationship between cultural intelligence and reverse KT.

The results of testing the relationship between cultural intelligence and knowledge transfer were expected ($H_{1a}$ and $H_{1b}$). These findings support the previous research of Kim et al. (2008), as well Rose et al. (2010), on the importance of a manager’s cultural intelligence for expatriates’ assignment effectiveness and job performance. Namely, cultural intelligence is one of the competencies senior managers need to possess in order to successfully complete their tasks, whether those tasks are company governance or knowledge transfer. Cultural intelligence, as a competency, ensures that managers using a knowledge transfer process will be able to recognize and control the specific cultural

<table>
<thead>
<tr>
<th>Relationship</th>
<th>$T$ statistics</th>
<th>$p$-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>$CQ \rightarrow$ Conventional knowledge transfer</td>
<td>0.276</td>
<td>2.398</td>
</tr>
<tr>
<td>$CQ \rightarrow$ Reverse knowledge transfer</td>
<td>0.284</td>
<td>2.829</td>
</tr>
<tr>
<td>Geographical distance $\rightarrow$ Conventional knowledge transfer</td>
<td>$-0.294$</td>
<td>2.081</td>
</tr>
<tr>
<td>Geographical distance $\rightarrow$ Reverse knowledge transfer</td>
<td>$-0.294$</td>
<td>3.18</td>
</tr>
<tr>
<td>Moderating effect 1 $\rightarrow$ Conventional knowledge transfer</td>
<td>$-0.15$</td>
<td>1.246</td>
</tr>
<tr>
<td>Moderating effect 2 $\rightarrow$ Reverse knowledge transfer</td>
<td>$-0.181$</td>
<td>2.453</td>
</tr>
</tbody>
</table>

Table III. Statistical significance of model relationships
environment, as well as be motivated to find a way to overcome differences and understand
verbal and non-verbal actions in diverse cultures, which is of paramount importance when
conveying and implementing knowledge from another environment.

However, this research model implies that the cultural intelligence of expatriate
managers is not constant, and that the power of these skills might be mitigated with
increases in geographical distances. This implication’s foundation rests on the fact that
increased geographical distance leads to an increase in location specificity knowledge
($H2a$ and $H2b$)—Knowledge is part of the environment in which it is developed
(Cantwell and Mudambi, 2005, Cui et al., 2006; Asmussen et al., 2013).

Location specificity of knowledge is a result of geographic and political aspects of that
country, such as the legal and commercial infrastructure, government policies, character
and cost of factors of production, or condition of transport and communications
(Dunning, 1981). Knowledge obtained from local innovation is very tough to transfer to
outside locations as they are formed in alternate circumstances (Borini et al., 2012). The fact
that knowledge is solely appropriate to one area diminishes the significance of skills and
experience that the manager uses for knowledge transfer (Van Vianen et al., 2004). Location
specificity might also decrease a manager’s motivation to transfer knowledge and the
willingness of executives may also be limited. This is the consequence of differences
between two locations: the one in which the knowledge is developed, and the one to which
that knowledge should be transferred. Differences could have cultural, social and
economic roots. This may require the manager to adapt the observed knowledge
(Van Wijk et al., 2008), which ultimately lowers the validity of the knowledge transferred.

The explanation for the different findings on moderation (interaction) effect that
geographical distance has on the relationship between cultural intelligence and
conventional/reverse KT could be rooted in the different transfer logic that Conventional
KT is a teaching process, whereas headquarters transfer knowledge is dictated, and
subsidiaries are thus obliged to accept it (Bezerra et al., 2013).

With this in mind, geographical distance should not pose a problem in the conventional
KT process, as the knowledge being transferred is imposed and the subsidiary is
obliged to accept it no matter how location specific this knowledge is or how demanding
this process will be for the expatriate manager’s competencies and skills. Headquarters
recognize this important knowledge for its business processes, thus making geographical
distance, location specificity, and its impact on expatriate skills and competencies
less important in this knowledge transfer process (Gupta and Govindarajan, 2000;
Zaheer et al., 2012).

On the other hand, reverse KT is a “persuading” process, wherein a subsidiary tries to
persuade headquarters about the importance of the knowledge it offers. However, because
of the huge effort the subsidiary has to invest, reverse KT is a much more fragile
procedure. While the subsidiary tries to convince headquarters about the importance of its
knowledge, this process relies heavily on the skills and competencies of carriers, in other
words, their cultural intelligence could present a significant breakthrough in this process
(Asmussen and Goerzen, 2013; Baaij and Slangen; 2013). Geographical distances, which
have significant cultural differences, may mean that the knowledge for the specific
location in which it was developed is too unique. This could then reflect lower
competencies (cultural intelligence) in the carriers when conveying information in a
foreign environment. Compared to the conventional KT teaching process, the persuading
aspect of reverse KT could lower the effectiveness of carriers acting in foreign
environments (lower cultural intelligence). This would be due to the lack of ability in
recognizing and controlling the specific cultural environment, which is highly important
when attempting to persuade headquarters on the validity of the conveyed knowledge
(Johnson et al., 2006; Håkanson and Ambos, 2010).
7. Conclusions

Scarce resources and highly complex and demanding global environments have made knowledge management one of the favorite focuses of strategic management literature. Furthermore, it has also helped to construct knowledge management as a primary focus for managers in companies around the world. This notion particularly refers to MNCs who, alongside the complexities of company governance, confront the geographical disparity of their units. MNC units’ geographical dispersion leads to many problems, mostly connected with the cost of physical and cultural distance. The focus of this study is on the knowledge transfer process between subsidiaries and headquarters, and the impact that environmental dissimilarity can have. This research has been done with a sample of foreign subsidiaries active in the Republic of Croatia. Results of this analysis indicate that a senior managers’ cultural intelligence is a significant factor in conventional and reverse KT processes. However, even more interesting is the finding that geographical distance proportionally impacts the relationship between cultural intelligence and the knowledge transfer process. Results indicate that geographical distance moderates relationships between cultural intelligence and reverse KT, implying that the larger the distance between a headquarters and a subsidiary, the higher the location specificity of knowledge will be; decreasing the impact that cultural intelligence has on Reverse KT. However, the same research shows that geographical distance moderately affects the relationship between cultural intelligence and Conventional KT, and is not statistically significant. Growth of geographical distance, diminishing similarities between cultures and corporate knowledge become more location specific. This impacts the value of the skills and experience that managers use for knowledge transfer. Distinct findings between conventional (regardless of geographical distance) and reverse KT (where geographical distance is important) could be explained by the different settings of these two processes—the former being a teaching process and the latter being a persuading process. As previously stated, antecedent research demonstrated that geographical distance might evoke the question of cultural dissonance (Petruzzelli, 2001; Holmstrom et al., 2006; Ambos and Ambos, 2009). Thus, the theoretical contribution of this research is evident in the combination of these two associations in relation to the knowledge transfer process in MNCs. In this way, research implies that the competencies of senior expatriate managers are not equal around the network of subsidiaries, but are dependent on geographic and cultural proximity to their native work environment, which ultimately reflects on successful knowledge transfer processes in MNCs. The theoretical contribution of this research lies in discovering a new way that geographical distance affects the knowledge transfer process through cultural intelligence.

The knowledge transfer process is a demanding task for managers, and managers have to be equipped with a special set of skills, i.e. cultural intelligence, while confronting foreign cultures on their assignment. Improvement of managerial cultural intelligence depends on a manager’s own motivation to learn about foreign culture; a motivation typically induced by incentives provided by companies for successfully completed assignments. Managers should devote more time in preparing themselves for assignments by carefully studying the culture in which they will operate. They should be aware of every aspect of their international experience as each experience could be useful in subsequent assignments at some point. Additionally, companies might organize corporate training sessions to equip future expatriate managers with knowledge about operations and customs in a desired country, negotiation processes and managerial best practices (e.g. Caputo, 2016; Borbély and Caputo, 2017). This suggestion refers not only to managers in MNCs, but also to all others facing work in alternate cultural surroundings, whether this be inside the borders of their own country or further afield.

This research can also be practically applied to cost structures surrounding knowledge transfer. Given the ambiguity of the knowledge transfer process and, considering a highly locational/geographical dispersed network of subsidiaries, every case of knowledge transfer...
in MNCs is unique, as the MNC has to focus its efforts on trying to control the cost of knowledge transfer. This study enriches the literature with a new specific model for the knowledge transfer process, directly affecting the ways in which MNCs can deal with this process. This research served to highlight to MNCs the challenges that geographical distance might cause on the knowledge transfer process, potentially leading to the undermining of carriers, senior managers and competencies. Although the sample is composed of senior managers, it is limited by focusing only on the country of Croatia. However, this leaves the door open for future research to test the same hypotheses in different regions in order to confirm or disconfirm the effect of geographical distance in cultural intelligence and the knowledge transfer process in alternate regions.

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**Further reading**


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Key factors that improve knowledge-intensive business processes which lead to competitive advantage

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Abstract

Purpose – The purpose of this paper is to empirically test the knowledge-intensive process of creative problem-solving and its outcomes.

Design/methodology/approach – This study uses survey data from 113 leading Italian companies. To test the structural relations of the research model the authors used the partial least square (PLS) method.

Findings – Results show that work design and training have a positive direct impact on creative problem-solving process while organizational culture has a positive impact on both creative problem-solving process and its outcomes. Finally creative problem-solving process has a strong direct impact on its outcomes and this, in turn, on firms’ competitiveness.

Practical implications – This study suggests that managers must highlight the problem-solving process as it affects a firm’s capability to find creative solutions and therefore its competitiveness. Moreover, the present paper suggests managers should invest in specific knowledge management (KM) practices for enhancing knowledge-intensive business processes.

Originality/value – The present paper fills an important gap in the BPM literature by empirically testing the relationship among KM practices, multistage processes of creative problem-solving and their outcomes, and firms’ competitiveness.

Keywords Creativity, Knowledge management, Knowledge processes, Competitive advantage, Business process management, Knowledge-intensive process

Paper type Research paper

1. Introduction

As highlighted by Isik et al. (2013), today’s organizations have to manage an increasing amount of business processes that extensively require information management, cognitive skills and creativity. With the shift from the industrial to knowledge economy and more attention to customer value (co)-creation (Chan and Mauborgne, 1998; Teece, 2003), knowledge workers (Davenport, 2005) and human centric processes that strongly rely on knowledge management (KM) (Di Ciccio et al., 2015) like research and product development, data management, executive objective setting and evaluation, customer support and CRM have become the key for success. These are all knowledge-intensive business processes (KIBPs) characterized by being highly complex; involving a wide decision range (several options are possible) for the decision maker; unpredictable because of uncertainty in functioning and outcomes generated; unstructured or semi-structured; thus non-repeatable and hard to automate (Isik et al., 2013; Marjanovic, 2016). In addition, compared to other business processes, KIBPs need creativity (Marjanovic and Seethamraju, 2008; Sarnikar and Deokar, 2010).
One important KIBP that has not been widely addressed by the extant literature is the formulation of creative solutions to management problems; also called creative problem solving, a process where knowledge is critical and outcomes are unpredictable (Reiter-Palmon and Illies, 2004; Carmeli et al., 2013). The process of creative problem solving may entail one or more sub-processes that are structured and repeatable (Seidel et al., 2010), but it is mainly unstructured especially when compared to planning (Isik et al., 2013). Creative problem solving is a critical process as it involves generating ideas, products or services that are novel and appropriate (Woodman et al., 1993) and help companies to be competitive and reach the desired performance.

From a BPM perspective looking at creative problem solving means trying to identify how this essential business process can be improved and managed to achieve an organization’s objectives in general (Jeston and Nelis, 2006) and competitive advantage specifically (Hung, 2006). In operative terms, it means trying to describe and model a process that it is difficult to structure by definition (Davenport, 2010). Actually, according to some authors (Manfreda et al., 2015), techniques and models used in reference to other business processes (e.g. lean, six sigma, EFQM excellence framework) cannot be applied to KIPBs.

Instead of searching for the best methodologies or techniques for modeling KIPBs, the present study suggests that a more fruitful approach is to focus on the factors that may support and improve the process itself, contributing to the achievement of the organization’s desired competitive performances. So the research question is the following:

**RQ1.** Which key factors can improve the creative problem-solving process and its outcomes?

The KM literature may help identify which factors are able to improve KIBPs’ performance as KM recognizes and manages all of an organization’s intangibles to meet its objectives (Lee et al., 2007; Serenko and Bontis, 2013). In particular, the knowledge management infrastructure (KMI) includes all the organizational variables (e.g. work design, training, reward, culture, decentralization and ICTs) (Giampaoli et al., 2017) that managers can deploy and control to generate organizational knowledge (Cepeda and Vera, 2007), transform tacit knowledge into explicit knowledge (Wickramasinghe and Davison, 2004), and improve organizational effectiveness (Gold et al., 2001).

By bringing together the KM and BPM fields, this study proposes a research model to examine the impact of selected variables of a firm’s KMI infrastructure on one of the most knowledge-intensive processes: creative problem solving. Several hypotheses are formulated and then tested on a sample of 113 firms.

This study is significant for at least three reasons: it determines the enabling factors (organizational variables that can be managed) that mostly impact on creative problem-solving process and its outcomes; it helps to understand whether structuring the process of creative problem solving has a positive impact on its outcome (i.e. the identification of useful and creative solutions) or not; and it demonstrates the impact of creative problem-solving outcome on company competitive performance.

From a practical point of view, empirical results suggest that managers who support a well-structured creative problem-solving process positively affect the quality of decisions (i.e. creativity) and these, in turn, positively impact competitive performance. At the same time, not all the KMI variables have a strong impact on creative solving process or on its outcome. Therefore, it is very important to identify, untangle and empower only some of the identified KM variables that are related to creative problem-solving efficacy and impact on company performance.

From a theoretical point of view, the study contributes to existing KM literature by confirming the importance of information and knowledge sharing activities in developing creative ideas while introducing the concept of modeling creativity as a process made by stages or steps. In addition, it contributes to BPM research suggesting how to enrich it with
KM concepts that allow a deeper understanding of complex and knowledge-intensive processes so that BPM can move away from its traditional operational roots: BPM research should not be considered as the mere investigation of how to use IT systems for process support and organizational efficiency and efficacy in manufacturing processes anymore (Jeston and Nelis, 2006).

2. Literature review and the research model

2.1 Knowledge-intensive business processes
BPM is traditionally based on the assumption that processes are characterized by repeated tasks, which are performed on the basis of a process model prescribing the execution in its entirety (Marjanovic and Freeze, 2011). This kind of structured work includes mainly production and administrative processes (Di Ciccio et al., 2015). However, modern companies increasingly rely on knowledge-intensive processes for their competitive advantage. In KIBPs, researchers need to understand the knowledge dimension of processes in order to go beyond process automation.

BPM researchers have recently recognized the need to integrate knowledge and collaboration dimensions with the traditional control flow/data dimensions. When knowledge creation, management and sharing are explicitly related to business processes, the collaborative nature of KIBPs has to be considered. Thus, various researchers have begun to examine the concept of KIBPs (Eppler et al., 1999; Marjanovic and Seethamraju, 2008; Marjanovic and Freeze, 2011) and promote the integration of the BPM perspective with the discipline of KM (Sarnikar and Deokar, 2010), which allows researchers to understand how knowledge is created, shared and used.

In the following sections, the authors present a research model developed as an extension of the KM literature, which aims to shed light on the factors that may contribute to process efficacy and the achievement of an organization’s objectives.

2.2 Problem solving and creativity
Problem solving may involve a great deal of creativity (Weisberg, 2006). Bertone (1993) claims that creativity is the ability to think in an alternative way and find solutions to problems. Thus, creative problem solving refers to a process (CPS PROCESS) characterized by new problems and situations to face where people and organizations have to go beyond their knowledge maps and find a new path that will allow them to find new solutions.

The core phases or sub-processes required for creative problem solving are: problem identification and construction, identification of relevant information, generation of new ideas, and evaluation of ideas/solutions proposed (e.g. Finke et al., 1992; Mumford et al., 1991; Reiter-Palmon and Illies, 2004). Some cognitive models of multistage processes of creative thinking and problem-solving identify more phases, but they all begin with problem formulation and end with the validation and verification of the solution.

Considering that idea generation has been equated with creativity (i.e. new and useful solutions) (Reiter-Palmon and Illies, 2004), we decided to disentangle this phase with a specific construct named CPS and focused on creativity outcome. In fact, the generation of ideas per se is not sufficient to ensure creativity. These ideas or solutions have to be new and useful (effective) (Amabile, 1988).

Problem identification and construction, identification of relevant information and evaluation of solutions proposed are three different sub-processes that can exist or not within organizations but it is very difficult to assess their effectiveness (Amabile, 1988). Therefore, respondents were asked to express their opinion about their presence. However, we can measure their impact on creativity outcome (CPS). That is why we assume that solutions’ effectiveness will strongly depend on the other sub-processes.
As suggested by Mintzberg et al. (1976) workers dealing with complex, new and ambiguous strategic processes tend to reduce them into sub-processes that are structured and repeatable. However, structuring the process in such a rational way does not guarantee adequate results. The very important aspect to consider is the firm’s capacity to put creativity into practice and not focusing on the supposed process structure nor on creativity itself (Klein and Sorra, 1996; Weinzimmer et al., 2011).

Creativity is strictly linked to knowledge and experience (Woodman et al., 1993). According to Amabile (1988) to enhance creativity of the problem solver both knowledge (domain-relevant skills) and cognitive abilities (creativity-relevant skills) are indispensable. In fact, even if an individual has a high level of knowledge, he will not be able to reach a good creative performance without the right cognitive abilities (Amabile, 1988).

Woodman et al. (1993) define organizational creativity as the creation of a new and useful product, service, idea or procedure, by individuals working together in a complex social system. Management scholars have shown that organizational creativity cannot be explained through an individual approach. To understand how the most important innovations have been developed inside organizations, researchers have to examine organizational variables such as work design, training, organizational culture and decentralization other than contextual factors such as market and norms (Sawyer, 2006). For example, even if employees are very creative, they will not be able to express their ability in a stifling culture (Sawyer, 2006). A creative culture is more appropriate, which usually means establishing a tolerant culture (Gong et al., 2013; Khedhaouria et al., 2015; Weinzimmer et al., 2011).

### 2.3 KM and knowledge sharing

KM has a key role in decision-making processes, which entail high-task complexity and high-knowledge intensity (Ragab and Arisha, 2013), and is generally considered the core of management (Cyert et al., 1995). Since Huber and McDaniel (1986) conceptualize decision-making and problem solving as similar processes, the authors have done the same in this study.

O’Dell et al. (1998) define KM as a conscious strategy of getting the right knowledge to the right people at the right time and helping people share and put information into action in ways that strive to improve organizational performance. Therefore, KM aims to optimize the management of the most important resource: knowledge, which is fundamental to solve problems that allow people to reach their goals. According to both Woolf (1990) and Turban (1992), knowledge is actually information that has been organized to make it understandable and applicable to problem solving or decision making.

If cognitive skills of individuals were unlimited, they could quickly absorb all useful knowledge to solve problems. Unfortunately, human cognitive abilities are limited and so, the distinct sets of useful information and knowledge they need to solve complex problems will probably be scattered in the mind of many individuals (Nickerson and Zenger, 2004). Consequently, knowledge sharing and transfer are two fundamental aspects that we need to consider when examining the efficacy of heuristic research. Knowledge sharing among employees is surely very useful for achieving a sustainable competitive advantage (Cabrer and Cabrera, 2005) because every employee has the potential to impact firm performance (Davis-Blake and Hui, 2003). Moreover, thanks to the acquisition and sharing of knowledge, cognitive abilities of individuals and groups are amplified and, this, in turn, leads to a better ability in solving complex problems beyond individual capability (Mumford et al., 1991).

The KM literature has identified several organizational variables having a positive impact on knowledge sharing (Bontis and Fitz-enz, 2002). While information technology merely allows a quick sharing of knowledge, most of the KM and sharing success depends on people’s behavior and organization-level variables (Bontis et al., 2000; Bhatt, 2001;
This paper focuses on those organizational variables that have demonstrated to have a positive effect on knowledge sharing within organizations such as work design, organizational culture, training and organizational structure (Bontis, 1999; Cabrera and Cabrera, 2005; Ives et al., 2003).

Work design is an important tool to encourage knowledge flows. Working in teams gives employees the opportunity to work side by side and share knowledge and information. In particular, cross-functional teams strongly contribute to a firm’s success. When teams have real problems to solve and are responsible for results, employees are more likely to collaborate and share their knowledge (Cabrera and Cabrera, 2005). Also community of practices may be very effective in leveraging knowledge sharing (Noe et al., 2003). Within community of practices as emergent and social activities, people working on similar problems self-organize in order to help each other and share their experience. Thus, it is hypothesized that:

H1. There is a positive direct relationship between work design and CPS PROCESS.

H2. There is a positive direct relationship between work design and CPS.

Organizational culture has an important role in the KM process (Chang and Lin, 2015) and is able to make the difference between the success and failure of KM initiative (Al-Adaihel and Al-Atawi, 2011). Organizational culture can stimulate collaboration among employees, nurture knowledge flows and give employees the ability to self-organize their own knowledge and create networks to facilitate solutions for problems (O’Dell and Grayson, 1998). There is a wide consensus about the fact that employees will be more willing to share their knowledge in an open and trusting culture (Davenport and Prusak, 1998; Bontis, 2001). Thus, the promotion of specific values such as tolerance toward mistakes, common goals and a confident environment, which positively influences employees’ behavior, are recommended to get KM benefits (Yahya and Goh, 2002). Thus, it is hypothesized that:

H3. There is a positive direct relationship between organizational culture and CPS PROCESS.

H4. There is a positive direct relationship between organizational culture and CPS.

Another factor that contributes to increase the employees’ level of self-efficacy is the deployment of training and development programs. When training supports the potential of employees, they become more confident, powerful and free to experiment and innovate (Yahya and Goh, 2002). Moreover, thanks to a new self-esteem, employees will be more likely to share their knowledge (Cabrera and Cabrera, 2005). Training in problem solving is useful for both the creation and transfer of knowledge (Yahya and Goh, 2002). Group training creates important relationships for knowledge sharing, while cross-training creates an environment which favors the contamination among ideas and therefore creativity (Yahya and Goh, 2002). To summarize, every kind of training enhancing cooperation and creating ties among employees should increase knowledge sharing within organizations (Cabrera and Cabrera, 2005). Thus, it is hypothesized that:

H5. There is a positive direct relationship between training and CPS PROCESS.

H6. There is a positive direct relationship between training and CPS.

With reference to the functioning of the organization, the design of decision making seems particularly important in supporting knowledge sharing. Several authors indicate that coordination mechanisms based on centralization hinder the sharing of knowledge while decentralization is more appropriate (Kim and Lee, 2006; Chen and Huang, 2007). However, the study of Willem and Buelens (2009) did not find the negative effects of centralization on
knowledge sharing, suggesting that the structural impact on knowledge sharing may be organization-specific and influenced by other organizational elements (Park and Kim, 2015). These results are further confounded when considering the size of organizations (Serenko et al., 2007). Accordingly, it is hypothesized that:

H7. There is a positive direct relationship between decentralization and CPS PROCESS.

H8. There is a positive direct relationship between decentralization and CPS.

All the above-mentioned organizational variables represent the key instruments that company managers can control to improve knowledge sharing and transfer among employees. Pinho et al. (2012) define them as facilitators, while other authors use the term catalysts (Yeh et al., 2006) to indicate such factors that contribute to knowledge sharing and through them the knowledge-intensive process of problem solving and, in particular, creative problem solving (Cabrera and Cabrera, 2005).

Finally, it is a common belief that both KM and creativity have a positive impact on firms’ performance but it is not clear if their impact on performance is directed or mediated. Firms’ ability to use knowledge and creativity seems to mediate their impact on performance (Klein and Sorra, 1996; Kogut and Zander, 1992; Roos and Oliver, 1990; Weinzimmer et al., 2011). That is why researchers should focus on organizational variables that may affect knowledge usage. Focusing on organizational performance and financial performance as two different types of outcomes, it is hypothesized that:

H9. There is a positive direct relationship between CPS PROCESS and CPS.

H10. There is a positive direct relationship between CPS and competitive organizational performance (COP).

H11. There is positive direct relationship between COP and competitive financial performance (CPF).

Considering the above, the authors analyzed the impact that work design, organizational culture, training and decentralization have on both creative problem-solving process (CPS PROCESS) and creative problem-solving efficacy (CPS) and how this, in turn, affects competitive performance. Performance was measured along a three-year period, as this is a common time frame used in the strategic management literature. The hypotheses are represented in Figure 1.

3. Methodology
3.1 Data collection and survey development
In this paper, the authors draw on the sample collected by Giampaoli et al. (2017) where KMI included six variables (e.g. work design, training, reward, organizational culture, ICT, and decentralization). Differently from the previous work, this study focuses on the impact that each single KMI variable has on the creative problem-solving process (CPS PROCESS) and its outcome (creative problem-solving efficacy termed CPS). After having observed the impacts of the KMI variables, the authors chose to focus only on the three variables with a significant impact and abandoned the others. At the same time, considering that this study specifically focuses on a process (CPS PROCESS) that involves decision making, the authors thought it would be interesting to investigate the decentralization of the problem-solving process as a possible explanatory variable capable to impact the generation of new ideas.

Survey data were collected from the top Italian companies as listed by Mediobanca. Questionnaires were gathered from January to March 2015. The authors focused on top firms because they are more likely to have implemented KM practices (Gold et al., 2001) and have already had some years of valuable experience (Wu and Chen, 2014).
An e-mail was sent to all 2,381 top Italian firms as listed by Mediobanca inviting them to take part in the survey. In order to increase the number of respondents, the authors promised them the full data report once completed. The questionnaire was formulated in a way that any manager or managerial level employee was able to participate. Out of 2381 firms only 113 took part in the research study, which represents a response rate of about 5 percent. The response rate is consistent with this kind of research (Andreeva and Kianto, 2012) and does not hinder the validity of its results. According to Hair et al. (2016), the sample size for performing PLS requires ten times the number of indicators associated with the most complex construct or the largest number of antecedent constructs linking to an endogenous construct. Coherently, the present research model would have been valid with 50 responses. In our case, there were 113 responses and the sample is adequate to test the hypothesis and results are reliable.

No questionnaire was excluded because they were fully filled in. Around 55 percent of the respondents were top or middle managers, while the remaining 45 percent covered various roles in finance, planning and control or human resource management. Respondents belonged to the following main sectors: manufacturing (34 percent), finance and insurance (25 percent), other services (13 percent) and construction (10 percent).

The questionnaire was developed in three phases. In the first one, variables and items were chosen and adapted from the literature and used to compose a draft questionnaire. Then, the draft was sent to a full professor of KM and innovation and to five CKOs. They all gave precious feedback. In the third phase, an amended draft was developed according to their guidelines and once again sent to them for a further feedback. Having only received favorable feedback, this version became the final one.

3.2 Measures
To be sure that the initial scales and survey questions were accurate, one of the authors of the present paper translated the scales from English to Italian. In the second step, the scales were translated back into English. Finally, both Italian and English scales were checked by a bilingual speaker that found them decisively correspondent (Brislin, 1970). All the latent variables and their respective items are shown in Table I. For each item
Variable | Items
--- | ---
**Work design**
WD1 | [...] there are regular teams appointed with responsibility of reach goals and solve problems
WD2 | [...] there are regular interdisciplinary teams appointed with responsibility of reaching goals and solve problems
WD3 | [...] individual employees and/or teams with similar aims or problem to solve discuss, share ideas and give reciprocally advices
WD4 | [...] there are specific mechanisms that assure the involvement of employees in solving problems

**Organizational culture**
CU1 | [...] an environment of trust and collaboration is encouraged
CU2 | [...] employees who experiment and take reasonable risks are well considered even if they should be mistaken
CU3 | [...] innovation and experimentation of new ways of doing tasks is encouraged
CU4 | [...] employees are always concerned with getting the job done, with great emphasis on goal achievement

**Training**
TD1 | [...] the opportunities for career development are provided to employees through job rotation and participation in various tasks
TD2 | [...] there are training courses aimed at team building
TD3 | [...] there are training courses aiming to improve problem solving skills
TD4 | [...] there are training courses on the use of software and ICTs

**Decentralization**
DE1 | [...] employees are encouraged to make autonomous decisions
DE2 | [...] employees can perform their activities without interference of superiors
DE3 | [...] decision-making authority is delegated to those employees who actually perform task
DE4 | [...] a formal work environment is supported

**CPS process**
PR1 | [...] we look for and focus on work problems
PR2 | [...] problems are discussed and analyzed within teams in order to be better understood
PR3 | [...] we look for information and knowledge useful for solving problems in organizational database and/or by consulting with colleagues
PR4 | [...] we look for information and knowledge useful for solving problems by recurring to external sources of information and/or external subjects (clients, suppliers, etc.)
PR5 | [...] we implement solutions only after they have been selected depending on their novelty and feasibility

**Creative problem solving (CPS)**
CPS1 | [...] thanks to new information and knowledge we are able to find new and effective solutions to problems
CPS2 | [...] we are able to find a large number of solutions for a specific problem
CPS3 | [...] implemented solutions are new and effective
CPS4 | [...] the solutions found and implemented are lower in cost than expected
CPS5 | [...] the solutions found and implemented are less expensive than previous ones

**Competitive organizational performance**
COP1 | [...] is more successful
COP2 | [...] has a greater market share
COP3 | [...] is growing faster
COP4 | [...] is more innovative

**Competitive financial performance**
CFP1 | [...] has major profit margin over sales
CFP2 | [...] is more profitable

Table I. Survey items and their corresponding variables
participants were asked to express their opinion on a 1 to 7 scale (1 = strongly disagree, 7 = strongly agree). Instead of the Likert scale, we used self-anchoring scales (Cantril, 1965) where only the two extreme numbers have a precise meaning between which the respondent makes his evaluation.

Work design was represented by four items that were based on the conceptual consideration of Cabrera and Cabrera (2005) and adapted by Donate and Guadamillas (2011). Organizational culture was investigated using four items based on the work of Cabrera and Cabrera (2005), Lopez et al. (2004) and Kamhawi (2012). Training was covered by four items based on the conceptual consideration of Cabrera and Cabrera (2005) and Lee and Choi (2003). Decentralization was covered by four items that were taken and adapted from the previous work of Lee and Choi (2003) and Kamhawi (2012). CPS PROCESS was covered by five items based on the conceptual considerations of Reiter-Palmon and Illies (2004), while creative problem solving was covered by five items taken from the previous work of Atuahene-Gima and Wei (2011) and Reiter-Palmon and Illies (2004). Competitive organizational and financial performance were covered, respectively, represented by four and two items taken from the previous work of Lee and Choi (2003).

4. Results
4.1 Internal consistency reliability, convergent validity and divergent validity
The psychometric properties of scales were assessed in terms of reliability, convergent validity and discriminant validity. The reliability of the inherent variables is tested using Cronbach’s α (α ≥ 0.7) and Dillon–Goldstein’s ρ (ρ ≥ 0.7) (Hair et al., 2016). Only three items were dropped (DE4, PR4, CPS5). All the factor loadings exceeded the recommended threshold (see Table II) confirming that measurement scales had adequate convergent validity (Hair et al., 2016). Discriminant validity requires that the inter-correlations among the latent variables do not exceed the square root of the AVE (Chin, 1998). The correlation matrix (see Table III) indicates that the square roots of AVE displayed on the diagonal are greater than the corresponding off-diagonal inter-construct correlations, providing good evidence of discriminant validity.

4.2 Testing of hypotheses
PLS was used to test the research model (Version: SMARTPLS 3.2.4), a structural equation modeling technique widely used in studies investigating KM’s impact on performance (Bontis, 1998; Ragab and Arisha, 2013) following the procedure suggested by Chin (1998). PLS can manage complex relations and places minimal demands on sample size (Chin, 1998). Considering that PLS requires ten times the number of indicators associated with the most complex construct or the largest number of antecedent constructs linking to an endogenous construct (Hair et al., 2016) the present research model would have been valid with 50 responses. In our case, there were 113 and the sample is adequate to test the hypothesis and results are reliable. We tested the structural model for multicollinearity. Table IV contains collinearity statistics (variance inflation factor—VIF). All values are below the threshold of 5 and therefore we can exclude multicollinearity (Hair et al., 2016). Path coefficients, t-values and p-values are presented in Table V.

Figure 2 shows the results of the structural model.

4.3 Findings
All latent variables had explanatory power ($R^2$ for CPS PROCESS = 0.652; $R^2$ for creative problem solving = 0.611; $R^2$ for competitive organizational performance = 0.232 and $R^2$ = 0.238 for CPF) considering the numerous factors that impact on them. In general, the
## Reliability and convergent validity

<table>
<thead>
<tr>
<th>Inherent variables</th>
<th>Items</th>
<th>Factor loadings</th>
<th>Dillon-Goldstein $\rho$</th>
<th>Cronbach's $\alpha$</th>
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<tr>
<td></td>
<td>WD3</td>
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<td></td>
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<tr>
<td></td>
<td>WD4</td>
<td>0.867</td>
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<td>0.874</td>
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<td></td>
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<td>CU3</td>
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<td></td>
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<td>CPS4</td>
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<td>Competitive organizational performance</td>
<td>COP1</td>
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<td>COP3</td>
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<td></td>
<td>COP4</td>
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<td>Competitive financial performance</td>
<td>CFP1</td>
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<td></td>
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<td>0.982</td>
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### Table II. Reliability and convergent validity
rule of thumb considers values of 0.75, 0.50 and 0.25 for substantial, moderate and weak, respectively (Hair et al., 2016).

As hypothesized work design has a strong positive impact ($\beta = 0.410$) on CPS PROCESS ($H1$) confirming the assumptions of Cabrera and Cabrera (2005). When team members have to solve real problems, they need to seek out and share information and knowledge (Noe et al., 2003). On the other hand, work design has no direct impact on a firm’s ability to develop new, useful and cost-effective solutions ($H2$). This means that setting up groups or teams is not enough to get effective results; organizations need to structure and activate the identified CPS sub-processes where the appropriate work design can contribute to the development of new ideas.

As hypothesized, organizational culture has a positive impact ($\beta = 0.285$) on both CPS PROCESS ($H3$) and CPS ($H4$) ($\beta = 0.239$) confirming that organizational culture is important to stimulate collaboration among employees and nurture knowledge flows that

<table>
<thead>
<tr>
<th>Path coefficients</th>
<th>t-values</th>
<th>p-values</th>
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<tr>
<td>COP → CFP</td>
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<td>CPS → COP</td>
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<td>CPS PROCESS → CPS</td>
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<tr>
<td>Work design → CPS PROCESS</td>
<td>0.410</td>
<td>3.935</td>
</tr>
</tbody>
</table>

Table V. Path coefficients, t-values and p-values

Figure 2. Test of structural model

Notes: NS, significant; $^*p = 0.000$; $^{**}p < 0.05$; $^{***}p < 0.1$
facilitate knowledge sharing and the identification of solutions for problems (O’Dell and Grayson, 1998; Sawyer, 2006; Serenko and Bontis, 2016). In other terms, it seems that creating a trusted and collaborative organizational culture can lead to greater creativity regardless the existence of specific stages or sub-processes within the problem-solving process.

As hypothesized, training has a positive impact ($\beta = 0.198$) on CPS PROCESS ($H_5$) confirming that effective training in team building, cooperation and problem-solving creates ties among employees and increases knowledge sharing within organizations (Cabrera and Cabrera, 2005; Yahya and Goh, 2002). Surprisingly, training has no impact on CPS ($H_6$). This result suggests that individuals can be trained to share information and work in partnership so that they actively participate to the CPS PROCESS but this collaborative attitude does not nurture the generation of new and useful ideas, which also need adequate cognitive skills to exist.

Decentralization is the only organizational variable that has no impact on both CPS PROCESS ($H_7$) and CPS ($H_8$). This means that ensuring decision-making autonomy would facilitate neither the initiation of CPS sub-processes nor the ability of the organization to find new and useful solutions. Autonomy may lead employees to rely on their own capabilities as a form of self-responsibility and hinder the sharing of information. Thus, the execution of the CPS process and the identification of new and useful ideas seems to mainly depend on individual’s actual will to contribute in the problem-solving process.

As hypothesized, CPS PROCESS has a strong positive impact ($\beta = 0.397$) on CPS ($H_9$) confirming the assumptions of Reiter-Palmon and Illies (2004) and Reiter-Palmon and Robinson. Moreover, this result is in line with other studies demonstrating that the quality and originality of solutions is related to the execution of the identified CPS sub-processes (Reiter-Palmon et al., 1997).

As hypothesized, CPS has a strong positive impact ($\beta = 0.482$) on COP ($H_{10}$) confirming assumptions and empirical research according to which firms’ ability to put knowledge and creativity into action impact on performance (Klein and Sorra, 1996; Kogut and Zander, 1992; Roos and Oliver, 1990; Weinzimmer et al., 2011).

As hypothesized, COP has a strong positive impact ($\beta = 0.488$) on CFP ($H_{11}$). Such evidence supports both similar findings of Lee and Choi (2003) and Zack et al. (2009).

5. Discussion and conclusion

The present study addresses an important KIBP, namely, the creative problem-solving process, which has not been largely investigated by previous BPM researchers in the academic literature. It focuses on one single process that strongly relies on knowledge and knowledge sharing and has become essential to support a firms’ competitive advantage. Thus, this study takes a different perspective from previous work on KIBPs that generically label knowledge-intensive work as the processes occurring in creative industries or organizations relying on creativity like software houses, biotech firms and universities (Seidel, 2011).

In detail, this paper proposes a research model that recognizes the importance of looking at creativity as both a process and an outcome, trying to overcome the perils highlighted by Seidel (2011) of merely focusing on the creative output. At the same time it emphasizes the importance of information and knowledge sharing activities and so it tries to capture the different impact of KM organizational variables on the required process steps and their impact on creative problem-solving outcome. The present model empirically tests the relationship among work design, training, organizational culture, decentralization and CPS PROCESS as well as the relationship among the same variables and the efficacy of creative problem solving. Furthermore, it tests the impact that CPS PROCESS has on creative problem-solving outcome (CPS) its linkage with competitive organizational performance.
The empirical results emphasize the importance of a multistage process of creative thinking and problem solving (Amabile, 1988; Reiter-Palmon and Illies, 2004) suggesting managers should structure the problem-solving process (i.e. define and implement procedural steps that are held to sustain people’s sense making of the problem to be faced and facilitate the identification of possible solutions). In other words, creativity is not supplanted by the implementation of some procedural steps designed to make people identify the problem, foster dialogue, facilitate the finding of ideas and the evaluation of possible solutions. At the same time, these research results suggest that managers should invest in selected organizational variables that foster knowledge sharing as they impact on the creative problem-solving process and its efficacy, which, in turn, affects an organization’s competitiveness.

Notwithstanding, organizational culture, which leaves people free to express their creativity, is the only variable that has a positive direct impact on the creative problem-solving outcome.

Thus, this study confirms that organizational culture can stimulate collaboration among employees so that they will be more willing to share their knowledge in an open and trusting climate (Davenport and Prusak, 1998), and thus facilitate the resolution of work problems (O’Dell and Grayson, 1998). That is why the promotion of specific values such as tolerance toward mistakes, common goals and a confident environment are recommended to realize KM benefits (Yahya and Goh, 2002).

One of the main limitations of the present paper is that it has not been possible to stratify problem-solving skills by hierarchical levels (i.e. strategic, tactical, operational) nor split them in to functional areas (i.e. marketing, finance, R&D, etc.). Another limitation is the generalizability of results given that the data were collected from Italian firms only.

Since data do not refer to a specific industry or sector, further research should investigate possible differences in the problem-solving process and outcomes in companies operating in different competitive contexts and especially between high-tech firms, which require high levels of technical knowledge to develop new products and innovative solutions, and low-tech firms, respectively.

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**Further reading**


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Dr Nick Bontis is Chair of Strategy at the DeGroote School of Business at McMaster University. He received his PhD Degree from the Ivey Business School at Western University in Ontario. His doctoral dissertation is recognized as the first thesis to integrate the fields of intellectual capital, organizational learning and knowledge management and is the number one selling thesis in Canada. He was recently recognized as the first McMaster professor to win outstanding teacher of the year and faculty researcher of the year simultaneously. He is a 3M National Teaching Fellow, an exclusive honor only bestowed upon the top university professors in Canada. Dr Bontis is recognized the world over as a leading professional speaker and consultant in the field of knowledge management and intellectual capital. Dr Nick Bontis is the corresponding author and can be contacted at: nbontis@mcmaster.ca

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Knowledge transfer in open innovation
A classification framework for healthcare ecosystems

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Abstract
Purpose – Despite the abundance of research in open innovation, few contributions explore it at the inter-organizational level, and particularly with a focus on healthcare ecosystems, characterized by a dense network of relationships among public and private organizations (hospitals, companies and universities) as well as other actors that can be labeled as “untraditional” player, i.e. doctors, nurses and patients. The purpose of this paper is to cover this gap and explore how knowledge is transferred and flows among all the healthcare ecosystem’s players in order to support open innovation processes.

Design/methodology/approach – The paper is conceptual in nature and adopts a narrative literature review approach. In particular, insights gathered from open innovation literature at the inter-organizational network level, with a particular attention to healthcare ecosystems, and from the knowledge transfer processes, are analyzed in order to propose an interpretative framework for the understanding of knowledge transfer in open innovation with a focus on healthcare ecosystem.

Findings – The paper proposes an original interpretative framework for knowledge transfer to support open innovation in healthcare ecosystems, composed of four main components: healthcare ecosystem’s players’ categories; knowledge flows among different categories of players along the exploration and exploitation stages of innovation development; players’ motivations for open innovation; and players’ positions in the innovation process. In addition, assuming the intermediary network as the suitable organizational model for healthcare ecosystem, four classification scenarios are identified on the basis of the main players’ influence degree and motivations for open innovation.

Practical implications – The paper offers interpretative lenses for managers and policy makers in understanding the most suitable organizational models able to encourage open innovation in healthcare ecosystems, taking into consideration the players’ motivation and the knowledge transfer processes on the basis of the innovation results.

Originality/value – The paper introduces a novel framework that fills a gap in the innovation management literature, by pointing out the key role of external not R&D players, like patients, involved in knowledge transfer for open innovation processes in healthcare ecosystems.

Keywords Open innovation, Intermediary networks, Healthcare ecosystem, Knowledge flow, Knowledge transfer

Paper type Research paper

1. Introduction
In a world of ever-changing corporate environments and reduced product life cycles, organizations working in R&D and technology-intensive industry “can and should use external ideas as well as internal ones, and internal and external paths to market” to make the most out of their technologies (Chesbrough, 2003, p. 24). Chesbrough et al. (2006) proposed a quite broad definition of open innovation as the “purposive inflows and outflows of knowledge to accelerate internal innovation and to expand the markets for external use of innovation” (Chesbrough et al., 2006, p. 1) using pecuniary and non-pecuniary mechanisms
in line with the organization’s business model (Chesbrough and Bogers, 2014). Since 2003, there has been an abundance of research conducted into open innovation, even though much of this research has focused on individual firms interacting with external partners, large-scale enterprises, leaving a gap in R&D intensive industry and at inter-organizational value network level (alliance, network and, specifically, ecosystem) (Chesbrough et al., 2014).

In inter-organizational value network, as in particular healthcare ecosystems, the open innovation model is based on the use of external knowledge in conjunction with internal R&D (Almirall and Casadesus-Masanell, 2010; Chesbrough, 2003). This approach is based on the recognition that valuable technologies and pieces of knowledge may originate from both within and outside the firm’s boundaries, and that innovation can be commercially exploited both internally, in the forms of new products and services to be launched on the market, and externally, i.e. disembodied from physical artifacts. In particular, healthcare ecosystems are based on the interactions of individuals and organizations into a complex adaptive environment, where productive relationships need to be managed as part of a complex system and interactions among parts that can “produce valuable, new, and unpredictable capabilities that are not inherent in any of the parts acting alone” (Plsek and Wilson, 2001, p. 746). Healthcare ecosystems have been experiencing a shift from a centralized and sequential model of value creation to a more distributed and open model, where citizens are co-creators of their own well-being (Bessant et al., 2012). The innovation of healthcare ecosystems will likely take the form of a constellation of improvements and not the adoption of a singular product or service. Healthcare ecosystems usually involve a wide number of actors (patients, doctors, nurses, companies and government bodies) that open their innovation processes in order to incorporate knowledge flows originated from or co-produced with external stakeholders (academia, research centers, industry, government, NGOs and public institutions) (Chesbrough and Bogers, 2014; Dahlander and Gann, 2010; Huizingh, 2011; Enkel et al., 2009; Ardito and Messeni Petruzzelli, 2017). Characterizing knowledge in terms of flows means looking at knowledge as “a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information” (Davenport and Prusak, 2000, p. 5). In the specific case of healthcare ecosystems, these would favor knowledge co-production processes where, for example, end-users, patients, policy makers, industries and academic institutions work together in order to advance scientific knowledge or to develop new services, solutions and prototypes. Within these ecosystems, a key role is assumed by the intermediaries involved in reducing distances among the network members and building trust between them (Bougrain and Haudeville, 2002). They collect information on technologies, markets, competitors and potential partners, as well as they transfer knowledge between different players, going over the companies reluctance to disclose detailed R&D information to potential competitors.

While previous research has primarily contributed to the comprehension of open innovation management from the perspective of a single firm or start-up interacting with external partners (e.g. Hosseini et al., 2017; Lichtenthaler, 2011; Vanhaverbeke, 2006; West et al., 2006; Spender et al., 2017), how open innovation unfolds at ecosystem’s level remains unexplored. Collaboration among distributed players and partners of the ecosystem allows the creation of something new, starting from what already exists (Hargadon, 2002), searching and recombining existing knowledge elements (Ardito and Messeni Petruzzelli, 2017; Savino et al., 2017) allowing the increasing of business performance (Lazzarotti et al., 2017). The scarcity of research on this phenomenon is surprising, as its importance has been highlighted across many disciplines and settings (Powell and Grodal, 2005; Enkel, 2010; Gassmann et al., 2010; West et al., 2006). Hence, analyzing the knowledge transfer of innovation networks (Provan et al., 2007) appears timely and relevant for open innovation management practitioners and academics alike (see Gassmann et al., 2010; Vanhaverbeke, 2006; West et al., 2006).
In relation to the above background, this study takes into account and aims to investigate the following research questions:

**RQ1.** Which typology of the intermediary network can be used as an organizational model for open innovation in healthcare ecosystems?

**RQ2.** Which kind of knowledge transfer and flows support healthcare open innovation in healthcare ecosystems?

Using the results of a narrative literature review, a framework analyzing knowledge transfer processes among the key players for open innovation in healthcare ecosystems is proposed. Considering the four categories of intermediary network as organizational models (Walshok et al., 2014), four classification scenarios for healthcare ecosystems involved into open innovation are presented as composed by the following components: healthcare ecosystem’s players’ categories; knowledge flows among different categories of players (e.g., universities, competitors and NGOs) along the exploration and exploitation stages of innovation development; players’ motivations for innovation; and players’ positions in the innovation process. We formally integrate separate aspects of open innovation and inter-organizational networks, to broaden the view to the relations of all the actors in an ecosystem of companies, organizations, government, patients and to underline the importance of the individual players’ motivations, balanced formal and informal knowledge flows, players’ position within the innovation process.

The paper is structured as follows: Section 2 provides a literature review about open innovation in healthcare ecosystems and knowledge transfer processes for open innovation. Section 3 introduces the framework for analyzing knowledge transfer in open innovation for healthcare ecosystems. Section 4 discusses the proposed framework and concludes the paper highlighting implications for theory and practices, limitations and further research.

## 2. Literature review

### 2.1 Open innovation in healthcare ecosystems: a knowledge view

This section presents the results of a narrative literature review exploring open innovation in the healthcare ecosystem. The literature review has been conducted by identifying the key research outlets focusing on open innovation and using a set of keywords (knowledge transfer, ecosystems, network(s), inter-organizational relationships, healthcare, open innovation players, knowledge management and knowledge processes) we have identified and selected the first group of papers which have been further selected by reading the manuscripts’ abstracts. Finally, the papers that are listed in the references have been selected for this study and thoroughly analyzed. Reviewing the papers the attention has been paid to: the context for open innovation (innovation ecosystems), the players’ categories and their motivations in healthcare ecosystems and the organizational model (intermediary networks).

Context: healthcare innovation ecosystems. Innovation ecosystems thinking has its roots in the “systems of innovation” as defined by Freeman (1995) and other scholars to encompass the systemic relationships between invention, innovation and in particular the institutions which are present in a geographical or sectorial space which supports and moderates the behavior of innovation actors. Innovation ecosystems relate to complex inter-organizational structures composed of a variety of players supporting innovation processes, through collaborative mechanisms that allow companies to interact for commercializing their innovations (Montanari and Mizzau, 2016; Carayannis and Campbell, 2009). This interpretation derives from the concept of business ecosystems, introduced by Moore (1993), as a group of organizations crossing many industries, working cooperatively and competitively in production, customer service and innovation. The success of an individual
innovation, however, is often dependent on the success of other innovations in the firm’s external environment (Adner and Kapoor, 2010), where innovation has to face institutional obstacles in the form of economic and cultural resistance (Trequattrini et al., 2016).

In recent years, classical approaches in the theme of innovation started to include a social dimension in the ecosystem, proposing the so-called “quadruple helix model” (Leydesdorff, 2012), where civil society becomes another cornerstone together to industry, university and government, with an active role in all the innovation process. A special attention must be reserved for the peculiar and unrepeatable conditions where the local ecosystem exists, and in particular, to its cognitive and relational capital (Montanari and Mizzau, 2016). In particular, knowledge does not reside in individuals or in informative systems, but it depends on the interaction among its members during the time. For this reason, creating appropriate coordination mechanisms becomes crucial, through the support of specific third actors like public bodies and agencies (Sydow and Staber, 2002). In healthcare ecosystems, economic motivations for innovation are mediated by social motivations, introducing the concept of social innovation, defined as the identification of new ideas able to meet social needs, creating new relations and collaborations (Mulgan et al., 2007). The simultaneous presence of innovators and end-users can lead innovations due to the ability of both keystone organizations and intermediaries to coordinate investments and new technologies toward their commercialization (Lichtenhaller, 2011). In this view, motivation becomes a key role in innovative processes, interpreted as the opportunity to create new collaborations, developing new products and services and improving end-users’ life conditions (Bessant et al., 2012). The drivers of external sourcing emphasize two types of motivations: improved efficiency through scale economies and access to innovations (or innovation-producing capabilities) not held by the focal firm (West and Bogers, 2014). Universities are a special source of external innovations (Lombardi et al., 2017), and research has measured the benefits of university technology to be commercialized by firms. From this point of view, it is the overall quality of interconnections within an innovation system that affects successful knowledge transfer for which the role of intermediaries (Bessant and Rush, 1995) and intermediate network models (Lee et al., 2010) becomes of high importance.

Players’ categories and motivations in healthcare ecosystems. Healthcare ecosystems include a variety of players with a wide range of interests, conflicting needs, priorities and influence. They can be classified as follows (Bessant et al., 2012):

- regulators: Ministry of Health, National or Regional Committees who set regulatory guidelines;
- providers: doctors, nurses and other health professionals who provide care in hospitals, doctor’s surgeries, nursing homes and others;
- payers: statutory health insurance, private health insurance and government agencies;
- suppliers: scientific institutions, universities, pharmaceutical and medical technology companies, who develop new products and treatments; pharmacies and wholesalers, who mostly do resale; and
- patients: beneficiaries of care and source of valuable knowledge.

Specifically, patients in the healthcare ecosystem can represent what Von Hippel (1986) called the “lead users,” i.e. users of a product that currently experience needs still unknown and who also benefit greatly if they obtain a solution to these needs. Patients gain their insights into how they solve a specific problem and declare their innovation needs. Patients as “lead users” are individuals who had experienced needs for a given innovation (product or process) earlier than the majority of the target market (Von Hippel, 1986). Recent research highlights the fact that lead users exist for services also (Skiba and Herstatt 2009, Oliveira and Von Hippel 2011).
In a pyramidal asset, the number and degree of influence of each player within the healthcare ecosystems can be represented in Figure 1 (adapted from Toma et al., 2016).

As discussed in the previous section, motivation is one of the main components that affect players’ activities in an innovative ecosystem. In this framework, each player holds specific motivations that could be exemplified as follow:

- regulators—supply efficient services, costs reduction, guidelines monitoring;
- providers—improving patient life conditions, reducing time of hospitalization, improving working conditions and efficiency;
- payers—reducing costs, monitoring hospital efficiency;
- suppliers—improve research activities, increase profits; and
- patients—improving life conditions, reducing the time of hospitalization, finding new and more effective treatments.

Certainly, the possibility for each category of players to state one’s motivation is strictly connected to its influence degree in an open ecosystem. Recent empirical observations highlighted how in some healthcare organizations patients are starting to have an increasing influence. In fact, patients, as end-users and lead users of products and services, are in a useful position to evaluate some critical aspects and to develop some alternative ideas able to increase efficiency, improve medical devices, test new ways of treatments, meeting the mutual motivations of health suppliers and stakeholders often reluctant to transfer patients ideas into their processes (Peek and Heinrich, 1995; Freire and Sangiorgi, 2010).

Motivation is also related to the position of each player along the innovation process that affects their knowledge level and typology for innovation results. Then, three distinct types of innovators are identified: core inside innovators, peripheral inside innovators and external innovators (Neyer et al., 2009). Figure 2 shows how their position along the innovation process is inversely proportional to their number, considering that:

- core inside innovators traditionally are R&D departments of large firms, SMEs, universities and non-profit centers, with a central role in tracing the innovation pipeline;
peripheral inside innovators are employees operating in non-R&D departments, as well as doctors and nurses usually without research responsibilities; and

- external innovators are players not directly participating in the innovation process (customers, patients, users, retailers, suppliers and so on) that can bring their contribution according to their background, perception and needs.

Moreover, in order to reduce the variability of results, each player can be grouped per category according to the definition used in the quadruple helix model (Leydesdorff, 2012): industry, university, government and civil society (see Table I).

Collaborations among the healthcare ecosystem players may last for a significant period (this is the case when jointly developing a new technology), could involve different groups of organizations, can have different initiators (e.g. the supplier invites the customer to explore applications of a new technology or the customer invites the supplier to participate in a project), could require different roles of the organization (e.g. project leader vs project participant) and include different departments (going beyond R&D by including production, logistics and even finance as well) (Huizingh, 2011). In all these cases, organizational models are required to manage the collaborations for open innovation in an ecosystem.

<table>
<thead>
<tr>
<th>Category</th>
<th>Players</th>
<th>Motivations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>Pharmaceutical companies</td>
<td>Increase profits</td>
</tr>
<tr>
<td></td>
<td>Medical technology companies</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Private health insurance</td>
<td></td>
</tr>
<tr>
<td>University hospitals</td>
<td>Scientific institutions</td>
<td>Improve research activities</td>
</tr>
<tr>
<td>Government</td>
<td>Ministry of Health</td>
<td>Supply efficient services</td>
</tr>
<tr>
<td></td>
<td>National or Regional Committees</td>
<td>Costs reduction</td>
</tr>
<tr>
<td></td>
<td>Government agencies</td>
<td>Guidelines monitoring</td>
</tr>
<tr>
<td></td>
<td>Statutory health insurance</td>
<td>Hospital efficiency monitoring</td>
</tr>
<tr>
<td>Civil society</td>
<td>Patients</td>
<td>Improving patient life conditions</td>
</tr>
<tr>
<td></td>
<td>Doctors</td>
<td>Reducing time of hospitalization</td>
</tr>
<tr>
<td></td>
<td>Nurses</td>
<td>Improving working conditions and efficiency</td>
</tr>
<tr>
<td></td>
<td>Other professionals</td>
<td>Finding new and more effective treatments</td>
</tr>
</tbody>
</table>

Table I. Players’ categories and motivations in healthcare ecosystems

Knowledge transfer in open innovation
Organizational model: the intermediary network. This section discusses the organizational models through which healthcare ecosystem’s actors open up their innovation processes and enter into a relationship with external organizations to transfer knowledge. For deepening this aspect, it is necessary to distinguish two dimensions of the open innovation paradigm (Bianchi et al., 2011), namely, “inbound” and “outbound” open innovation (Chesbrough and Crowther, 2006). Inbound open innovation is the practice of leveraging technologies and discoveries of others, and it requires the establishment of inter-organizational relationships with an external organization with the aim to access their technical and scientific competencies. Outbound open innovation is instead the practice of establishing relationships with external organizations to which proprietary technologies are transferred for commercial exploitation.

Moving from the studies of March (1991), inbound open innovation serves the purpose to improve the firm’s “exploration” capabilities in innovation management, whereas outbound open innovation is very much related to the “exploitation” of the firm’s current basis of knowledge and technologies (He and Wong, 2004). For example, in contexts with a high technology intensity, inbound open innovation may be important as even large companies are able to cope with or afford to develop technology on their own (Gassmann, 2006), but the same may not be necessarily the case for outbound open innovation.

Literature has documented the use of different organizational modes through which inbound and outbound open innovation can be put into practice (Grandstrand, 2004; Lichtenthaler, 2004) including networks in which participants retain their knowledge and collaborate informally (Williamson and De Meyer, 2012). Some scholars started to propose network models to encourage innovation through the relevant role of intermediaries linking large firms, institutions and SMEs in a unique ecosystem (Lee et al., 2010; Walshok et al. 2014). Walshok et al. (2014) proposed a classification of intermediary network based on some characteristics that include purposes, financing mechanisms, performance metrics and organizational aspects. From this latter point of view, all these networks are established and managed thanks to the direct involvement of third parties constituted specifically for the purpose of bridging the gap between the network players. Four categories of the network are identified (Walshok et al. (2014):

1. Technology sector networks are self-organized, driven by local stakeholders and local businesses with an interest in growing their performances. Market growth and profitability are their purposes. Their functions are ensured by members’ fees and their performances are evaluated in terms of a number of new business ideas created and of transactions’ increase.

2. Identity-based social networks arise from a specific need expressed by a class of individuals, and then, are self-organized with a clear vision relating their mission, that is promoting individual benefits and success. Fees permit their functionality and their objective is to increase the level of participation in business and industry of their societal basis.

3. Government-led networks are created with the determinant role of public institutions, with the final aim to assure regional prosperity. They operate through the allocation of public funds and the measured metrics include the level of employment, job creation and tax revenues.

4. Civic and philanthropically enabled networks are created on a voluntary basis through the involvement of community stakeholders. Their finances are supported by charitable contributions and their performance metrics relate to social equity, economic prosperity and access to opportunities.
In all the mentioned categories, intermediary organizes the network and builds trust between network members, establishing partnerships by mean of public authorities with the role of intermediaries (Davenport et al., 1999; Bougrain and Haudeville, 2002). Specifically, intermediaries are agents that facilitate the process of knowledge/technology transfer across people, organizations and industries (Hargadon and Sutton 1997). Assuming intermediation as a process, Wolpert (2002) has identified two major functions associated with the intermediation: a function of “scanning and gathering information” and “communication,” both connected to the front end of innovation. Despite the widespread recognition of the intermediary potential for both inbound and outbound open innovation, using intermediaries comes with new management challenges (Sieg et al., 2010).

2.2 Knowledge flows in open innovation healthcare ecosystems

This paper focuses, specifically, on the processes of knowledge transfer in healthcare ecosystems, where knowledge is transferred from one actor to another on the basis of the principles of an open innovation approach. Open innovation occurs where knowledge transfer and knowledge flow beyond the boundaries of a single organization and where a high degree of cross-border organizational collaborations take place (Chesbrough and Crowther, 2006; Grimaldi et al., 2013; Rippa et al., 2016). In the last decades, scholars have proposed various models that study how knowledge flows across the boundaries of a single organization focusing on the intersection of multiple reciprocal relationships across academia, government, industry and society (Etzkowitz 2008; Carayannis and Campbell 2012).

Literature agrees on the following main dimensions to describe the knowledge transfer in open innovation: the actors involved (sources, recipients and intermediaries), the object of knowledge transfer, the mechanisms of knowledge transfer and the relationships among the players (Albino et al., 1998; Battistella et al. 2016).

The actors involved in knowledge transfer. The most important disseminator of knowledge is the actors situated in the innovative network and participating in an ecosystem (Albino et al., 1999). Three categories of actors can play the role of the source or recipient of a transfer of technology or knowledge (Bozeman 2000; Reisman 2005; Trequattrini et al., 2018): companies, universities/research institutions and other organizations. A detailed discussion about the classification of these actors related to the specific case of healthcare ecosystem has been already presented in the previous sections.

Object of knowledge transfer: the knowledge categories. In a network of actors aimed to promote innovation, two types of knowledge exist external knowledge, which is originated from the interaction of the firms with their external environment (Tranekjer, 2017), and internal knowledge, generated within a special circle of participants. The internal knowledge is usually knowledge resulting from experiences in processes such as learning by doing and learning by using (Albino et al., 1998). The traditional classification (Polanyi, 1962; Nonaka and Takeuchi, 1995) between “tacit knowledge” and “explicit knowledge” is considered. Moreover, knowledge can be referred to technological and physical characteristics of what is being transferred and resides in the object itself (technoware component). Knowledge can be relative to know-how of people on the use of technology and is therefore inherent in individuals (humanware component). A component of the knowledge is created from the information: it typically resides in the documents and is the most easily transferable (infoware component). A final component is a knowledge embodied in the organizational structure (orgaware component), for example, at the level of rules and practices and it is “rooted” in the context in which it is located and it is difficult to transfer (Battistella et al., 2016). All the categories of knowledge are strategic for improving quality of care and this aspect is relatively new in healthcare (Hellström et al., 2015).
The mechanisms for knowledge transfer. The objective of a knowledge transfer process that takes place between two or more actors (individuals or organizations) is to enable an actor to acquire the knowledge of another actor (Albino et al., 1998). A working definition of knowledge transfer is the one provided by Christensen (2003, p. 14) who considered knowledge transfer as the process of “identifying (accessible) knowledge that already exists, acquiring it and subsequently applying this knowledge to develop new ideas or enhance the existing ideas to make a process/action faster. So, basically knowledge transfer is not only about exploiting accessible resources, i.e. knowledge, but also about how to acquire and absorb it well to make things more efficient and effective.” Knowledge transfer at inter-organizational level means knowledge access (or acquisition), knowledge search, knowledge assimilation (or absorption) and knowledge integration (or combination) (Filieri and Alguezaui, 2014). According to Van Den Hooff and De Ridder (2004), knowledge transfer involves either actively communicating to others what one knows, or actively consulting others in order to learn what they know. Successful knowledge transfer means that transfer occurs in successful creation and application of knowledge in organizations. The process of knowledge transfer has been described by many researchers using different models; among these, one of the most known is the knowledge conversion model introduced by Nonaka and Takeuchi (1995), distinguishing between tacit and explicit knowledge (Polanyi, 1975). Tacit knowledge can be transferred with socialization; however, explicit knowledge can be transferred through externalization, combination and internalization. Knowledge can be shared through joint engagement in social practices among groups, organizational units and even the firm (Von Krogh, 2012).

Relationships among the actors: knowledge flows. Another perspective has to consider the various knowledge flows in open innovation. The focus is on how knowledge moves across the boundaries created by specialized knowledge domains (Argote and Ingram, 2000; Gilbert and Cordey-Hayes, 1996). For Kumar and Ganesh (2009), this dimension is represented by the relationship between the actors, called “flow.” Cummings and Teng (2003) defined the success of a transfer according to the degree of “internalization of knowledge”: the way the recipient obtained the knowledge, the degree of effort applied by the actors in the process and the satisfaction of the recipient on what has been transferred. Lichtenthaler and Lichtenthaler (2009) distinguished between three knowledge processes—knowledge exploration, retention and exploitation—that can be performed either internally or externally.

Finally, some empirical studies focused on regional healthcare ecosystems where knowledge flows are defined on the basis of the involved players and on the nature of the exchanged information, designing them on the basis of some simple questions, like: “who,” “what” and “to whom.” In his research, Laihonen (2015) defined some flows and actors moving from an upper level where policy makers are primarily involved, to medium level (interest groups) formed by political parties, media, elected officials, customers and other opinion leaders, to a regional level where actors belong to the single healthcare organizations, formed by healthcare specialists, administrative personnel and patients.

3. Knowledge transfer in open innovation for healthcare ecosystems: a proposed classification framework
The insights gathered from the narrative literature review and the acknowledgment of the existing gap about open innovation studies at ecosystem level (Chesbrough et al., 2014) define the context to introduce a framework for open innovation in healthcare ecosystem focusing on knowledge transfer and flow among all the players. In particular, the following key components characterize the knowledge transfer in open innovation of
healthcare ecosystems. Figure 3 depicts such categories that represent the building blocks of a framework:

1. main players’ categories operating in healthcare system and classified according to their position for innovation (core inside innovators, peripheral inside innovators and external innovators) (Neyer et al., 2009);
2. exploration and exploitation stages (March, 1991) for open innovation activities; and
3. knowledge transfer and flows according to the player’s positions along the open innovation process (lines describe connections among players, arrows point innovation results) (Laihonen, 2015).

In the following, a brief description of each component of the proposed framework is presented (Toma et al., 2016):

1. Main players’ categories: players in the healthcare ecosystem are categorized according to the centrality degree of both “traditional” players (large firms, SMEs and universities), and “untraditional” players (doctors, nurses, patients, etc.). Moreover, each player is further classified distinguishing among core inside innovators, peripheral inside innovators and external innovators (Neyer et al., 2009).
(2) Exploration and exploitation stages: these stages relate to the definition of exploration and exploitation activities (Rothaermel and Deeds, 2004), with different level of interactions among players. In particular, along with the product development process in its early stages, firms, institutions and organizations are involved in exploratory activities to discover something new; after this, new knowledge is enhanced through exploitation alliances among partners and other players interested in its valorization for commercial or social purposes.

(3) Knowledge transfer: this category describes the knowledge exchange among the ecosystem players during the exploration and exploitation stages. In fact, in the exploration phase, valuable knowledge contributions can come also from peripheral inside innovators (like doctors, nurses and other non-R&D employees), as well as from external innovators (like regulators, payers, suppliers and patients). This dense knowledge flows can bring to the exploitation of new products and services, but also to the birth of new R&D projects, new companies, as well as the generation of new intellectual property (IP) and its out-licensing (Lombardi et al., 2016; Manzini and Lazzarotti, 2016).

However, in the healthcare ecosystem, by transferring knowledge, collecting information on technologies, markets, competitors and potential partners, intermediaries can support the knowledge and technology flow among the players according to their motivation for innovation. Second, an intermediary can improve strategic technology management through the construction and support of knowledge and technology transfer activities. Considering that SMEs can be reluctant to disclose detailed R&D information to potential competitors, as well as potential partners can avoid co-operating if they lack sufficient information, an intermediary can hold important information able to bring this gap (Lee and Burrill, 1994). Finally, intermediaries can contribute to increasing the level of involvement into open innovation activities of the patients as lead users.

Moving from the assumption that an intermediary network could be the most suitable organizational model for healthcare ecosystem in which open innovation occurs, a classification framework is proposed according to the main motivation and position of players within the ecosystem. The four categories of Walsbok et al. (2014) are adopted to build a complete classification framework for open innovation in healthcare ecosystems grounded on knowledge transfer perspective and composed by: the main players categories; the main players’ influence for innovation; players’ motivation for open innovation; and finally knowledge transfer and flows (Table II) (Toma et al., 2017).

<table>
<thead>
<tr>
<th>Organizational models</th>
<th>Main players’ categories</th>
<th>Main players’ influencers</th>
<th>Players’ motivations for innovation</th>
<th>Knowledge transfer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identity-based social networks</td>
<td>Industry</td>
<td>Core inside innovators</td>
<td>Increase profits</td>
<td>New product on the market</td>
</tr>
<tr>
<td>Technology sector networks</td>
<td>University hospitals</td>
<td>Core inside and peripheral inside innovators</td>
<td>Improve research activities</td>
<td>Prototype development</td>
</tr>
<tr>
<td>Government-led networks</td>
<td>Government</td>
<td>External innovators</td>
<td>Supply efficient services</td>
<td>New technologies</td>
</tr>
<tr>
<td>Civic and philanthropically enabled networks</td>
<td>Civil society</td>
<td>Core inside and external innovators</td>
<td>Improving patients life conditions</td>
<td>Low-cost products and services</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>Foresight of research stream</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>User centered design and prototypes</td>
</tr>
</tbody>
</table>

Table II. A classification framework for open innovation in healthcare ecosystems.
The first case, named identity-based social networks, relates to healthcare ecosystems established with the specific mission of developing new products and services ready for the market. The main influent players are core inside innovators and in particular SMEs and large firms, in collaboration with universities and research centers. During exploration activities, knowledge flows could be established with some peripheral inside innovators, like non-R&D employees in the same firms. Because firms' main objectives consist in increasing profits, exploitation activities could let to new IP or R&D projects with other active players. Intermediaries are third parties set up by a pool of companies, hospitals and research centers interested in improving their products through scientific collaborations. Examples of identity-based social networks include the ecosystems where mediation activities can be performed by organizations built with the mission of developing new products and innovative technologies, such as the case example of “TT Factor s.r.l.” (Milan, Italy), that offers its support to a wide network of private and public entities for patentability analysis and commercial exploitation.

The second typology of the network is sustained by the key role of university hospitals. Considering that university hospitals have different technological vocations, relations of core inside innovators (like universities), and peripheral inside innovators (like doctors and nurses) can lead to the establishment of technology sector networks, whose goal is to improve research activities in a particular technological field, without an attention to the launch of new products or services. For this reason, the aim of this intermediary network is to propose new prototypes of products, encouraging relations among SMEs and large firms from exploration to exploitation stage. The main results of the interrelationships and knowledge transfer are new IP and R&D projects among the main actors of the innovative ecosystem. Examples of technology sector networks refer to cases promoted by universities with high specialization in medicine and other biological and pharmacological disciplines, like “Oxford University Innovation” or “MIT Medical,” where innovative ecosystems are promoted and encouraged with the determinant role of their universities (Oxford University and Massachusetts Institute of Technology (MIT)). The final goal is to bring research results to the market, thanks to pharmaceutical companies or through new companies with a direct involvement of researchers as founders.

The third typology relates to government-led networks, where governmental institutions play a determinant role in tracing the healthcare ecosystems mission. Top influencers are external innovators, and then regulatory entities, payers and patients, whose objectives are to reduce costs, maintaining an efficient service level for the community interest. The government-led networks could lead to the creation of new companies, as well as new project and in some cases, when their mission includes new entrepreneurship support, to new products and services ready for commercialization. Various examples of government-led networks exist, starting from regional, to national and international level. In all cases, like in the “National Institute of Health” for the USA or the “European Medicine Agency” for EU, their primary role is to define the strategic future research streams and trace the paths along which research should move, also finance collaborative research programs developed by companies, hospitals and research centers.

Finally, civic and philanthropically enabled networks are based on the main role of civil society especially through non-profit foundations operating in healthcare ecosystems. Here, non-profit centers are stakeholders of the interests of patients and their families, and their mission is to improve patients’ living conditions. The most relevant relations are established in the exploration phase with firms and universities in order to develop specific prototypes able to meet patients’ needs. For this reason, exploitation activities consist of new R&D projects, without addressing to market commercialization. One of the most relevant examples of civic and philanthropically enabled networks is the “Telethon Foundation,” operating in rare disease treatments, putting patients at the center of its mission through a
massive fund raising activity finalized to highly innovative research projects support. Figure 4 illustrates the classification framework of knowledge transfer for open innovation in the healthcare ecosystems.

4. Discussions and conclusions

Literature suggests that open innovation is more appropriate in contexts characterized by technology intensity, new business models and knowledge, leveraging technology-intensive services and supporting internal R&D activities (Gassmann, 2006). Despite the abundance of research in open innovation, few contributions relate to healthcare ecosystems that include “traditional” players like public and private organizations including hospitals and universities, as well as “untraditional” players like doctors, nurses and patients. In this context, one of the under searched challenge is the understanding of the most suitable organizational models able to encourage open innovation in healthcare ecosystems, taking into consideration the players’ motivation for innovation and the knowledge transfer processes on the basis of innovation results.

With the aim to cover this gap, the insights gathered from a systematic literature review focusing on open innovation and knowledge transfer at the inter-organizational level in the context of healthcare ecosystems have provided the basis to propose a classification framework. Starting from the four categories of intermediated organizational models (Walshok et al., 2014), the proposed classification framework for open innovation in healthcare ecosystems emerges four main building blocks: healthcare ecosystems’ players; knowledge flows among different categories of players along the exploration and exploitation stages of innovation development; players’ motivations for innovation; and players’ position in the innovation process. The framework allows to define relevant organizational structures depending on roles and objectives of the most influent players operating in innovative ecosystems inspired by an open innovation approach. In particular, the framework describes the interactions among different actors involved in healthcare ecosystems, identifying their roles and positions in the innovation process, their network of relations along which knowledge and information flow, and the motivation to contribute to innovation potentialities.

4.1 Implications for theory

Moving from the classification of Walshok et al. (2014), four categories of intermediary network models are proposed as suitable organizational model for open innovation in healthcare ecosystem: identity-based social networks, describing ecosystems based on the key role of core inside innovators, like SMEs and large firms; technology sector networks for ecosystems built around specific technological needs expressed by university hospitals as core inside innovators, in collaboration with other peripheral inside innovators, like doctors and nurses; government-led networks, characterized by the determinant role of governmental institutions in tracing the healthcare ecosystems mission, with the relevant contribution of external innovators, like regulatory entities, payers and patients; and civic and philanthropically enabled networks, based on non-profit foundations pursuing the interests of patients in order to improve their life conditions. From the proposed classification framework emerged that the influence of some players compared to others has a direct impact on the specific organizational model, modifying their position into the network and leading to different results in term of projects, IP and products.

For all the categories of intermediary networks, knowledge transfer occurs among the inter-organizational relationships, established with an explorative or exploitative intent, the former enabling the inflow of external knowledge (outside-in dimension of open Innovation), the latter allowing for the external exploitation of technological opportunities (inside-out open Innovation) (Chiaroni et al., 2009). This suggests that in implementing open innovation,
Figure 4. A classification framework for open innovation in healthcare ecosystems from knowledge transfer view.
organizations should be able to manage different networks for different innovation purposes and players’ motivation. In the proposed classification framework, all the healthcare ecosystem’s players search for new ideas and technologies in a different way from the past, due to their motivations that range from the economic to social aspects. This is coherent with the fact that open innovation firms increase both the search breadth (the number of external sources they rely upon in their innovative activities) and the search depth (the extent to which firms draw deeply from the different external sources) of their innovation networks (Laursen and Salter, 2006).

4.2 Implications for practices
The paper is conceptual in nature and intends to outline the main dimensions and variables characterizing the inter-organizational knowledge transfer mechanisms of open innovation processes in healthcare ecosystems. It offers insights to public managers and policy makers to better understand the inter-organizational relationships affecting open innovation processes in technology-intensive ecosystems. The identification of the characteristics of the intermediary network supports the adoption of efficient governance models able to pursue open innovative goals in healthcare ecosystems. Implications for managers and policy makers regard the possibility to propose more compliant governance models for intermediary healthcare ecosystems, taking into account their specific vocation depending on players’ centrality and motivation that affect the whole network mission.

4.3 Limitations and future research
Limitations of this research are due to the specific geographical regulation of the healthcare ecosystem that could distort, facilitate or impede knowledge transfer process among ecosystem’s players, as well as to the IP’s ownership in open innovation regimes. In particular, limitations relating to the safety of products that should not determine negative effects on patients’ health conditions along all the R&D process, and then to the peculiar process along which experimental activities are performed. This research did not consider these specific aspects that could bring to a more relevant framework, after its test on some real cases.

Future research will focus on the application of the framework for both descriptive and normative purposes. In particular, the application of the framework to the analysis of healthcare ecosystems adopting a multiple case study analysis will offer the base to explore and identify the knowledge transfer mechanisms and relations dynamics characterizing open innovation processes in different sets of healthcare ecosystems. Particularly, important is the analysis of the characteristics of the different networks and how they correlate with different innovation outcomes, selecting different case studies belonging to each category of network: national and international philanthropic associations for civic and philanthropically enabled networks category; health ministries or local authorities with responsibilities on health issues for government-led networks; organizations built by local authorities and health companies for technology sector networks; and companies and hospitals networks for identity-based social networks.

References


Further reading


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Institutional pressures, isomorphic changes and key agents in the transfer of knowledge of Lean in Healthcare

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Abstract

Purpose – Application of operations management in healthcare is particularly promising to improve the overall organisational performance, although the Italian system is behind in introducing related techniques and methods. One of the recent experiments in healthcare is the implementation of “Lean Thinking”. The purpose of this paper is to investigate which exogenous forces are driving knowledge transfer on Lean, both in the private and public healthcare sectors.

Design/methodology/approach – Informed by institutional sociology (DiMaggio and Powell, 1983; Powell and DiMaggio, 1991), the paper builds on the case study methodology (Yin, 2013) to elucidate the environmental pressures that are encouraging the adoption of Lean thinking by Italian hospitals and Local Health Authorities.

Findings – The study highlights the economic, coercive, mimetic and normative pressures that are triggering the adoption of Lean thinking in the Italian National Health System (INHS). At the same time, the authors reveal the pivotal importance and innovative roles played by diverse prominent key-actors in the different organisations investigated.

Originality/value – Considering that little is known to date regarding which exogenous forces are driving the transfer of knowledge on Lean, especially in the public healthcare sector, the paper allows scholars to focus on patterns of isomorphic change and will facilitate managers and policy makers to understand exogenous factors stimulating the transfer of Lean thinking and the subsequent innovation within health organisations and systems.

Keywords Knowledge transfer, Operations management

1. Introduction

The Italian National Health System (INHS) is facing several institutional, social, clinical and professional challenges as well as financial and economic difficulties (Lega and DePietro, 2005; De Belvis et al., 2012; Longo, 2016). To face these issues, Italian healthcare organisations are expected to innovate and improve their performance through adequate asset, knowledge and disease management systems (Lega, 2012). In this perspective, the application of operations management in healthcare is particularly promising to improve the overall organisational performance, even if the Italian system is lagging behind in introducing related techniques and methods (Bensa et al., 2010).

One of the recent experiments in healthcare is the implementation of “Lean production” (McCarthy, 2006). Lean production has been addressed by practitioners and the scientific
community since the end of the seventies (Sugimori et al., 1977). The new production system was labelled “Lean production” at the beginning of the nineties in the now famous and often-cited book *The Machine That Changed the World*. This book made Lean a household term in western economies (Womack et al., 1990). Recently, Modig and Åhlström (2012) described the true essence of Lean outlining the new production paradigm as “an operations strategy that prioritises flow efficiency over resource efficiency” (p. 118).

Previous studies, focusing on the forces within the healthcare organisations, elucidated how actors interpreted Lean when the strategy was implemented (Papadopoulos et al., 2011; Waring and Bishop, 2010; Trägårdh and Lindberg, 2004) and how it was important to understand the emerging of network associations and allegiances (Papadopoulos et al., 2011) as well as the close interconnection between Lean and clinical practices in the ongoing process of change (Waring and Bishop, 2010). On the contrary, not much is known to date about which exogenous forces are driving the transfer of knowledge on Lean in the private and public healthcare sectors.

Knowledge transfer is considered fundamental for a firm’s competitive advantage, although it can be difficult to implement (Argote and Ingram, 2000). Accordingly, the study aims to highlight what conditions and circumstances, as well as managerial and organisational mechanisms, are triggering the adoption (and adaptation) of knowledge on Lean in the Italian public and private healthcare sectors. First, the study identifies the main environmental and social agents which influenced key decision making of top management to deploy Lean thinking in diverse healthcare organisations. Second, it applies new institutional sociology to three different case studies belonging to the seldom explored public and private healthcare organisations (i.e. Scott et al., 2000). By so doing, the study will explore the ways in which economic, coercive, mimetic and normative pressures (DiMaggio and Powell, 1983, p. 150) triggered the adoption of Lean thinking in the INHS, thus influencing the behaviour and processes of the healthcare organisations and their respective operations.

Given that the paper seeks to address healthcare organisations’ responses to institutional pressures, contributions to the new institutional sociology are of considerable importance. Admittedly, institutional theory is playing a major role in helping to explain the pressures which trigger changes both in the private (e.g. Bruton et al., 2010; Moore et al., 2010; Sargiacomo, 2008), and in the public sectors (Carpenter and Feroz, 2001; Dacin et al., 2002; Nasra and Dacin, 2010; Townley, 2002). The paper is in agreement with Powell’s (1991) request for an expanded institutionalism, where the focus of empirical research, working in tandem with the main principle and tenets of new institutional sociology, will permit the identification of processes of the main institutional pressures and isomorphic changes (DiMaggio and Powell, 1983; Guler et al., 2002; Oliver, 1990, 1991; Powell and DiMaggio, 1991), thus permitting managers and policy makers to understand exogenous factors stimulating the transfer of knowledge on Lean and the subsequent innovation within health organisations and systems.

At the same time, the study will reveal the pivotal importance and innovative roles played in the different investigated organisations by diverse prominent key-actors, who shaped their wider environment. These actors promoted and introduced new Lean management practices and, by adopting innovations to legitimate their own organisational practices (Tolbert and Zucker, 1983, p. 25), they succeeded in becoming acknowledged leaders among the public and private healthcare organisations. By demonstrating the institutionalisation processes prompted by the key actors, this paper represents one of the few studies which overcomes another major criticism of institutional sociology: its neglect of the role played by individuals in the institutionalisation process (DiMaggio, 1988; Dacin, 1997; Powell, 1991, p. 188).

2. Knowledge on Lean
In the last two decades, some healthcare organisations are proposing themselves, explicitly or not, as the “Toyota” of the sector, e.g. the Mayo Clinic model of care (Berry, 2008),
the Virginia Mason Medical Center’s Pursuit of the Perfect Patient (Kenney, 2011), The Pittsburgh Way (Grunden, 2007), or the Bolton Improving Care System (Fillingham, 2007).

The Toyota Production System and Lean production have been addressed by practitioners and the scientific community since the end of the seventies. The new method was first described as the Toyota production system, a combination of two major components, the “just-in-time production” and the “respect for human” (Sugimori et al., 1977). A decade later, it was labelled “Lean production” to distinguish better the manufacturing mass production system, the conventional paradigm in western economies, from the new one developed by the Toyota Motor Company (Womack et al., 1990).

In the manufacturing sector Lean is now a consolidated research subject and a well-experimented operations strategy, although a clear and commonly agreed definition is not yet shared (Pettersen, 2009). Consequently, findings and evidence stemming from research on Lean are difficult to compare and the knowledge about Lean is hard to systematise in a few concepts and constructs. Authors lament the lack of a shared definition despite the fact that the influential researchers Womack and Jones proposed, in the nineties, a definition underlying the fundamental principles adopted by businesses attempting to introduce Lean as a new way to manage their operations (Womack and Jones, 1996; Womack et al., 1990). According to these authors “Lean thinking can be summarised in five principles: precisely specify value by specific product, identity the value stream for each product, make value flow without interruptions, let the customer pull value from the producer, and pursue perfection” (Womack and Jones, 1996, p. 10).

Bhasin and Burcher (2006) suggested Lean should be viewed as a philosophy differentiating technical and cultural requirements of this operations thinking. Companies should practise most of the tools of Lean (technical components) and should be aware that when implementing this philosophy their own corporate culture should change. More recently, Modig and Åhlström highlighted the true essence of Lean outlining the new production paradigm as “an operations strategy that prioritises flow efficiency over resource efficiency” (Modig and Åhlström, 2012, p. 118).

Notwithstanding the risk of failure, advocates of a “production-line approach to services” stated the service sector, both private and public, can benefit by applying innovative manufacturing practices, such as Lean (Åhlström, 2004; Bowen and Youngdahl, 1998). The results would be a reduction of performance tradeoffs, flow production and JIT pull, value chain orientation, increased customer focus and training and employee empowerment (Bowen and Youngdahl, 1998).

As well as in the entire service sector, Lean thinking is increasingly being adopted in healthcare (D’Andreamatteo et al., 2015). The literature in the domain of Lean healthcare has continuously grown in the last decade (Brandao de Souza, 2009; D’Andreamatteo et al., 2015; Filser et al., 2017). Except for a few cases, most of the literature is not about the implementation of Lean at a strategic level, involving the whole organisation, but in discussing applications concerning single (or several) projects rather than highlighting a systemic approach (D’Andreamatteo et al., 2015). This literature usually deals with supposed benefits for patient care, namely, quality, safety and efficiency, and employees, i.e. changes in their conditions and outcomes (Holden, 2011). These results could be achieved using one or more tools or activities in the broad range of possibilities already experimented in the manufacturing (and service) sector.

Acknowledging the Modig and Åhlström’s (2012) framework, the knowledge on Lean, that is being implemented in healthcare as well, can be described as a set of fundamental elements, such as in an ascending order of abstraction, tools and activities, methods, principles and values, all means to realise a Lean strategy (Modig and Åhlström, 2012).

Radnor (2012) describes the nature and the aim of these different tools, methods and activities referring to the necessity of assessing, acting and monitoring results. Indeed, there is first the need to assess the processes at the organisation level, using tools such as the customer analysis, process mapping, six thinking hats, value definition and value stream
mapping. Other tools are useful in trying to reach the targeted objectives of change, such as 5S, control charts, cross-functional teams, daily meetings, rapid improvement events (Kaizen events) and visual management. To monitor results of planned actions A3s, benchmarking, competency framework, problem solving, standard work, visual management and workplace audit could be used.

Notwithstanding the wealth of knowledge about tools and activities that can support a Lean strategy, Modig and Åhlström (2012), among others, insist that when organisations implement Lean simply as a toolbox, the likelihood of a failure in the process of change is high, especially when other sectors adopt the strategy in addition to large-scale manufacturing where it was first developed.

The NHS Institute for Innovation and Improvement, echoing the Institute for Healthcare Improvement (Womack et al., 2005), translated and promoted the Lean principles for healthcare organisations striving to improve their quality, safety and efficiency, as well as reducing wastes, lower costs and improve staff morale (Westwood et al., 2007). According to the NHS Institute, all the principles proposed by Womack and Jones (1990, 1996) would have implications for the healthcare sector: specifying value, identifying the value stream (or patient journey), making the process and value flow, letting the customer pull and pursuing perfection. Healthcare organisations willing to streamline their processes and achieve efficiency flow should identify their customers; first the patient but other “clients” as well. Besides, they should understand the patient journey, distinguishing in the value stream the value adding activities from the non-value-adding ones (wastes). Once identified the core activities, which add value for the patients, efforts should be made to smooth out processes, avoiding batching and queuing. The processes should be dictated by the needs of customers, in a logic of letting the patient pull and not to push them throughout the organisation. Eventually, in a never-ending process of improvement, the organisation should pursue perfection continuously.

All these objectives can be achieved through mechanisms and approaches especially aimed to improve the efficiency flow as well the safety and quality of care, such as just-in-time and jidoka. The former is “a system for producing and delivering the right items at the right time in the right amounts” (Womack et al., 2005). The second is a system to prevent mistakes and harms to patients and workers, stopping a process when problems occur (Grout and Toussaint, 2010). Both just-in-time and jidoka, as well as other Lean principles, have their roots in the increase of work standardisation, augmentation of stability, introduction of best practices and the elimination of rework and defects (Machado and Leitner, 2010).

Undoubtedly, on a higher level of abstraction, along with a strong commitment on continuous improvement, the most important values of Lean in healthcare are the patients and those working in the sector (e.g. Fillingham, 2007). While the former search improvements for their health, well-being and experience (Westwood et al., 2007) and benefit from a safer and efficient healthcare delivery system (Toussaint and Berry, 2013), the latter can benefit from an organisation that respects their potential and make them key agents for improvement (Toussaint and Berry, 2013).

A specific tenet of the Knowledge in Lean is that the transformation process should lead to a change in the organisation. Machado and Leitner (2010) recommend avoiding “point optimising” and described the overall Lean transformation process as composed of four distinct phases: understanding the current state, defining the future state, implementing Lean and, importantly, sustain.

3. Theoretical framework
Admittedly, in the past decades analysis of the effects of the environment on organisational practices has played a central role in accounting and business research (Bruton et al., 2010; Dacin et al., 2002; Hopwood and Miller, 1994). A pivotal principle of institutional analysis is that the institutional environment exerts strong pressures on organisations in order that their
key-decisions have the appearance of being infused with rationality. Organisations are inclined to “conform [to institutional pressures] because they are rewarded for doing so through increased legitimacy, resources and survival capabilities” (Scott, 1987, p. 498). According to this view, institutionalisation tends to reduce variety; operating across organisations, it discourages diversity in local environments, thereby pushing organisations towards convergent behavioural patterns (DiMaggio and Powell, 1991; Fligstein, 1991; Covalesky and Dirsmith, 1988; DiMaggio and Powell, 1983; Martin et al., 1983), “if they are to receive support and legitimacy” (Scott and Meyer, 1983, p. 149; Deephouse, 1996). Notably, institutional sociology has been either applied to analyse the behaviour of for-profit organisations (Bruton et al., 2010; Firth, 1996; Goodstein, 1994; Guler et al., 2002; Mezias, 1990) or to investigate not-for-profit and governmental sectors (Basu, 1995; Carpenter et al., 2007; Dacin et al., 2002), whilst there is still much to learn about the scattered applications to date deployed in healthcare organisations (Kennedy and Fiss, 2009; Scott et al., 2000).

In this paper, the view supported is that different leading healthcare organisations tend to have a convergent behaviour by adopting widely accepted practices or procedures, displaying “responsibility, and avoiding claims of negligence” (Meyer and Rowan, 1977, p. 45). The “embeddedness perspective assumes that organisations are situated in networks of social relationships” (Dacin et al., 1999; Palmer et al., 1993), where conformity is considered “useful to organisations in terms of enhancing organisations likelihood of survival” (Oliver, 1991, p. 150). Isomorphism is the concept that best captures the process of homogenisation according to new institutional sociology. This is defined as “a constraining process that forces one unit in a population to resemble other units that face the same set of environmental conditions” (DiMaggio and Powell, 1983, p. 149).

Economic pressures may provoke isomorphism, as well as various mechanisms/forms, namely, coercive, mimetic and normative processes (DiMaggio and Powell, 1983, p. 150). Generally speaking, economic pressures, depicted as functional or technical forces in institutional theory literature, incorporate many agents that can influence the organisations’ behaviour, such as upheavals, stock market downturns, national or international recessions and crisis, and globalisation of markets (Bruggerman and Slagmulder, 1995; Dent, 1996; Granlund and Lukka, 1998). In a related manner, economic pressures may influence the public entities’ behaviour as well, as state-regional government financial distress and crisis may push the healthcare organisations to try to reduce any resource waste, by adopting any accounting, business and operation innovation, at the same time improving and ensuring the healthcare services (Lega et al., 2010).

Institutional isomorphism also comprises the many forces that can encourage organisations towards accommodation with the outside world. According to Zucker (1987), institutionalisation is fundamentally a “cognitive process”, whereas Scott (1995, p. 33) argued that institutional studies represent institutions composed by “cognitive, normative and regulative structures and activities that provide stability and meaning to social behaviour”. Coercive isomorphism usually “stems from political influence and the problem of legitimacy” (DiMaggio and Powell, 1983, p. 150; Carpenter et al., 2007). National and international legislation and transnational bodies are among the major sources of these pressures (Arnold, 2005). Importantly – as noted by DiMaggio and Powell (1983) – coercive isomorphism may also be triggered by “informal pressures exerted on organisations by other organisations upon which they are dependent, and by cultural expectations in the society within which organisations function” (p. 150). This may happen, for example, when a State or Regional healthcare government is sustaining the adoption of new business practices, such as what happened for the promotion of benchmarking projects in the UK (Llewellyn and Northcott, 2005; Northcott and Llewellyn, 2005).

Even though coercive authority is one of the main sources of institutional isomorphism, sometimes uncertainty and ambiguity are also effective forces that push organisations
towards the “emulation of currently prevalent forms” (Palmer et al., 1993, p. 105). When organisational goals are ambiguous, or there is a high level of environmental uncertainty, it is argued that organisations mimic successful practices (Galaskiewicz and Wasserman, 1989; Sevon, 1996) either inside or outside their business industry. Hence, other organisations are the “major factors that organisations must take into account” (Aldrich 1979, p. 265, quoted in DiMaggio and Powell, 1983, p. 150). DiMaggio and Powell (1983, p. 152) and Powell and DiMaggio (1991) contend that “organizations tend to model themselves after similar organizations in their field that they perceive to be more legitimate or successful”, thus adopting culturally supported practices as well as conceptually correct business operations. Importantly, sometimes the manufacturing industry is also offering new practices to be adopted and adapted, as usually innovations in the private sector are experimented well before their inculation in the public sector, following the NPM reform (Hood, 1995).

DiMaggio and Powell (1983, p. 152) argue that the final source of isomorphic institutional change is referred to as “normative”, thus underlying that “professions are subject to the same coercive and mimetic pressures as are organizations”. University and training centres become important agents of normative isomorphism, as well as professional associations (Carpenter and Feroz, 2001, p. 570), as they build the basis of “legitimation in a cognitive base produced by university specialist” (DiMaggio and Powell, 1983, p. 152). These institutions usually determine the “unwritten” rules that shape the educational curricula of potential entrants to the labour market (Powell and DiMaggio, 1991, p. 71). In certain circumstances, “on-the-job socialisation” acts as a normative force, e.g. when occupational socialisation of staff working in similar organisations of a field occur within external professional and trade networks, i.e. “trade association workshops”, “consultant arrangements”, etc. (DiMaggio and Powell, 1983, p. 153).

University, professional associations and consultancy firms also exert pressures on organisations to adopt novel management and accounting systems, such as Benchmarking, TQM and BPR (Sargiacomo, 2002), or any other new conceptually supported business operation innovation, like Lean thinking. In so doing so they act as “change agents” of organisations (Boyns and Edwards, 1996; Carnegie and Parker, 1996), sensing managers’ collective preferences for new techniques and encouraging their pervasive adoption. Thus, knowledge transfer processes can be stimulated by leading “change agents” (i.e. managers/executives), whose “individual preferences and choices” in the healthcare organisations “cannot be understood apart from the larger cultural setting and historical period in which they are embedded” (Powell, 1991, p. 188).

4. Research method

As already stated in the introduction, Italian empirical evidence is presented to underline the economic, coercive, mimetic and normative pressures (DiMaggio and Powell, 1983, p. 150) impinging on adopting Lean thinking and related knowledge transfer in the INHS.

Particularly, three case studies are analysed, mainly through data gathered from academic and practitioner literature as well as from internal documents, according document analysis approach (Bowen, 2009), provided by private and public hospitals, i.e. “Galliera” public hospital in Genoa, University Hospital in Siena and the “Humanitas” private teaching and research hospital in Rozzano (Milan). Internal documents, strategic and performance plans, internal memos and deliberations were gathered from the date in which Lean thinking was introduced so as to allow an in-depth description of the cases relying on multiple sources of evidence (Yin, 2013).

These cases have been chosen for three main reasons. The first is that such cases portray various starting situations, i.e. different types of healthcare organisation in terms of activities, duties, skills, etc., albeit all of them belonging to INHS. Second, these have been considered as first movers, because they represent organisations which have launched Lean project for more than a year (Carbone et al., 2013) in the last five to ten years. Lastly, they have conducted and implemented Lean Projects systematically, giving evidence of a
“system wide approach”, in which Lean is implemented as an overall organisational strategy, rather than a means to reach short gains in limited areas highlighting a “bandwagon effect” approach (D’Andreamatteo et al., 2015).

In order to get further data and some additional details about our cases, thereby reinforcing the corresponding results, five semi-structured interviews, lasting, on average, 1 h each, have been conducted by members of the research team. Each interview, based on specific topic open questions, has involved different key actors, also acting as Lean Champion, in adopting and implementing Lean, because “lean thinking relies upon effective leadership to shape and sustain the change process” (Waring and Bishop, 2010, p. 1333).

In the Humanitas case, the first interviewee is a manager engineer, a graduate of the Politecnico University of Milan, and has been working at the Humanitas Institute for about one year. She started the first-year Lean training course with both technicians and clinicians. She has a solid knowledge on Lean theories and applications. The second interviewee is an anaesthetist doctor from the University of Pavia, with a background achieved at another clinical institute in Milan where she was already involved in Lean activities. She has been working at the Humanitas Institute for 15 years. The third interviewee is a physician, with a background in healthcare management, and former supervisor for the Lean office. The fourth interviewee, a previous operations director, is a physician with a specific degree in healthcare operations management.

In the Galliera case, a key executive, responsible for quality in healthcare was interviewed. Since 2009, he has held a position in staff of the directorate-general; in the same year the general manager decided to introduce and implement Lean Projects, after an “English experience” of the director of the anaesthesia and intensive care ward at the Royal Bolton NHS Trust in UK (Fillingham, 2007).

In the “Siena” Case, a key manager of the “Lean office” was interviewed. He graduated in management engineering and started his work experience during the internship of the third year of graduation in a manufacturing company, acting as a support to an external consultant who had to apply the Lean within different areas. Later, he attended a Master in Healthcare management and visited, during the internship in California, various hospitals advanced in successfully implementing Lean projects. He has been working at the Siena Hospital University for five years.

All interviews have been recorded in the original language, transcripted by a specific software to avoid possible errors and mistakes, translated into English directly by the interviewer and then checked by other members of the research team in order to ensure agreement of a “correct” version of the text. Admittedly, “the researcher/translator role offers the researcher significant opportunities for close attention to cross cultural meanings and interpretations and potentially brings the researcher up close to the problems of meaning equivalence within the research process” (Temple and Young, 2004).

5. Results
5.1 The E.O. Ospedali Galliera
Built between 1877 and 1888 by the Duchess of Galliera, the E.O. Ospedali Galliera (E.O. Galliera) is a hospital institution that has gained for itself a distinct position among Italian public hospitals, maintaining its legal autonomy despite various health system national reforms. It is now a hospital of national importance and high specialisation (Decree of the President of the Council of Ministers 14 July 1995).

To date, the hospital has to its credit several intercompany agreements (Local Health Authorities, IRCCS – National Institutes for Scientific Research, local governments, universities and other institutions). It participates in inter-professional networks (oncological, surgical and orthopaedic) as well as in international collaborations regarding clinical and scientific issues (Strategic Plan 2017–2019). Consequently, the functions carried
out are not limited to the typical diagnostic-therapeutic and rehabilitation services but extend to the field of scientific research, training and innovation.

As the majority of the Italian healthcare organisations, the E.O. Galliera, operates in a context of resource cutbacks but still faced with a continuous challenge to improve its own financial and economic equilibrium and overall performance. Moreover, the hospital faced the challenge of being subject to a regional healthcare system involved in a healthcare budget recovery plan (in the years 2007–2009). This was a mandatory measure imposed by the Italian Government for financially distressed regional healthcare systems (Lega et al., 2010).

In such an environment, the Lean strategy was first introduced in 2007 by a physician, the director of the anaesthesia and intensive care ward to improve the performance of the operating theatres (Nicosia, 2009). The anaesthetist had gained invaluable experience on the subject of Lean at the Royal Bolton Hospitals NHS Trust in England, one of the first movers in the international arena (Fillingham, 2007). The general management supported the project immediately and, subsequently, Lean was applied to the entire hospital. Recently, and for the past several years, the initiative has been supported externally by a consulting firm which was appointed to assist and carry out the training programme.

The Lean strategy, conceived by management and hospital staff as a continuous improvement approach to reduce wastes, is applied to setting medium/long-term goals, using PDTA (clinical or critical pathways) to ameliorate clinical decisions. This may be done using the value stream mapping to spread the standardisation of activities carried out by staff (especially physicians) and by redesigning hospitals along the intensive care model, using the cells design, more visual management and training staff continuously.

The improvement process was aimed to streamline the delivery of healthcare services and to improve the quality of care (Nicosia et al., 2016). Indeed, the hospital is engaged in evolving towards a new organisational model based on levels of intensive care and treatment. At the same time, it was also a reaction to the growing economic crisis – erupted in 2008 – and to the Italian Government’s spending review initiatives. Indeed, E.O. Galliera’s strategic plan before 2014 underlined the strong need to react to the ongoing process of reducing the available resources of the National Health Service (3.84 per cent in 2011) (Strategic Plan 2012–2013). The aim, through the Lean strategy, was also to reduce wastes, overcoming a “linear cut” rationale to expenses. In this context, the adoption of a recovery plan, by rationalising the use of resources and improving the management control, was decisive. Indeed, all the efforts in implementing Lean and, in so doing, change the hospital towards the new model, are focused on cost accounting, as well.

Staff learnt to use a broad set of tools, among the most experimented in the manufacturing and service sectors, such as the 6S, Kanban, value stream mapping, kaizen events, the Spaghetti diagram, the Ishikawa diagram, and 5 whys. Especially since 2009, after the first experiences of Lean implementation, an extensive internal training differentiated in three levels (basic, advanced and specialisation) was launched (Annual Report E.O. Ospedali Galliera, 2011). These courses have had as an objective the formation of the future “trainers” between doctors and administrative staff to reach as much as possible every operational area of the hospital. The training scheme “Lean Healthcare at Ospedali Galliera” was jointly elaborated by the hospital and the external consultant, inspired by the Royal Bolton Hospital in the UK.

After the initial phase in which the structure entrusted the steering responsibilities to a heterogeneous group of persons who were not necessarily experts in Lean management, at the end of the first courses, the responsibility for the effectiveness and efficiency of projects was entrusted to a Lean Committee consisting of competent operators and supervisor. The team (“Lean G.E.N.O.V.A.” acronym for Galliera Empowerment by New Organisation and Value Analysis) coordinated by the Medical Director of the hospital, still has the responsibility of coordinating initiatives, selecting consultants, sharing pertinent
experiences with other hospitals, monitoring results and regularly informing the top management regarding implementation.

The concrete realisation of an improvement connected to Lean management systems was, therefore, preceded by two important phases of preparation: the extended acceptance by the managerial class to take a Lean initiative and the training of the operative corpus (which lasted four years) (Nicosia et al., 2016).

Another element characterising the Lean attempt is the constant exchange and comparison with other hospitals in Italy or abroad (e.g. the Royal Bolton Hospital – UK). In 2011, the hospital also launched an association termed SALTH (Scientific Association for Lean Training in Healthcare), aimed at spreading the adoption and implementation of Lean practices in the INHS context.

After a first period in which Lean was the prerogative of professionals, it is now a concern of all staff. Initiatives such as the Quality Awards have been launched to improve quality in a Lean context: the general management asks “competitors” to use a broad range of Lean tools to compete for the award (first A3 and in subsequent editions also value stream mapping, Ishikawa diagram, 5 whys, visual management).

To the present day, the E.O. Galliera has completed a great number of projects, with excellent results in several areas, such as reducing waiting times, reducing bureaucracy, improving the quality of procedures, increasing patient satisfaction and cutting costs (Nicosia et al., 2016).

Even though Galliera’s path to streamlining all the processes along the entire supply chain cannot be considered concluded, Lean is now a major strategic initiative within the hospital (Strategic Plan 2017–2019).

5.2 Istituto Clinico Humanitas
Istituto Clinico Humanitas (Humanitas), opened in 1996, is one of the more important private hospital in the INHS scenario. It belongs to the Regional Healthcare System of Lombardia and is considered a highly specialized teaching and research hospital. With its high focus on Surgery, it combined various centres for cancer treatment, cardiovascular diseases, neurological and orthopaedic disorders, as well as an ophthalmology and a fertility centre. The clinical hospital is also equipped with emergency and radiotherapy wards.

The hospital has been accredited (by INHS) since 1997. Since 2002 it is also accredited by the Joint Commission International. Another clear sign of its excellence is the strong commitment on research, that lead the hospital, in 2014, to establish the Humanitas University dedicated to medical science. The high quality of research allowed the hospital to obtain the status of IRCCS (National Institutes for Scientific Research) in 2005.

Before officially launching the Lean strategy, the former director of operations, a physician with a specialisation in healthcare operations management, had been studying Lean and also documenting himself with the results of other organisations. He was driven by the belief and desire to bring further improvements to Humanitas. The pilot project was started at the beginning of 2012 within the Oncology Day Hospital, with the aim to shorter waiting times for patients, reorganise spaces in the waiting room and improve organisational well-being, in particular for nurses. Among the main achievements, by using Lean methods, the unit reduced significantly waiting times and their variability, besides improving the internal climate.

Furthermore, by the end of 2011, Humanitas supported the idea of the director of operations to establish a Lean office, within the operations department, with the aim of introducing continuous improvement according to the Lean system. Three engineers were put in charge to implement, among other tasks, three Lean training activities: basic training, training of internal consultants, training of project managers (dealing with more strategic projects). The intensive training process was launched in 2012 with a direct, remarkable and clear message: “Humanitas can improve from a business and quality point of view”. Within
Humanitas, Lean represents high quality: to make anything of high quality the Lean approach should be used.

Also in 2012, a Lean contest was organised for the first time within Humanitas, to generate improvements, with remarkable results: 65 participants involved in 20 Lean projects that liberated 2,414 man-hours, avoided €30,000 of costs and saved 140,000 sheets of paper. After the first edition, the contest was launched yearly, giving visibility to an ever-growing number of improvement projects and their significant impact in terms of quality, safety and staff and patient satisfaction.

At the moment of introducing Lean, operations within Humanitas were already managed at a high efficient level, indeed the hospital is also a Harvard case study (Bohmer et al., 2002/2006). The decision to introduce the Lean methodology, in 2012, was dictated by the need to focus even more on the patient’s path/process. Therefore, the main goal was to accompany the need to trace the entire path of the patient itself from the moment he entered the institute until the moment the relation ceased. In this case, the Lean methodology could focus both on the two needs (patient’s path and performance).

The Lean implementation process has not been completed but is still in process, and it further strengthened the attitude of Humanitas to improve continuously. However, it has a very solid basis of involvement. Currently, the team committed to implement Lean at a strategic level is working within the quality area, in so doing increasingly focusing on clinical outcomes as well (high value care).

The key point in the process of Lean implementation is the training. For this reason, two types of courses have been activated:

1. a basic-level course where the principles and techniques of the Lean are discussed and to which all employees can participate; over 900 people have been trained to “basic” level. The basic training lasts 4 h; each lesson covering basic concepts, classic process problems, Lean principles, analytical and practical tools. Participants are 20 in number per session (with 1–2 sessions per month); and
2. an advanced-level course, named Lean Champion Program, with not only theoretical contents but with projects activation that can bring improvements within the institute. Furthermore, there are 15 Lean champions already formed in the institute and other 15 in progress.

There have not been external initiatives (laws, regional projects, etc.) that have stimulated the implementation of Lean in the institute. The main stimulus was the so-called “contagion effect”. After having seen the first cases of success in projects implementation, everyone desired to share this success and spread it in all hospital activities: care departments, outpatient clinics and all centres of responsibility at all levels.

Humanitas is also engaged in the dissemination of Lean in other healthcare organisations and stipulated in 2017 an agreement with the university public hospital Azienda Ospedaliera Universitaria Senese (AOUS) to activate a network: the Lean Healthcare Engaged Network (LHEN), as occasion of benchmarking and to share and spread the culture on Lean (AOUS Resolution No. 592/2017).

Furthermore, the main key performance indicators refer to measures of sustainability in terms of percentage of projects still active and projects that have been modified. Other meaningful indicators are used to measure the ability to move forwards and/or adapt ongoing projects. Results are promising in all the areas of efficiency, safety and quality of care: clinical outcomes, patient and staff satisfaction, reductions of unnecessary examinations and tests, reduction of waiting times and lists.

The great opportunity to have a heterogeneous team with so many different profiles, qualifications and different experiences that share the same mission is considered within Humanitas one of the success factors of the Lean strategy. This initiated a virtuous
circle triggered by the focus on training and the “contagion effect” which, in turn, resulted in the formation of health professionals with a wide variety of background and specific competencies.

5.3 The Azienda Ospedaliera Universitaria Senese

The university public hospital AOUS belongs to the Tuscany Regional Healthcare System, one of the best performers in the INHS scenario. AOUS delivers more than 3mn health services, 35,000 hospitalisations and manages more than 50,000 accesses to emergency care per year. The hospital delivers its services through more than 2,700 persons, between health professionals and administrative staff, and has a capacity of more than 650 hospital beds. The hospital supplies the South-East area of Tuscany, its reference environment, which has a resident population of about 850,000 people, but also offers high specialised services both for other Italian and international patients. Indeed, the non-resident patients index of attraction is high; in 2015 (last official data) 28.5 per cent of hospitalised patients came from other areas (AOUS Performance Plan, 2017–2019).

At a higher level, the hospital is organised in seven departments of integrated activities (DAI), one inter-organisational department and the Sanitary Direction. AOUS, being a university centre, has a full complement of services, currently delivered through the intensive care organisational model. This model, present in Tuscany since 2005 (Law No. 40/2005), overcomes the traditional division of areas into specialist wards and promotes homogeneous areas of hospitalisations according to levels of intensive care and treatment. Accordingly, AOUS is reorganising its activities around homogeneous flows ranging from the emergency value stream line to the elective care stream line and around different levels of care, from the basic to the high specialisation and complexity levels. Overall, the hospital is evolving towards a process-based healthcare organisation. Lean is the fundamental way through which AOUS is trying to achieve the strategic objective of a better organisation of its health services.

AOUS has been implementing the Lean operations strategy since 2012 (Resolutions No. 515/2012 and No. 768/2012). The administrative director, appointed in 2011, former strategic consultant in a large business consulting firm, had experience in Lean, and an innovative vision with regards to healthcare delivery. The occasion was a Tuscany’s Regional project launched in 2011 (Decision of the Tuscany Regional Government No. 693/2011) aimed to improve the flow of patients within the Emergency Department and from this unit towards other hospital wards. The focus was in the use of tools of visual management. The regional project was influenced by the positive experience of the Local Health Authority in Florence that had been experimenting Lean since 2004 on the initiative of the (then) general manager, former manager and Lean specialist in the manufacturing sector. Even though the project did not oblige to adopt Lean, it referred to this operations strategy to change towards a “visual hospital” model, also thanks to a continuous work of training of health professionals (“train the trainers”). Overall the project financed activities of acquisition of technological and professional resources and continuous training within the healthcare organisations involved. After one year, the initiative was extended to other hospitals, AOUS included (Tuscany Regional Government’s Resolution No. 2497/2012). The general management decided to hire a skilled engineer in Lean, who was the project manager in charge of leading the implementation of the project using Lean tools. With a strong commitment of the top management, the project was presented to the staff of the emergency department, to the university, to ward directors and to trade unions. The event was a true occasion of information-training on Lean. After six months (September 2012–January 2013), the results were so promising and interesting for the healthcare professionals that the former teamwork for the “Net-Visual-DEA” was established as the group in charge of promoting Lean throughout the hospital. The group was labelled GOALS (Leans Operations Group of Siena) and was given the clear mission to support the...
different projects. The team was initially composed of a controller, an information technology expert, a management engineer, a nurse and a clinician. Starting with a single (top-down) project in 2012, at the end of 2014 the projects implemented and concluded were 51 and the staff trained were 1,200 persons, about a half of the total workforce. The team helped the organisations to share a vision of Lean based on four pillars: the analysis of processes, aimed to reduce wastes, through the empowerment of individuals and the improvement of well-being in the work environments.

A second milestone in the implementation of Lean was the consolidation at the end of 2014 of the teamwork established in 2012 and the establishment of a Lean office, always reporting to the general management (Resolution No. 608/2014). This unit had the mission to help the hospital to change towards a Lean healthcare model, i.e. a continuously improving organisation. Still today, the responsibility of the office is threefold. It supports the general management in the design and implementation of strategic projects, organises and delivers specific training on Lean and acts as internal consultants for projects stemming from the bottom-up. The training is arranged on three levels, and some courses are focused on specific techniques such as 5S and visual management. Among the trainers, there are also “Lean champions”, which, after attending the basic level, have achieved interesting results implementing projects within the specific unit. Until the beginning of 2017, about 2,400 persons have been trained. Recently, in cooperation with the University of Siena, the Lean office launched the “Lean lab”, a role-playing game in which the staff is trained simulating the implementation of Lean in a situation of outpatient care. The Lean office provides internal expertise to all hospital units and health professionals interested in improving their processes of care. The activity of the Lean office was fundamental in encouraging a bottom-up approach in the implementation of Lean: in the time span between 2013 and 2015, thanks to this internal support, 60 per cent of the total number of projects was designed and implemented by the staff of the AOUS’s operative core (Guercini, 2016). Principally, the tool used to share the launch of a project is the A3 report. Significantly, at the end of 2014, the health director established other groups of “internal consultants” with the principal task to promote the adoption of the Lean philosophy and techniques already experimented in their hospital unit. The first was established to apply the Single Minute exchange of die (SMED) technique (Guercini, 2016). These groups constitute together, with the Lean office, an actual network of internal experts that supports a continuously improving organisation. Importantly, besides the establishment of a formal unit in charge of Lean and of groups of internal consultants, the general management expanded the projects of Lean to the administrative units of AOUS, thus achieving a strategic level of implementation involving both health and administrative processes (Resolution No. 608/2014).

A third milestone in the process of implementing the Lean strategy was the cooperation with other healthcare organisations that are implementing Lean and institutions, such as the Lean Institute in Spain, the University of Siena and the Sant’Anna School of Advanced Studies (Pisa). This cooperation resulted in the long run in the establishment of professional networks and the launch of a master in Lean healthcare. AOUS collaborates with the University of Siena for the implementation of Lean since the start of the “Net-Visual DEA” projects. The two institutions have been disseminating the culture of Lean through both publications on the experience on Lean in the AOUS and conferences about the implementation of Lean in the healthcare sector. The partnership is even closer after the joint launch of an executive master in Lean. The first edition was held in 2015 after the stipulation of a convention between AOUS and the University of Siena (Resolution No. 533/2014). The aim of the master is the diffusion of the Lean methodology and concepts in the Italian healthcare system, with an interdisciplinary approach involving engineering, medical, strategic and organisational expertise. In 2017, AOUS has established, together with Humanitas Mirasole SPA, an Italian private healthcare organisation that is
implementing Lean at a strategic level, the Network LHEN (Resolution No. 592/2017). The network, which is open to new participants, has the aim to share and spread the culture on Lean beyond the net and promotes joint training for staff and benchmarking on the processes of implementation. Furthermore, the participation of AOUS in Lean boot camps and Lean healthcare study tours, also abroad, as well as activities of Lean dissemination carried out by AOUS itself, have been continuous and both played a significant part in the benchmarking process and learning on Lean.

AOUS is also careful to processes of communication to share projects implemented in the hospital, as well as to celebrate their results. The Lean day is the annual event in which the entire staff can “compete” submitting their own projects highlighting the problem faced and the improvement achieved; the general management, the Lean office and an external jury evaluate and award the best projects.

AOUS has been monitoring results in the implementation of Lean through indicators grouped in three key areas, according to the client who benefits of the process improvement: the patient, staff or the whole organisations. Some of the dimension monitored and evaluated was given an economic measure of impact. Savings were calculated amounting to €638,283.40 in 2014 (years 2012–2014), updated to about €5,500,000.00 in 2017 (years 2012–2016).

6. Discussion and conclusions
The cases analysed are examples of Lean implementation at a strategic level and show how different institutional pressures triggered the introduction of this manufacturing practice, confirming the influential thoughts by Palmer et al. (1993, p. 104): institutional theory assumes that organisations will select among alternative structures (strategic decisions, or practices) on the basis of efficiency considerations, primarily at the time that their organisation field are being founded or reorganised. Subsequently, they adopt forms that are considered legitimate by other organisations in their field, regardless of these structures (or strategic decisions, or practices) actual efficiency.

The three hospitals belong to different Italian Regional Healthcare Systems and have a distinct legal form, ranking from private to public. Therefore, even though all the organisations deliver care on behalf of the Italian National Healthcare System and face similar economic (Italian Government “spending review” initiatives and cuts in the funding of the INHS), epidemiological and demographic challenges, their environments have partially different features. At the same time, notwithstanding these differences, the three hospitals showed a convergent behaviour (Meyer and Rowan, 1977) by adopting Lean at a strategic level, while reorganising their operations towards innovative models.

The E.O. Galliera introduced Lean in 2007 when the first projects were implemented in the operating theatres. The launch was essentially due to different factors. The director of the anaesthesia and intensive care ward disseminated Lean within the hospital after an experience made at the Royal Bolton Hospitals NHS Trust in England. Those were also the years in which, along with the global crisis of 2008, further challenges stemmed from the economic and financial results of the hospital, as well as from constraints imposed by the Liguria Regional Healthcare System due to the healthcare budget recovery plan (2007–2009). In the thinking of top management, Lean, besides improving the quality of care, could have avoided wastes to the hospital, as well as “linear cuts” to expenses. The economic pressures (Bruggeman and Slagmulder, 1995; Dent, 1996; Granlund and Lukka, 1998) were determinants for the hospital to stimulate the deployment of Lean at a strategic level two years later in 2009.

AOUS introduced Lean in 2012, in a different environmental context, the region of Tuscany, where other healthcare organisations had been experimenting Lean practices, among which one with a systemic approach. The occasion was a regional project aimed to improve the performance of the Tuscan emergency hospital departments. The NET-VISUAL DEA project launched by the Tuscan Government referred explicitly to
Lean and tools of visual hospital and funds allocated to participants had to be directed as well to train workers on Lean. Some years later, in 2015, the Tuscany Regional Healthcare Authority acknowledged that “projects brought systematically the culture of Lean management within the Tuscan healthcare organisations, activating a network of professionals that in their organisations created a structured benchmark and at systemic level, thanks to the regional platform” (Notes of Tuscany Regional Healthcare Authority, 2015). At the same time, the administrative director, boasting a former experience as a consultant also on Lean management, played a pivotal role to push the organisation to embrace Lean. The AOUS’s experience highlights the role exerted by informal pressures on the organisation by “other organisations upon which they are dependent, and by cultural expectations in the society within which organisations function” (DiMaggio and Powell, 1983, p. 150).

All the investigated cases confirm that institutional isomorphism stems from other forces, such as mimetic pressures. DiMaggio and Powell (1983) explicitly referred to modelling in the early eighties by American companies of circles of quality and quality-of-work-life issues developed in Japan, since “organisations tend to model themselves after similar organisations in their field that they perceive to be more legitimate or successful” (p. 152). Similarly, efforts made by the three hospitals can be interpreted as the attempt to model themselves on other healthcare organisations, which were perceived to be improving their efficiency by means of a Lean strategy. This was especially true in the EO Galliera case, where a physician made an internship at the Royal Bolton Hospitals NHS Trust in England. Further, the AOUS case highlights the partial unintentionality by which the model was diffused within the hospital, in particular through two employee transfers with competencies on Lean in the manufacturing sector (DiMaggio and Powell, 1983), the administrative director who arrived in AOUS in 2011 and the industrial engineer hired in 2012 as project manager for the first endeavour in the emergency department. The Humanitas case confirms how managers search models to imitate (Kimberly, 1980; DiMaggio and Powell, 1983). Indeed, the former director of operations, established a Lean office in the department, to allow Humanitas’ operations to gain further in efficiency. The EO Galliera case shows how mimetic processes can be explicitly triggered. When the Lean strategy was launched at a strategic level, models were disseminated especially by a consulting firm in charge of a massive programme of training.

A particular feature of all cases is the continuous occurrence of a “pervasive on-the-job socialisation” (DiMaggio and Powell, 1983, p. 153), that can be considered as a source of isomorphic change through which health but also administrative staff were trained on new patterns of professional and organisational behaviour. These normative pressures occurred since in each case a massive programme of training was designed and implemented to train staff on basic and advanced practices of the Lean strategy. At the same time, the competitions among projects held during the “Lean days”, reinforced these mechanisms. Over the years, within the hospital occurred what interviewees called “contagion effect”. Indeed, an ever-increasing adoption of Lean by other staff, willing to experiment the promises of the new approach, triggered the formation of a professional network of Lean champions and new trainers (denoted explicitly in the AOUS case “internal consultants”) that further spread the new managerial practices within the hospitals. Interestingly, the process of Lean implementation, resulted in the institutionalisation of the environment (DiMaggio and Powell, 1983), especially at the moment when the three hospitals launched several initiatives concerning the “dissemination” of Lean outside the organisation. In addition to the engagement of all hospitals to spread the knowledge about Lean, organising or participating in conferences and publishing books or articles on the topic, other more structured initiatives were carried out. One noteworthy example was the joint establishment of the Master in
Lean Healthcare Management by the University of Siena and AOUS, the first Italian Master on the topic, at the academic level. At the same time, AOUS and Humanitas established, in 2017, a joint network (the Network LHEN) also aimed to allow “on-the-job socialisation” (DiMaggio and Powell, 1983, p. 153) to participants, as well as dissemination of the Lean culture (and knowledge) outside the network. The E.O. Galliera, some years earlier had launched the network SALTH.

All the cases confirm patterns of institutional isomorphism provoked by economic, as well as coercive, mimetic and normative pressures. At the same time, the study adds to prior literature on institutional sociology by illuminating the seldom explored role played by key agents in the process of change, as well as in the institutionalisation process (DiMaggio, 1988; Dacin, 1997; Powell, 1991, p. 188). All cases showed the undeniable influence exerted first by the general management and subsequently by health professionals later acting as Lean champions, who spread the knowledge transfer processes of the new managerial practices. Indeed, a pivotal role was exerted by the administrative director in AOUS who advocated a strong commitment on Lean, leading to the hiring of an industrial engineer competent on Lean. Later, he extended the implementation of Lean to administrative processes and established, together with the health director and the general manager, a Lean office, to take Lean to a strategic level. At this stage, many Lean champions were acting as change agents to spread further the principles of Lean within the hospital. Interestingly, even though AOUS was affected by similar coercive pressures by other Tuscan healthcare organisations, dissimilarly from most of the healthcare organisations participants of the Tuscan Government’s project “Net-Visual-Dea”, the hospital implemented Lean systematically and at strategic level also thanks to these key agents.

A similar process occurred within the E.O. Galliera, with the initiatives of two key agents, first the physician who experienced the implementation of Lean at the Royal Bolton Hospitals NHS Trust – thus acting as an individual vehicle of normative professionalisation pressures – and later also the general manager who effectively launched the project at an organisation level. Similarly to AOUS and Humanitas, a key role was assumed by the Lean champions. Furthermore, the former Humanitas operations director at Humanitas had a prior background as medical doctor and had developed specialised skills in a master on operations management in healthcare, thus, offering to his work environment new business models to be transferred and deployed.

The cases confirm the pivotal role of key agents, whose “individual preferences and choices”, also in the healthcare organisations, “cannot be understood apart from the larger cultural setting and historical period in which they are embedded” (Powell, 1991, p. 188).

Applications of Lean thinking in healthcare are particularly promising to improve the overall organisational performance. Previous studies, focused on the forces within the organisation and elucidated how actors interpret the Lean strategy (Papadopoulos et al., 2011; Waring and Bishop, 2010; Trägårdh and Lindberg, 2004), the role of network associations and allegiances (Papadopoulos et al., 2011) and the interaction between Lean and the clinical practices (Waring and Bishop, 2010). On the contrary, the paper has tried to investigate which exogenous forces (economic, coercive, mimetic and normative pressures) are driving the transfer of knowledge on Lean, both in the private and public healthcare sectors, adding to the previous literature. In so doing, this paper allows scholars to focus on patterns of isomorphic change and allows managers and policy makers to understand exogenous factors stimulating the transfer of Lean thinking and the subsequent innovation within health organisations and systems.

Indeed, the presented and discussed cases have explained the ways in which economic, coercive, mimetic and normative pressures (DiMaggio and Powell, 1983, p. 150) triggered the adoption of Lean thinking in the INHS, thus, influencing the behaviour and processes of the healthcare organisations, and their respective operations.
At the same time, the study has revealed the pivotal importance and innovative roles played in the different investigated organisations by diverse prominent key-actors, who shaped their wider environment. These actors promoted and introduced new Lean management practices, and adopted innovations to legitimate their own organisational practices (Tolbert and Zucker, 1983, p. 25). In so doing, they succeeded to become acknowledged leaders among the public and private healthcare organisations. This paper also confirms the insights provided by Kennedy and Fiss (2009) about rethinking the role of motivations in the diffusion of practices among organisations. Particularly, it can be considered as an additional study taking considerable steps toward recognising greater managerial agency (Dacin et al., 2002) rather than casting managers as unreflective followers of whatever appeared to be legitimate (Perrow, 1986).

The study has some practical implications for managers and health professional seeking to improve health and administrative processes and the organisation as a whole. The cases show which managerial and organisational mechanisms worked in the transfer of “knowledge on Lean” in the Italian healthcare context, within a public hospital, a public hospital with special legal autonomy and a private hospital. In particular, when implementing Lean, change agents, even though starting with a single or few projects, should quickly focus on the commitment of the top management, the establishing of a Lean office, the promotion of a network of key agents (such as the so-called Lean champions) which can act as “internal consulting”, the launch of a massive training of staff first on basic “knowledge on Lean” (all the staff) and then on advanced knowledge (mainly Lean champions), the celebration of results, for example, through internal competitions held during Lean days.

Lastly, although results cannot be generalised since they are built only on three cases (Yin, 2013), the study, showing patterns of knowledge transfer of Lean practices within a sector different from the one in which they were generated, highlights that when Lean is implemented at a strategic level and with a systemic approach, almost all the tenets of “Knowledge on Lean”, tools and activities, methods, principles and values, are potentially adopted (and adapted), in the attempt to imitate the success of leading manufacturing companies who first gained by implementing Lean. Further research is needed to understand which ways, context and organisational and managerial mechanisms can facilitate this transfer of knowledge.

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Appendix. Primary sources

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Abstract

Purpose – The importance of relational capital for the university has grown enormously in recent years. In fact, relational capital allows universities to promote and emphasize the effectiveness of the third mission. The purpose of this paper is to propose a case study involving an Italian university that recently set up a new research observatory, and, thanks to its success, succeeded in enhancing its relational capital.

Design/methodology/approach – The authors adopted an action research approach to analyze the case study. Consistently, the authors followed the analysis, diagnosis, and intervention phases. First, the authors focused on the identification of the strengths and weaknesses of the process through which the university created relational capital, and finally, the authors proposed solutions to improve the process.

Findings – This case study shows that the creation of relational capital for the host university was the result of a process of transfer and transformation of the individual relationships of the observatory’s promoters.

Originality/value – This paper contributes to filling a significant gap in the literature on relational capital and universities and provides useful insights into how these organizations can encourage its creation. It also allows scholars, managers, and politicians involved in higher education to gain a greater understanding of this relevant topic.

Keywords Relational capital, Imprenditoriale university, Case study, Action research

1. Introduction

In recent years, in light of the so-called “academic revolution,” the university system has undergone a profound process of rethinking and reorganization (Etzkowitz et al., 2000; Etzkowitz, 2004), and its institutional aims have also changed, including teaching, research, and economic and social development (Etzkowitz, 2002; 2003). Universities have often been accused of being too “self-referential” (Etzkowitz et al., 2000; Shekarchizadeh et al., 2011). They have been urged to open up to the external environment, multiply and strengthen interactions with ever-expanding stakeholder groups and actively promote collaborative relationships in the business and institutional world to contribute to the development of the economic and social system (Furman and MacGarvie, 2009; Seethamraju, 2012)—the so-called “third mission” (Laredo, 2007). In this new context, universities must not only foster the creation of knowledge through research and its dissemination to students through teaching activities. They should also play a role in transferring it externally to encourage the exploitation of research results and foster the economic and cultural growth of regions and countries (Etzkowitz, 2002; Elena-Pérez et al., 2011).

The concept of relational (or social) capital in universities refers to the intangible resources that can generate value when linked to the university’s internal and external relations (Paoloni and Demartini, 2018). Relational capital includes a university’s...
relationships with public and private partners, its position and image in (social) networks, its involvement in training activities, networking with scholars and academics, international student exchanges, its international recognition, its attractiveness and so on. The ability to create and develop relational capital is crucial to the effectiveness of the third mission. However, despite the importance of relational capital to the third mission, it is a neglected topic in existing studies. In fact, some authors have dealt with the current process of universities’ transformation and have focused on the significance of intellectual capital to such organizations (Rowley, 2000; Garnett, 2001; Schiuma and Lerro, 2008; Paloma Sánchez et al., 2009; Secundo et al., 2010; Ramirez et al., 2016). However, they have not focused on relational capital and how it can be formed and developed. Above all, studies that thoroughly analyze how universities can promote and encourage the creation and development of this intangible asset do not exist.

We believe that it is crucial to fill this gap. Etzkowitz and Leydesdorff (2000) have asked: “Can academia encompass the third mission of economic development in addition to research and teaching?” This is a fundamental question, and it captures the reason why we are focusing our attention on relational capital in universities. Relational capital, in fact, is the means through which universities can promote and emphasize the effectiveness of the third mission, as it involves the universities’ ability to contribute to economic development by transferring internal knowledge externally through research activities. But how can universities succeed in creating relational capital? We think it is extremely important to know the processes and variables involved in creating this intangible asset. That is why, in this paper, we have proposed a case study involving an Italian university that has recently set up a new research observatory (Ipazia Observatory, hereafter Observatory). Thanks to its success, the university has succeeded in creating relational capital, with positive effects for its third mission. This case study has allowed us to identify the main critical success factors of the transfer and transformation process. As a result of this process, the relationships created by the observatory promoters have become the relational capital of the host university, enabling the improvement of its third mission. The remainder of the paper is structured as follows. In Section 2, the literature review is presented, and the methodology is described in Section 3. The case study is presented in Section 4 and discussed in Section 5. Conclusions, practical implications, and suggestions for future research are proposed in Section 6.

2. Literature review

The restructuring of the university system and its institutional aims has forced the traditional academic mission to expand. Teaching is no longer the only focus—research and economic and social development are now considered just as valuable (Etzkowitz, 2003). This new trend relies on the concept of the triple helix of university–industry–government relationships, initiated in the 1990s by Etzkowitz (1993). The triple helix thesis calls for the hybridization of elements from universities, industries, and the government to generate new institutional and social formats for the production, transfer, and use of knowledge (Trequattrini et al., 2016; Vlajčič et al., 2018; Wehn and Montalvo, 2018). Triple helix theoretical and empirical research has increased over the last two decades (Klofsten et al., 1999, 2010; Inzelt, 2004; Geuna and Nesta, 2006; Smith and Bagchi-Sen, 2010; Geuna and Rossi, 2011; Svensson et al., 2012; Etzkowitz, 2002; Furman and MacGarvie, 2009). The most relevant aspect of this research is that all these studies look at various aspects of the university’s third mission.

The third mission encourages universities to promote three types of activities: technological transfer and innovation; continuous training; and social engagement (Secundo et al., 2016). It brings with it the stakeholders’ demand for greater transparency, increased competition among universities, organizations and companies involved in research and
teaching, pressure from universities to promote greater autonomy, and the adoption of new management and performance systems that incorporate intangible assets and intellectual capital (Paloma Sánchez et al., 2009; Secundo et al., 2010, 2015, 2016).

The increasing importance of the third mission to universities has enhanced the significance of universities’ intellectual capital (Parung and Bititci, 2008; Ditillo, 2013; Marr et al., 2004) and, in particular, encourages us to focus our attention on one of the main components of intellectual capital, namely relational capital (Bull, 2003). Literature analysis shows that the theme of relational capital in universities has been neglected so far, both in studies that have focused on the university system and in those that have focused on intellectual capital and its main components. The central theme of this paper, in fact, is the result of the intersection of different research fields, with broad overlapping areas that have been inadequately explored. From this perspective, three main research strands can be identified.

The first strand of research focuses on the transformation that has been taking place in the university system for some time and the establishment of a new model of the entrepreneurial university.

In recent years, Italian universities, like most other European universities, are experiencing a profound transformation process, which is redefining their relationships with the outside economic and social contexts and their main objectives and missions. This transformation aims to implement an entrepreneurial university model that is more consistent with the promotion of economic development (Shekarchizadeh et al., 2011; Etzkowitz, 2003, 2004; Gibb and Hannon, 2006; Lazzeroni and Piccaluga, 2003). European universities (public or private organizations) are currently involved in the process of corporatization, which implies the introduction of the principles of business administration and management in strategic and operational activity. The grounds for this transformation are the increasingly limited availability of funds that public universities, in Italy and abroad, receive from national governments. For this reason, in recent years, there has been an increase in competition among universities, which are under constant pressure to improve their results, even in economic terms. The result is the introduction and diffusion of a new business approach to university management. This new approach aims to promote the affordability, efficiency, and effectiveness of the university system. Therefore, the ability to engage in exchanges and collaborations with external stakeholders, primarily private and public enterprises and institutions, has become essential to universities.

The most obvious manifestation of this transformation is the emphasis placed on the so-called “third mission.” It includes activities destined for direct application, enhancement, and the transfer and exploitation of knowledge produced through scientific research, as a means to contribute to the social, cultural, and economic development of society (Etzkowitz et al., 2000; Etzkowitz, 2004). Therefore, universities are encouraged to promote three main groups of activities: knowledge and technological transfer; continuous training; social engagement (Secundo et al., 2016). For universities, the third mission implies a much more active role in aiding the economic development and cultural growth of the contexts in which they are located (Etzkowitz et al., 2000; Vorley and Nelles, 2008). This means that universities can no longer work in total autonomy and be self-referential. On the contrary, they should commit to ensuring that their activities and strategies are aligned with the needs and interests of external stakeholders, to promote the technological and economic growth of the society (Secundo et al., 2016).

In entrepreneurial universities, new dynamics and collaborations with industrial communities and social institutions are encouraged. In particular, the third mission requires greater openness and transparency and more dialogue with external stakeholders, involving them in defining strategic goals and plans.
The key role of relational capital in universities is evident. In fact, it is the indispensable vehicle that enables universities to achieve their strategic goals in research, teaching, and the third mission. However, while there is a broad awareness of the importance of relational capital in universities, research on this topic has been poorly developed.

The second strand of research focuses on the entrepreneurial university and the role of intellectual capital in such organizations. This line of research has been prompted by the awareness of this indispensable intangible asset that enables universities to reach their strategic goals. Studies in recent years have fueled this research, focusing on some prevailing thematic areas:

(1) A new form of accountability based on intellectual capital reporting, improving transparency, and internal management (Leitner, 2004; Vagnoni et al., 2005; Renzl, 2006; Ramirez et al., 2007; Paloma Sánchez et al., 2009; Bezhani, 2010; Lu, 2012; Córcoles, 2013; Veltri et al., 2014; Low et al., 2015; Ramirez et al., 2016). Studies belonging to this research area are beginning to appear because scholars are aware of the benefits that the third mission and the model of an entrepreneurial university offer. For example, the stakeholders’ demand for greater transparency, increased competition among universities, organizations and companies involved in research and teaching, pressure from universities to promote greater autonomy, and the adoption of new reporting systems (Paloma Sánchez et al., 2009; Secundo et al., 2010, 2015; Secundo and Elia, 2014).

(2) Strategic management in universities, thanks to specific intellectual capital-based KPIs or IC based models (Seethamraju, 2012; Garnett, 2001; Lee, 2010; Elena Perea et al., 2011; Bucheli et al., 2012; Tahoone and Shatalebi, 2012; Siboni et al., 2013; Carayannis et al., 2014; Mumtaz and Abbas, 2014; Altenburger and Schaffhauser-Linzatti, 2015; Secundo et al., 2015; Vagnoni and Oppi, 2015; Teimouri et al., 2017). Studies in this area mainly focus on managerial tools that universities can use to monitor their activity and the degree of achievement of their strategic goals, as reflected in the three main functions of research, teaching, and the third mission.

(3) Knowledge transfer and university spin-offs (Venturini and Verbano, 2017; Feng et al., 2012; Szopa, 2013). Studies in this area analyze issues associated with knowledge transfer from universities to the external community. Special emphasis is put on the creation of spin-offs and factors affecting their creation, competitive success, and profitability.

The third strand of research focuses on relational capital.

Studies on this topic have mainly examined for-profit organizations and have investigated the ability of the intellectual capital’s component to enhance business performance (Kale et al., 2000; Cousins et al., 2006; Paoloni and Demartini, 2012; Paoloni and Dumay, 2015; Hitt et al., 2002; Cesaroni et al., 2017). These studies have only marginally turned to the university system for further research.

Smolag et al. (2016) have focused on the role of social media in connecting universities with their stakeholders. These authors underline the great impact of ICT tools on business, due to the possibility of developing external and internal networks, increasing stakeholders’ engagement and enhancing brand value. They believe that similar tendencies can also be observed in universities, allowing them to take advantage of these tools in education and research activities.

Relational capital is a component of intellectual capital and, as mentioned above, several studies have analyzed issues related to intellectual capital in universities. However, in this case, attention is focused mainly on reporting and management issues, as well as the possible impact of intellectual capital on organizations’ performance. In fact, in such studies,
relational capital is viewed in a static perspective, and no attention is given to dynamic issues. With only a few exceptions (Smolag et al., 2016; Paolini and Demartini, 2018), how relational capital is formed and how its creation and development can be stimulated are highly neglected topics.

In conclusion, this analysis shows that, despite the emphasis on the concept entrepreneurial university and the importance of external and internal stakeholder for the success of this model, the theme of relational capital in universities has received insufficient attention. Several scholars have stressed the significance of intellectual capital in universities and have proposed several models and approaches to managing, measuring, and enhancing it. However, the focus on the relational component of intellectual capital is almost absent, and studies on relational capital have primarily overlooked university organizations.

This paper aims to contribute to filling this gap, focusing on how relational capital is formed in universities and how they can stimulate relational capital’s development and enhancement. In particular, it sheds light on the process through which the relationships of individual academics can become an asset to the university and give impetus to the improvement of its third mission.

3. Methodology

3.1 Methodological approach

From a methodological point of view, we addressed the research question by analyzing a case study (Yin, 2013). This research strategy is particularly suitable for the analysis of in-depth, real-life events and helps us understand the meaning of people’s experiences (Palmberg, 2010).

The selected case study was investigated with an “action research approach.” In fact, we were directly involved with a double role: as actors actively participating in the analyzed events and as researchers observing and interpreting the phenomena. As stated by Bradbury and Reason (2006, p. 1), action research is a process that “[…] seeks to bring together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern to people.” This approach not only considers the observations of the researchers but also the impact the interventions have on the organization. The main benefit is the ability to develop profound insights into the implementation of new processes in organizations, increasing the involved actors’ degree of awareness (Dumay, 2010).

Consistently, with the aim of action research, we combined the analysis, diagnosis, and intervention objectives. The case’s description and analysis, in fact, were followed by the identification of the critical success factors of the process. Finally, we proposed solutions (interventions) that aim to eliminate the identified criticalities and delineate a replicable model, even in different contexts.

3.2 Case selection

The case presented in this paper involves a scientific research observatory—Ipazia Observatory of gender studies—recently set up at an Italian university. The main reasons why we selected this case are: it is an exemplary case owing to the fact that the creation of this Observatory gave great impetus to the university’s relational capital; we were directly involved in the analyzed case, and we had easy access to documents and data. We were also able to interview the main actors of the Observatory; we were able to follow the evolution of the Observatory over a two-year period (2015–2017), starting from the initial launch phase. For all these reasons, we think this case study is particularly suited to the analysis of a little-known phenomenon and can help us understand the critical success factors that enabled the creation of relational capital for the host university.
3.3 Data collection

Data were collected from 2015 to 2017 by the authors, who acted as “participant-observers.” Data used for the analysis come from different sources:

1. semi-structured interviews with persons involved in the Observatory;
2. notes from meetings, seminars, and workshops organized by the Observatory;
3. proprietary reports and documents; and
4. press articles.

Interviews were the primary source of data, and the interviewees were selected based on two criteria:

1. Relationship with the Observatory: we distinguished the main actors (the Observatory’s promoters and scientific committee members) from the stakeholders (scholars who participated in the Observatory’s conferences, experts, and practitioners from business associations and/or public and private organizations involved in the Observatory’s activities; host university’s board of directors; host university’s administrative staff; host university’s students).
2. Relationship with the host university: we distinguished scholars belonging to the host university or other universities and organizations.

Interviews with a wide range of people allowed us to better understand the Observatory’s creation process and helped us identify the critical success factors of this process. Moreover, we were able to compare the interviewees’ perspectives and avoid bias caused by retrospective sense-making and impression management (Eisenhardt and Graebner, 2007).

A total of 18 interviews were carried out during the Observatory meetings, conferences, and workshops (see Table I for more details). Most of them (14) took place at the host university, while four interviews were held in other universities hosting workshops organized by the Observatory.

Interviews varied in length from one to two hours. The main actors were asked to describe their experience at the Observatory, mainly focusing on their role, their involvement, activities, any difficulties encountered during the Observatory’s creation and development process and their relationships with other main actors and the host university. Interviews with the Observatory’s stakeholders focused on their opinion of the Observatory’s usefulness and effectiveness, their interest in its activities and the relationships they built with the main actors and the host university before and after the Observatory’s creation.

All interviews were recorded and later transcribed verbatim for further analysis.

<table>
<thead>
<tr>
<th>Relationship with the host university</th>
<th>Main actors</th>
<th>Not belonging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belonging</td>
<td>Promoter</td>
<td>3 academic members of the scientific committee</td>
</tr>
<tr>
<td></td>
<td>1 academic member of the scientific committee</td>
<td></td>
</tr>
<tr>
<td>Stakeholders</td>
<td>3 students attending the host university</td>
<td>3 academic scholars involved in the Observatory’s conferences</td>
</tr>
<tr>
<td></td>
<td>2 academic scholars involved in the Observatory’s activities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 member of the host university administrative staff</td>
<td>3 experts from non-academic organizations</td>
</tr>
<tr>
<td></td>
<td>1 member of the host university board of directors</td>
<td></td>
</tr>
</tbody>
</table>

Table I. Interviewees details
3.4 Data analysis

As suggested by Miles et al. (2014), data analysis was an ongoing process. Available data were iteratively analyzed to allow a progressive elaboration of a general interpretative framework. In the first step of the data analysis, we created a rich description of the case, putting together interviews and data from other sources. In the second step, we cycled through multiple readings of the data. In line with the purposes of our research, in this phase, we identified the critical success factors that made it possible to create relational capital for the host university. With this purpose in mind, each author read the empirical material independently and categorized the stream of words into meaningful categories, via manual open coding. Subsequently, the results obtained by each author were compared and discussed. In cases of coding disagreements between authors, interviews, and other data were jointly re-analyzed, and codes were discussed to reach a consensus.

This iterative and interactive analysis process allowed us to describe the main phases of the relational capital creation process and identify its critical success factors. Moreover, its weaknesses were also identified, and we recommended some interventions for overcoming them. Furthermore, in our analysis, we found the use of excerpts highly worthwhile, as they allow researchers to focus on the main aspects of the relational capital creation process.

4. Case study

The concept of Ipazia was created in 2015 by a university professor—one of the authors—with research experience in gender studies. After contemplating the creation of a scientific center, she shared the idea with some colleagues—mostly from different disciplinary areas and other universities—who were also friends. Her proposal was immediately accepted, and a group of multidisciplinary scholars quickly got organized. They decided to create a research organization with the intention to continue their research experience in gender issues. What followed was an Observatory of gender studies—Ipazia—that was founded at the university where the professor worked.

With the creation of the Observatory, its organization was also defined. The promoter became the director of the Observatory, and colleagues who had participated in the start-up phase participated in the scientific committee.

At the first workshop in 2015, the Observatory began to promote a number of different activities, mainly concerning teaching and research.

In the field of didactics, several seminars were offered to students from various degree courses, involving several speakers from businesses, other universities, and public and private institutions.

As far as research is concerned, from the start, the Observatory has organized several scientific initiatives (workshops, seminars, conferences, research projects, science labs) to foster scientific research on gender studies, at a national and international level, involving scholars from different scientific areas. Thanks to these scientific initiatives, the network has expanded a lot. Relationships with several scholars, from Italy and abroad, have also grown stronger, as the latter have begun to frequent the host university on a regular basis.

The Observatory has also contributed to several scientific publications (books, papers, and so on). A website and a Facebook page were also created to increase the Observatory’s visibility and its initiatives.

All these initiatives have favored the creation of an extensive network of contacts and relationships with a great deal of stakeholders, not only academic scholars but also entrepreneurs, managers, professionals, and experts from private and public companies and institutions. Thanks to them, important connections have been established with national and international organizations. The latter have promoted joint projects with the host university. Through these collaborations, the university has also launched new initiatives,
such as research with third parties, training activities, and so on, resulting in an enrichment of the university’s third mission activities.

In conclusion, thanks to the Observatory, the host university has been able to expand its network of external stakeholders and thus enrich its relational capital. The latter, in turn, has stimulated and enriched the activities that correspond to the third mission.

5. Findings

5.1 The main phases of the relational capital creation process

In accordance with the purpose of this research, the case analysis was carried out to highlight the distinctive features of the relational capital creation process of the university hosting the Observatory, as well as the critical success factors that made this outcome possible.

As summarized in Figure 1, this process can be represented as a chain, in which various steps can be identified. The first phase is the incubation phase—where the Observatory’s promoter was able to create the first “informal” network. The second phase is the development phase—where a high number of stakeholders were involved in the host university’s institutional relational capital.

The description of this process facilitates its analysis and helps us identify its distinctive features and critical success factors. In fact, each stage of this process is characterized by the presence of a “main actor,” who played a leading role in enabling the process. At each stage, the main actor carried out a number of actions, which concurred with the evolution of the relational capital, regarding both quality and quantity. Finally, it is possible to identify the critical success factors that made it possible for the university to create relational capital.

In Table II, the main actors, actions, relational capital features, and critical success factors associated with each stage of the process are briefly described.

Each stage of this process is described and discussed below.

![Figure 1. The dynamic of relational capital in the university](image)

<table>
<thead>
<tr>
<th>Phases</th>
<th>Main actors</th>
<th>Actions</th>
<th>Relational capital features</th>
<th>Critical success factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incubation</td>
<td>Promoter</td>
<td>SMS, phone calls to friends, and well-known colleagues</td>
<td>Informal network made up of a few colleagues and friends</td>
<td>Promoter’s proactive attitude</td>
</tr>
<tr>
<td>Pre-launch</td>
<td>Informal network</td>
<td>Informal meetings until the formal creation of The Ipazia Observatory</td>
<td>Wider and formalized network of scholars and founders of The Ipazia Observatory</td>
<td>Mutual trust</td>
</tr>
<tr>
<td>Launch</td>
<td>Observatory</td>
<td>Organization of workshops, conferences, seminars</td>
<td>Observatory’s formal relationships with a number of stakeholders (business associations, private and public companies and institutions, etc.)</td>
<td>Shared scientific interests</td>
</tr>
<tr>
<td></td>
<td>Director and Scientific Committee</td>
<td>Scientific publications</td>
<td></td>
<td>Promoter and Scientific Committee members’ initiative and commitment</td>
</tr>
<tr>
<td>Development</td>
<td>IPAZIA as an institute embedded into the university</td>
<td>Research, teaching and third mission activities</td>
<td>Host university’s wide network of relationships with a high number of stakeholders</td>
<td>Support from the host university’s administrators (board of directors) and its administrative offices</td>
</tr>
</tbody>
</table>
5.1.1 Incubation phase. The role of the promoter in this cultural initiative was of the utmost importance for the activation of the initial network. Without the activism of this promoter, who was able to effectively share the idea of the cultural project and involve the first group of colleagues, the initiative would have hardly been founded. At this stage, the network was informal, created thanks to the promoter’s personal contacts and the voluntary, non-formalized membership of several colleagues, united by friendships, and shared scientific interests.

The promoter’s attributes and, in particular, her proactive attitude were without a doubt, the critical success factors of this stage. She played the role of intrapreneur (Antonicic and Hisrich, 2001) in the university context, leading her initial group of colleagues toward the creation of the first informal network and launch of the new project:

She was very enthusiastic and able to engage others when she proposed the idea of getting the observatory started. And even though I had many commitments, I immediately showed my willingness to join and support her (scientific committee member).

5.1.2 Pre-launch phase. The role of the informal network was fundamental in the phase that preceded the formal creation of the research center, taking into account that it was its first bundle of resources and competencies. Activating these resources enabled them to create the necessary conditions that permitted the legitimization of the initiative and its formal creation. In fact, the members of the informal network devoted much effort to elaborating the formal Observatory project and defining its objectives, activities, and organization. Thanks to their commitment they were able to involve other scholars, who then joined the Observatory’s scientific committee. They also managed to get formal recognition from the host university and attract interest from public and private bodies and organizations.

In this phase, friendship, trust, and shared scientific interests were the critical success factors, as they allowed the initial group of colleagues to work together and collaborate to achieve a common and shared goal. Even though their roles were not formalized, they still devoted a great deal of effort to get to the formal creation of the Observatory:

The trusting climate helped us build the network and allowed us to share our personal knowledge, enabling the formation of a coherent research group that aimed to achieve shared goals (a scientific committee member).

5.1.3 Launch phase. After the formal foundation of the Observatory and the appointment of the director and the scientific committee members, the latter committed themselves to the project by organizing scientific activities (mostly conferences, workshops, seminars, and publications) in line with the main goals of the Observatory. The purpose of these initiatives was twofold. First of all, they wanted to promote studies and research on gender issues and develop knowledge on this topic; second, they hoped to expand the Observatory’s relationships and create a solid network with the local, national, and international communities interested in gender issues. In fact, the varied composition of the scientific committee, with the presence of scholars from different countries and research fields (history, sociology, economics, business and management, statistics, etc.), also allowed the Observatory to expand its scientific relationships in an international scientific context. The director and the scientific committee were also able to include others from the business and professional world to get acquainted and increase the Observatory’s visibility and reputation outside of the academic context.

The scientific committee played a crucial role in the establishment of an informal network of friends and academic colleagues, in a well-formalized research center, which was supported and formally recognized by the host university, as well as appreciated and well known in Italy and abroad.
Therefore, in this phase, the critical success factors were the promoter’s and scientific committee members’ initiative, commitment, and ability to involve a broad network of subjects and transform informal and personal relationships into institutional relationships. This was done to increase the visibility of their cultural project, on one hand, and to ensure its essential resources for its development, on the other:

I was very impressed with Ipazia’s research and didactics initiatives. I have also appreciated the opportunity to share my entrepreneurial experience (a businesswoman, who is part of Ipazia’s network).

5.1.4 Development phase. In the phases following its formal establishment, the Observatory launched a series of activities concerning both research (e.g. research projects, journal publications) and didactics (e.g. seminars for students). Such activities were carried out involving a number of entrepreneurs, managers, professionals, and experts from private and public companies and institutions, with whom the host university activated collaborative relationships for jointly running projects and research. The result of these activities was the enrichment and increased effectiveness of the three typical academic activities.

In the development phase, a key factor for success was the ability to engage stakeholders (students, researchers, and private and public organizations) in common cultural projects by adopting a participatory approach. This means that a real transfer of knowledge from the university to the ecosystem, in which it operates and vice versa, can be concretely realized through the activation of a reciprocal dialogue between subjects belonging to the same community of interests.

Another critical success factor was the support received from the host university. Launched as an academic’s personal initiative the Observatory was able to become a formally recognized center and, subsequently, develop further thanks to the support of the host university. From this point of view, the approval and the appreciation of the board of directors and the support services from the administrative offices played a key role. Their help was crucial in organizing initiatives (conferences, etc.), preparing and updating the Observatory website, maintaining contacts with its stakeholders, and so on:

Ipazia has achieved national and international visibility through the research activity on gender studies its network has carried out (academic involved in the network).

We are very pleased with the success and visibility that Ipazia brings to our University (member of the university’s board of directors).

5.2 The transfer of relational capital from the promoters to the university
The previous section describes the main phases of the Observatory’s creation, the development process, and the parallel process of the formation of relational capital for the host university. In this description, with the role of the principal actors, the main activities carried out, and the progressive transformation of the features of the relational capital, the key success factors of each stage have also been highlighted.

The strengths and weaknesses of the whole process are described below (Figure 2).

The first are aspects that have had a positive role in favoring the transfer of relational capital from the actors involved in the Observatory to the host university. Critical issues refer to the risks of the main process, which allow us to propose some recommendations for how to mitigate such risks and ensure that a similar process can be repeated more effectively in other organizations.

The main strengths of the process described above are as follows:

1. The transfer of relational capital was done in phases and with an incremental diachronic logic. In fact, it is only through a set of coordinated actions aimed at transferring the
wealth of personal relationships to a collective body (the Observatory, first, and the host university, later) that can initiate a process of growth for a university that focuses on the third mission. In this regard, our case study confirms that the first phase of developing an entrepreneurial university requires a push from within and research teams—those that Etzkowitz (2003) calls “quasi-firms.” These teams can promote knowledge growth, with particular reference to a specific object of research, due to contamination from the outside world.

(2) Another strength is the scholars’ spontaneous start of the initiative. The process of creating and transferring relational capital was done according to a bottom-up logic, legitimized by the host university. This condition has enabled the promoter and the informal network of scholars to engage in the initiative with commitment, creativity, and proactivity (thus with an entrepreneurial attitude) to achieve the common goal (the creation of the Observatory). This aspect is very important and draws on the existing debate in literature. Do projects concerning the third mission of universities have to be governed by a central, top-down logic or, as has happened in our case study, is the university’s role to create favorable conditions so that the entrepreneurial academics can develop, that is, in a bottom-up logic, an entrepreneurial university (Etzkowitz, 2003)?

(3) The third distinctive element is the fluidity of the different phases of the process, thanks to the trust that the promoter built with the informal network of scholars. It was the factor that facilitated the relationships developed within the Observatory, with the other bodies, and the administrative staff of the host university. Trust is not only a core element of relational capital (Smolag et al., 2016) but a driver that allows individuals to share knowledge and personal relationships (Kale et al., 2000). Nevertheless, trust played a strategic and vital role in the process of creating relational capital for the host university. In fact, the shift from individual trust capital to a collective trust capital can generate conflicts among the members of a community (Wasko and Faraj, 2005; Castelfranchi et al., 2006). However, in our case study, the promoter, in the first step, and later on the Observatory’s director and the scientific committee, built a collective trust capital, enhancing the contribution of those who participated in the life of the Observatory. Therefore, the role of these main actors was fundamental because their effort in the launch and development steps was oriented toward the legitimation of the
Observatory and, in the meantime, the recognition of their leadership (Etzkowitz and Kemelgor, 1998) in the research group.

Another factor that has favorably affected the climate of trust and the commitment of project participants was the coincidence of personal goals between the promoter, the scientific committee members, and the community committee that contributed to the creation of the Observatory. This coincidence stems from sharing the same research interests (especially for scholars) and the perceived common benefits of enhancing their professional and academic reputation through the Observatory’s activities.

A final aspect that needs to be highlighted is the issue of aligning the interests of each individual (academics/researchers/employees from the university) with that of the organization (in this case, the university as an organization). The analysis of this issue calls to mind the so-called agency theory (Eisenhardt, 1989). If both parties pursue the maximization of their related utilities, it is unlikely that the agent will act effectively in the best interest of the principal. The relationship between principal and agent (universities and individual teachers/researchers) can only result in an exchange contract. For this reason, it is important to strive to fulfill the institutional needs/motivations linked to enhancing its image, synergies between teaching, research and third mission, in addition to the personal needs of each individual so that the objectives converge to become one.

The weaknesses and areas of improvement of the process, which arise from our analysis, concern the following aspects related to the actual development phase. The most critical and controversial issue concerns the “exchange contract” between the main actors (i.e. the director and the other members of the scientific committee) actively involved in the participatory governance of the Observatory and the university system, into which the Observatory is embedded (i.e. the host university but also the national university system). The main critical aspects are as follows:

The Ipazia Observatory’s relational capital is a collective relational capital that was created through the combination of the personal and informal relationships of the main actors, who are proactively dedicated to the initiative. In the incubation, pre-launch, and launch phase the proactive role of the main actors was essential to attract a community of interests. For this reason, we deem fundamental that the management of the host university leaves room for the entrepreneurial spirit of individual academics. They should support the initiatives that are established “from the bottom” within the university, but also act as a seedbed with a hands-off logic that does not stifle the entrepreneurial spirit of individuals. The creation of research groups/interested communities that transcend the single institution is, in fact, the first phase of a process, which was outlined by Etzkowitz (2003), and which may subsequently result in the economic exploitation of the products of research (the so-called “capitalization of knowledge”).

Another critical issue is the need to guarantee human capital in initiatives, such as Ipazia, which promote the third mission and involve scholars belonging to different universities. For this reason, it is important to identify, at the national university system level, an incentive plan for academics and researchers who promote and collaborate in the success of these initiatives. If the third mission has become an even more important factor in the strategy of a modern university (Etzkowitz, 2003), then it is desirable that this emerges in the assessment of the performance of academics and non-teaching staff.
6. Conclusions
In this paper, we have focused our attention on relational capital in universities. Relational capital is the means through which universities can promote and emphasize the effectiveness of the third mission.

Up to this point many scholars have delved into the topic of how a university that has included the third mission in its strategy should be managed according to managerial logic (Etzkowitz and Leydesdorff, 2000; Etzkowitz, 2004; Secundo et al., 2015, 2016). However, today not one scholar has addressed the research question of how relational capital can be created, developed and, most importantly, transferred from individual academics and scholars to the university. Relationships, indeed, can be seen as antecedent factors of a new model of iterative and collaborative innovation between entrepreneurial universities and their ecosystems.

Academic entrepreneurship arose from internal as well as external impetuses. As far as the inner impulse is concerned, Etzkowitz (2003) addressed the topic of how universities should support research groups that he defines as “quasi-firms.” To sum up, if there is an increase in the stock of internal and external relationships thanks to entrepreneurial academics organizing research groups, this could trigger a second wave in which universities can systematically manage the third mission to create financial and societal value (Etzkowitz et al., 2000).

The Ipazia case study is in the first wave of its journey and can lead an alma mater to become an entrepreneurial university, where the goal is to develop the necessary conditions for creating an exchange and accumulation of knowledge between researchers and other actors interested in a specific research theme—gender studies. The process of creating and managing the Observatory is an example of success, and, for this reason, offers future scholars and managers food for thought.

6.1 Limitations and future research
Since this study has examined only one case study involving a university in Italy, the process analyzed could be impacted by its specific socio-economic conditions. However, we believe that being directing involved in the project, as promoters and members of the Observatory’s scientific committee, has allowed us to offer our readers a unique, in-depth analysis of the motivational factors that prompt scholars to begin initiatives in line with the spirit of a university that has carried out the third mission. At the same time, to reconcile the subjective elements involved in the research process, we also conducted semi-structured interviews to outline the formation process of relational capital from the perspective of a triangulation of research methods (Patton, 2005).

In summary, we believe that the managerial implications suggested in the discussion, if put into practice by the host university, can be useful in overcoming the criticalities we see above all in the Observatory’s (future) consolidation phase. It is our job as researchers to critically analyze such future developments both within the Ipazia Observatory and through the study of other case studies that ask the same research question.

Notes
(1) www.accademiaidea.it/
(2) www.sidrea.it/
(3) www.sisronline.it
(4) www.ifkad.org/
(5) www.aidda.org
(6) www.unwomen.org
(7) www.biclazio.it/it/home/gli-sportelli-donna-forza-8.bic
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Knowledge transfer within relationship portfolios: the creation of knowledge recombination rents

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Andrea Caputo and Lee Matthews
Lincoln Business School, Lincoln, UK

Abstract

Purpose – The purpose of this paper is to clarify the underdeveloped conceptualization of a particular type of network rents, defined as knowledge recombination rents, related to the possibility for a firm to transfer and recombine knowledge within and across its portfolio of inter-organizational relationships.

Design/methodology/approach – Adopting a contingency approach, the authors develop a comprehensive model with propositions drawn from an original synthesis of the extant literature on the management of inter-organizational relationships.

Findings – The authors summarize the most important internal and external variables that explain how knowledge recombination rents arise within a firm’s portfolio of inter-organizational relationships. The authors create a seven-proposition model that considers: an “internal fit,” related to internal contingencies of the firm, specifically life stage and its strategy; an “external fit,” related to external contingencies of the network of the firm, specifically past experience and current portfolio structure.

Research limitations/implications – The model is theory driven. Future research should validate empirically the relations proposed, especially in different industries and contexts.

Practical implications – The model, beyond the fact of being theoretically sounded, is also completely practical oriented. Indeed, the authors developed a comprehensive model articulated in seven propositions which relationship managers can easily use to analyze and manage their portfolios of inter-organizational relationships.

Originality/value – The model allows us to assert that the value of an inter-organizational relationship is neither fixed nor just related to the single dyadic interaction; rather before engaging with a relationship is crucial to ponder possible benefits and harms. This is the central element in the contribution that develops an easy-to-use and comprehensive model based on best practices.

Keywords Inter-organizational relationships portfolio, Knowledge recombination rents, Recombination processes, Inter-organizational relationships, Relationship management, Alliance and network portfolio, Exploration/exploitation

Paper type Conceptual paper

Introduction

In recent years, the strategic management of knowledge has increasingly turned its attention to the relational rents that can be created through inter-organizational relationships, partnerships and alliances (Dyer and Singh, 1998). An impressive body of literature has emerged in order to understand how organizations can create relational rents through the transfer of knowledge within individual inter-organizational relationships. However, it is less clear how knowledge is transferred across the relationships within a company’s portfolio of relationships. This represents a significant gap within the literature as the ability to transfer knowledge across a portfolio of relationships is vitally important for organizations as it allows them to understand what is the potential for recombining the different knowledges residing in different relationships to create new sources of rent, henceforth known as “knowledge recombination rents.” Within the extant literature on knowledge transfer and relational rents, relational rents are typically conceptualized at the level of the dyad and focus on the idiosyncratic matching of jointly owned resources, shared capabilities and the coordinated efforts of
both organizations within a given relationship (Dyer and Singh, 1998; Lavie, 2006). While this concept of dyadic rent is useful for understanding knowledge transfer within individual inter-organizational relationships, it has a number of limitations as a tool for understanding how knowledge is transferred across relationships within a portfolio to create knowledge recombination rents. First, relationships are not isolated, unrelated business processes but occur simultaneously and reciprocal influences especially for the most innovative organizations (Powell et al., 1996). Second, the portfolio space in which such relationships are managed is not merely a frame for these business processes but rather a factor influencing the structure and evolution of relationships (Gulati, 1998). In recognition of these facts, inter-organizational studies have expanded the focus from the dyadic level to the network level of a firm (Yang et al., 2010). This network approach facilitates a better understanding of how organizations manage their entire portfolio of relationships alliances (Zhao, 2014) and manage these business processes more holistically to produce knowledge recombination rents. Despite the extensive debate on the topic (e.g. Lavie, 2006; Rothaermel and Deeds, 2004; Sidhu et al., 2007), the extant literature is still lacking a clear and analytic representation of the rents that arise from the recombination of firms’ knowledge within a portfolio of relationships and this is exactly the gap that we aim to fill in this paper with our novel concept of “knowledge recombination rents.”

Thus, this paper is positioned within the broader field of studies investigating the impact of managing knowledge on partnership strategies, and aims at answering the following research question:

RQ1. What conditions and factors increase knowledge recombination rents within a company’s portfolio of relationships?

We developed a model made of seven propositions on the nature and development of these knowledge recombination rents.

Consistent with the extant literature (e.g. Burt, 2000; Jiang et al., 2010; Koka and Prescott, 2008; Pett and Clay Dibrell, 2001; Zhao, 2014), we adopt a contingency approach (e.g. Pratono, 2016; Zaheer and Bell, 2005) in order to focus on the internal and external conditions of fit (Zajac et al., 2000) that determine how firms are able to create potential knowledge recombination rents through their portfolio of inter-organizational relationships.

We are determining what is the potential value of such knowledge transfer as in purely relational view (RV) approach, which indeed interprets relational value as a combination of resources and capability strategically developed and deployed (Dyer and Singh, 1998), rather than the dynamic capabilities approach (Zollo and Winter, 2002), which is more interested in studying processes and routines apt to catch such relational value (Lorenzoni and Lipparini, 1999).

The contribution of our work to the literature is twofold. The first contribution is theoretical. We present a holistic framework that is able to show how a company can recombine knowledge within its portfolio of relationships and, thus, deepens our understanding of the most important aspects that should be considered ex ante before starting. The second contribution is practical. The framework can be used by organizations as an “easy to use” tool based on seven points that managers can use in the strategic planning process for their portfolios of inter-organizational relationships.

The paper is structured as follows: a problem statement made in this introduction, our model of knowledge recombination rents is presented in the “Model Development” section; next seven propositions present the contingencies that will determine the possibilities for knowledge recombination rents within a portfolio of relationships; next, we discuss the managerial implications of each proposition; and finally, we discuss conclusions, limitations and future research directions.
Model development

Extension of the concept of relational rents to the portfolio level

The foundational theory upon which our theoretical model is constructed is that of the RV. This theory states that a relationship can provide a unique source of profit through the jointly created and idiosyncratic elements developed within the context of an inter-organizational relation (Dyer and Singh, 1998). This type of profit is known as relational rent and is defined as:

\[
\text{supernormal profit jointly generated in an exchange relationship that cannot be generated by either firm in isolation and can only be created through the joint idiosyncratic contributions of the specific alliance partners. (Dyer and Singh, 1998, p. 662)}
\]

In this paper, we adopt an extended concept of relational rent that draws upon the concepts of appropriated relational rents and spillover rents (Lavie, 2006). Appropriated relational rents come from the “real” interaction between two parties, i.e. they are outcomes of the process of sharing resources. In Lavie’s vision, they are called “appropriated” in as much as jointly achieved outcomes can be appropriated depending upon the absorptive capacity, bargain power and opportunism of the parties to the relationship. Spillover rents, also known as knowledge leakages, are rents derived from an unintended effect of leveraging a resource. Examples of such spillovers include the imitation of technologies, business models or productive layouts and the copying of patented products. Opportunistic behavior, bargaining power and absorptive capacity have positive influences on the creation of these rents while mechanisms of isolation reduce it (Lavie, 2006).

Our model uses Lavie’s (2006) concept of extended relational rent to explore how knowledge is transferred and recombined within the firm’s portfolio of inter-organizational relationships, which we conceptualize as the ego-network space that consists of the set of relationships a firm has with other organizations and the recombination of different firms’ knowledge patrimonies (e.g. Jin-Hai et al., 2003; Kogut and Zander, 1992; LeLoarne and Maalaoui, 2015). Indeed, we argue that a complete understanding of relational rents can only be achieved with a complex three level model consisting of: internal rents, i.e. the idiosyncratic combination of internal resources and capability belonging to a firm; relational rents, i.e. the appropriated relational rents and spillovers, which are the idiosyncratic synergies achievable in a relationship (Lavie, 2006); and finally, knowledge recombination rents that are achieved at the portfolio level. In the RV literature, the final perspective is underdeveloped (Provan et al., 2007) and will be developed within our model.

The three pillars of knowledge recombination rents

Our concept of knowledge recombination rents consists of three pillars, which are presented in Table I.

The first pillar delineates what knowledge recombination rents are. Our basic definition of knowledge recombination rent is the rent that results from the recombination of multiple knowledges among multiple relationship partners. This represents a departure from the

<table>
<thead>
<tr>
<th>What?</th>
<th>Recombination of knowledge obtained or spilled from a partner with the ones obtained or spilled from one or more partners</th>
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<tr>
<td>How?</td>
<td>The range of opportunities to recombine derives from the network (Potential knowledge recombination rents), but real recombination happens only into an alliance context with a specific partner (Realized knowledge recombination rents)</td>
</tr>
<tr>
<td>When?</td>
<td>To facilitate the process of creation of potential rents, the network should assume specific configurations in accord with endogenous firm conditions (internal fit) and exogenous contingences of the network itself (external fit)</td>
</tr>
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Table I.
The “three pillars” of the knowledge recombination rents
extant literature, which has tended to focus on the recombination of knowledge between two relationship partners (e.g. Lavie, 2006).

The second pillar concerns how these rents are generated. To understand this, we need to differentiate between potential and realized knowledge recombination rents. Potential recombination rents are the range of opportunities that exist to recombine knowledge within a portfolio of inter-organizational relationships. As we premised, our model explains how to evaluate and spot potential knowledge recombination rents that can arise from a specific configuration of a firm’s inter-organizational relationships portfolio. Thus, in line with an RV approach (Dyer and Singh, 1998), we are concerned about individuating specific conditions and configurations of a portfolio.

Realized recombination rents instead are those that the firm is actually able to appropriate within the real relationship context. This second step instead is more related to the dynamic capabilities possessed by the firm, such as its relational capability and absorption capacity just to name a few of the most important for these matters (Lorenzoni and Lipparini, 1999; Zollo and Winter, 2002). However, due to space constrains, this second aspect is not included in the present study.

Figure 1 visually summarizes the two pillars stressed up to this point. The focal firm in a relationship context gets access to internal, appropriated and spillover rents, which do not depend upon the firm’s involvement within a network. The potential to earn knowledge recombination rents starts when the focal firm strategically interprets the possibility to recombine one of its precedent rents with other rents obtained or obtainable in other relationship contexts. In the end, the realization of these potential rents will depend upon the relationship context, the firm’s dynamic capabilities, and the interaction between the focal firm and its partner.

“When” is the third and final pillar of our definition and concerns the conditions under which knowledge recombination rents at the level of the portfolio can be increased or reduced. The third pillar is the central contribution of our model. We adopt a contingency approach, since different contingencies, either internal or external, experienced by the focal firm require different adjustments and alignments to find a fit within the inter-organizational portfolio (Miles et al., 1978). So, our definition of fit is related to an
intentional searched accordance between relevant firm’s conditions and the ego-network of relationships possessed in order to boost the performance (Zajac et al., 2000). In the specific case, an internal fit is a positive condition of alignment between internal elements of the firm and the portfolio which leads to the creation of what we termed internal knowledge recombination rents. An external fit instead regards a positive condition of alignment between external (relational) elements of the firm and the portfolio which leads to the creation of what we termed external knowledge recombination rents.

These fits will be discussed in more detail in the following sections.

Internal knowledge recombination rents (internal fit)
The first contingencies that we will be presented in our model are those related to internal fit. There are two types of contingency presented: evolution stage and strategy, which need to find alignment with the portfolio, thus a fit.

Evolution stage fit. The first element with which the portfolio should find an alignment and a fit is the evolution stage. We refer to this element as the life stage of a firm in which we may distinguish two phases. The first is related to the “infancy of firm” from its formation to its survival (Davidsson and Honig, 2003), while the maturity phase can be regarded as the stage in which a firm has been established and created a source of competitive advantage within its industry (Gargiulo and Benassi, 2000). This stage also includes episodes of crises, decline and rejuvenation (e.g. McKinley, 1993; Stopford and Baden-Fuller, 1990).

To develop our propositions on the fit of the evolution stage, we draw upon the entrepreneurial literature. Although new entrepreneurs are often innovators within their industries (Christensen and Bower, 1996; LeLoarne and Maalaoui, 2015; Rothaermel, 2001), they encounter significant challenges, such as demonstrating their worth to the industry and striving against competitive pressures within a scarce-resource environment. Hence, the core ability of new entrepreneurs is to successfully attain, at minimum cost, the necessary resources needed to compete while often having to rely only on what is at hand, such as their existing relations and kinships (Hanlon and Saunders, 2007).

Intuitively, it is easier for new entrepreneurs to succeed when supported by a social structure constituted by a high number of bonding ties with embedded elements of trust, mutual reciprocity and strong emotional commitment that transcend purely rational and economic logics (Chung et al., 2006; Huggins, 2010; Zhao, 2014). When implementing entrepreneurial strategies, these networks will likely obtain better results than networks constituted by relationships based on a more transactional logic, such as relations with new business partners (Hoang and Antoncic, 2003). This is consistent with the perspective of transaction cost economics in which strong ties are built upon reiterated exchanges with the same partner, who becomes increasingly trustworthy and incurs lower transactions costs as a result (Williamson, 1975).

For new entrepreneurs within an industry, newness is often a liability as much as a benefit but it is a liability that can be offset through establishing a portfolio of collaborative relationships that forms a network of bonding ties (Abatecola et al., 2012). First, the new companies often need to cooperate (chiefly with the incumbents) due to a resource endowment that is not yet completely developed, e.g. in biotechnology industry the young firms are often very research oriented but may lack commercial experience (Durand et al., 2008; Hine and Kapeleris, 2006; Powell et al., 1996). Second, young ventures can exploit collaborations with high-status incumbents to signal to the market their reliability as an enterprise (Stuart et al., 1999), for example, encouraging venture capitalists to invest (MacMillan et al., 1985). Further, working with well-known partners and within a close network will ensure that behavior that might considered deviant within the industry is censured (Davidsson and Honig, 2003).
This ability to meet the expectations of the market through relationships with industry incumbents gives the new ventures “legitimacy” (Lacam and Salvetat, 2017; Zimmerman and Zeitz, 2002), which requires the new firm to repeatedly abide by the rules and norms of within the industry. This is in line with our extended definition of knowledge recombination rents in which value is created through a series of positive feedback loops between the new firm and industry incumbents (e.g. Batocchio et al., 2016). This is confirmed in many empirical studies. For instance, Yli-Renko et al. (2001) found that young knowledge-based firms perform better if they have repeated and intense interactions with industry incumbents. Similarly, Hansen (1995) found that for start-up companies the closure of their ego-network and the frequency of interactions within the network were the most important predictors of growth, especially when these variables are co-present.

In conclusion, new entrepreneurs need a portfolio of inter-organizational relationships that form a relatively closed network of closely tied actors in order to: receive support, access resources and capabilities, gain legitimacy and protect themselves from opportunism (Hanlon and Saunders, 2007; Zhao, 2014). This leads us the development of our first propositions:

**P1a.** In a start-up phase, a portfolio structure with a predominance of bonding ties, which forms a close network structure, will be most favorable to the creation of knowledge recombination rents.

**P1b.** In a start-up phase, a portfolio structure with a predominance of bridging ties, which forms a sparse network structure, is unfavorable to the creation of knowledge recombination rents.

Contrary seems to be the situation after the success of a firm on the market; to analyze this firm contingency in respect to its portfolio, we draw upon the literature on network and structural holes (e.g. Burt, 2000). The incumbents within an industry often struggle to respond to the rapid, and often radical, changes in technology affecting their industries (Christensen and Bower, 1996). Therefore, establishing relationships with innovative new ventures is a well-established method to respond to the problem of breakthrough technology (Hoang and Antoncic, 2003). Nevertheless, embarking upon relationships with these businesses is not a risk-free activity for incumbent firms (Rothaermel, 2001). To manage the risks of working with unknown business partners, incumbents are advised to maintain relationships with a wide range of new ventures and have flexible agreements in place (Williamson, 1991). This portfolio structure would consist of bridging ties and allow the incumbent to reach a broker position within the network, reaping the advantages of accessing from different sources a large amount of knowledge (Burt, 2000; Lacam and Salvetat, 2017).

There will still be the need for firms to maintain strong ties with strategic partners, however. For this reason, some authors have proposed the construction of a balanced network structure, also called “dual network structure” (Capaldo, 2007; Tiwana, 2008; Zaheer and Bell, 2005). Such structure consists of a “network core” formed by few and strategic partners with whom the focal firm shares a bonding tie; and a myriad of bridging ties related to a large and unconnected periphery of other partners. A dual network relieves the redundancy of information, thanks to the ability of the focal firms to access a large and unconnected set of loosely tied partners within the periphery of the network. However, at the same time, it fosters innovation, thanks to having few bonding ties with strategic partners at the core of the network. This leads to the development of our second set of propositions:

**P2a.** In a maturity phase, a portfolio structure with a predominance of bonding ties, which forms a close network structure, is favorable to the creation of knowledge recombination rents.
P2b. In a maturity phase, a portfolio structure with a predominance of bridging ties, which forms a sparse network structure, is favorable to the creation of knowledge recombination rents.

P2c. In a maturity phase, a portfolio structure with a dual network structure, is more favorable than a sparse network structure to the creation of knowledge recombination rents.

Strategy fit. The second contingency that should find a fit with a firm inter-organizational portfolio concerns the strategic goals of firms participating in the relationships. To do this, we draw upon March’s (1991) Exploitation–Exploration framework. Exploitation strategies aim to refine existing knowledge, competencies and technologies, in other words the concern the uses of knowledge already possessed while exploration strategies are more experimental. The firm in this case engages in scanning activities and aims to discovering novel knowledge previously not available for the company and opportunities to get access to it. March’s (1991) framework is widely applied to alliance and network studies (e.g. Lavie and Rosenkopf, 2006; Lavikka et al., 2015; Yamakawa et al., 2011).

Firms engage in exploitation relationships with the intention pooling together complementary resources and knowledge to better use the actual patrimony they already possess (Koza and Lewin, 1998). In such cases, agreements usually take the form of equity investments, licensing or franchising agreement and emphasis is on results and control over the process, since at stake there is firm’s already consolidated knowledge (Lavie and Rosenkopf, 2006). In contrast, an exploration relationship is more likely to be used as a means to penetrate new markets, to develop new products and technological opportunities, and usually takes the form of an open-ended agreement, e.g. an R&D agreement or a learning joint venture. In such agreements, the emphasis is less on results and more on the interaction itself (Yamakawa et al., 2011). Beckman et al. (2004) assert that exploration relationship strategies are executed by enlarging the size of network by creating new social interactions with new partners, while exploitation strategies reinforce existing relationships by reinforcing connections with the same partners (Woolfall, 2006). Most of the authors (e.g. Rothaermel and Deeds, 2004) agreed on the idea that explorative and exploitative strategies can experience a fertile environment in a certain structure of the focal firm’s relationships portfolio.

Exploitation strategies will be more effective when supported by a nexus of dense and cohesive relationships (e.g. Dyer and Nobeoka, 2000; Kogut, 2000), due to the fact that easy mobilization of resources and tacit knowledge, and cooperation possible through bonding ties seem more proper (Obstfeld, 2005; Reagans and McEvily, 2003).

In contrast, exploration strategies rely mostly on the creation of new ties with new actors, which allows them to access novel knowledge and possibly the knowledge available through the networks of these actors (Podolny and Baron, 1997). The creation of novel ideas in a close-knit structure can be drastically reduced due to isomorphism and standardization of knowledge’s flows inside it (Burt, 1992; Gargiulo and Benassi, 2000), that instead is vital in a not well-defined context along with dynamicity and flexibility (Sidhu et al., 2007).

It has been observed that firms can have a “firm-genetic inclination” toward either an exploitation and exploration relationship strategy (Lavie and Rosenkopf, 2006; Rothaermel and Deeds, 2004; Yamakawa et al., 2011). This is because exploration and exploitation strategies can enact self-reinforcing loops. Exploration strategies are more uncertain than exploitation strategies and promote continuous and simultaneous investments in similarly explorative projects, partly to hedge the risk of failure in one project. Exploitation strategies, which tend to be more focused on outcomes within a short period, can be more alluring to managers under pressure to produce quick returns, for example due to pressure from
shareholders or to increase their personal prestige quickly (Gupta et al., 2006). So either knowledge explorative or exploitative claim for more and successive same-type strategies to accelerate the process of obtaining results (Lavie and Rosenkopf, 2006). Therefore we can propose:

P3. Pursuing an exploitation strategy reinforces the creation of knowledge recombination rents if the firm possesses a close network structure.

P4. Pursuing an exploration strategy reinforces the creation of knowledge recombination rents if the firm possesses a sparse network structure.

To conclude, we can detect a possible “combined effect” that evolution stage and strategy can have in respect to the fit with a relationships portfolio. Giving the fact that entrepreneurial young ventures have an advantage relying on bonding affiliations and the creation of a close and dense network is favorable to an exploitation strategy, it is possible to highlight a strong potential for knowledge recombination rents using exploitation strategy in start-up phase to achieve simultaneous meliorations (e.g. Hine and Kapeleris, 2006; Yamakawa et al., 2011). For an established corporation, instead, the opposite is exactly true: pursuing an exploration strategy is positive from several perspectives (Burt, 1992; Zahra, 2010).

**External knowledge recombination rents (external fit)**

The second group of contingencies presented in our model are those related to external fit, so the alignment that relationships may find with the overall structure of a firm’s portfolio. There are two types of contingency presented: past ties fit, so the “legacy” of previous relationships, and actual ties fit. Indeed from a dynamic angle, the formation of new partnerships deals with a structure of social interactions already constituted (actual network) and a history of interactions (past ties) (Ozcan and Eisenhardt, 2009; Parise and Casher, 2003).

**Past ties fit.** For analyzing this fit, we draw upon literature related to the alliances and particularly the value of experience in such interactions (e.g. Gulati et al., 2009). Many studies have argued that experience can improve the performance of inter-organizational relationships (e.g. Heimeriks et al., 2009; Koza and Lewin, 1998; Lavie and Rosenkopf, 2006; Lorenzoni and Lipparinii, 1999) due to the fact that proficiency in dealing with activities of partnerships in general or with specific partners can increase potential benefits. Know-how accrued from precedent partnerships can help improve a firm’s relationship management capabilities and establish routines for selecting partners and monitoring the performance of a relationship (Liebeskind et al., 1996). These capabilities are known as “relational capabilities” within the literature (Dyer and Singh, 1998; Lorenzoni and Lipparinii, 1999), i.e. the ability to identify relationship opportunities, manage interactive relationships and establish relational routines (Gulati et al., 2009). As we premised however, we are not interested in studying the actual processes that lead to the appropriation of such potential value that would be a pure dynamic capabilities approach (Zollo and Winter, 2002); rather we are arguing that the existence of a more developed stock of relational capabilities (Koza and Lewin, 1998) offers per se potential value for knowledge recombination and its rents.

In the extant literature, disagreement exists on what exactly should be considered “experience.” We can refer to two types of experience capital: the general and the specific ones; both predict that potential rents will decrease as the network of relationships increases in size and stabilizing over time (Heimeriks and Duysters, 2007; Kale and Singh, 2007; Woolfall, 2006). We will start our discussion with the specific experience that is the set of precedent contacts with the same partner (Wassmer, 2010). While we broadly agree with this conceptualization of experience, there are other kinds of specificity that experience can
have beyond the partner interactions. Markedly, we are drawing upon our considerations in the strategy fit section, to propose a strategy of specific experience (Koza and Lewin, 1998; Lavie and Rosenkopf, 2006). We have already pointed out how strategies are conservative in nature, since company actions, especially when they are successful, tend to result in the institutionalization of successful routines (Nelson and Winter, 1985), including relational routines (Parise and Casher, 2003).

There are two types specific experience: exploitation experience and exploration experience. Exploitation experience is created by routines that are established to improve the implementation of actions, while exploration experience consists of recombining novel knowledge (Finkelstein, 2009). In this case, not all of experiences can affect both future strategies outcomes (Heimeriks et al., 2009). What we propose is near to the concept of “diversity of ties” but applies to the context of past relationships, that is directing attention on “cluster” of relations similar for attributes of partners firms or knowledge to manage (Jiang et al., 2010; Lavie and Rosenkopf, 2006; Ozcan and Eisenhardt, 2009; Phelps, 2010).

For every new social interaction settled by a corporation concordant in type with the previous ones, management can structure, collaborate and control the new relationship in the best way they know. In the case of a non-concordant strategy, it can exist an “organizational inertia” (Lavie and Rosenkopf, 2006) since for the management is easier to continue applying company’s consolidated routines. But this does not consider important divergent learning paths and interaction diversity, which can sharply diminish potential outcomes of a relationship. For example, exploitation is based on short-term results and its control is result oriented, while in exploration strategy, with its uncertainty, the control is process oriented (Gupta et al., 2006; Koza and Lewin, 1998; Rothaermel, 2001; Yamakawa et al., 2011). That implies a completely different contract structuring and forma mentis approach to strategy. Applying a mistaken repertory of routines, inevitably fosters the failure of a relationship. It seems plausible that such specific experience has a direct influence on potential relationship gains due to a specialization of routines directly applicable to a strategy context, or at least they can be given as rules for structuring and governing the relationship process. Thus, we postulate:

**P5a.** A relationship increases the creation of knowledge recombination rents if a firm possesses a concordant specific experience.

**P5b.** A relationship hinders the creation of knowledge recombination rents if a firm possesses a non-concordant specific experience.

Considering instead, general experience can be related to every previous firm’s interactions (Gulati et al., 2009), and as pointed out by successive works of Kale and Singh (2007, 2009) and Heimeriks and Duysters (2007), Heimeriks et al. (2009) this type of experience supports the success of a relationship only in an indirect way. This also appraises general experience as less relevant in performance outcomes compared the specific one (Wassmer, 2010). General experience so is helpful only when consents a better relationship process and learning thanks to the codification and sharing of explicit knowledge (Holmberg and Cummings, 2009). To facilitate such transfer of best practices, management should be forced to dedicate attention to the such problem (Kale and Singh, 2007; Parise and Casher, 2003), having managerial roles specifically dedicated to partnerships, such as an alliance manager or in some cases even a dedicated function. Therefore, we propose:

**P6.** A new tie despite its nature can increase the creation of knowledge recombination rents if the firm possesses formal structure and/or routines dedicated to the relationship process.
Actual ties fit. A crucial aspect of knowledge recombination rents creation in the same portfolio is the possibility to share resources among several relationships. Vassolo et al. (2004), for instance, accredited that a portfolio which is full of competing projects has a sub-additive effects on each one. This is closely coupled to the concepts of real options where the firm must choose between incompatible projects. In contrast, shared resources across relationships have the potential to create economies of scope and can have a super-additive effect upon a firm’s portfolio of inter-organizational relationships.

Lavie (2009) considers the effect of having competing relationship partners in a firm’s portfolio, also known as coopetition (Le Roy and Czakon, 2016). If a direct (bilateral) coopetition can weaken the results of a relationship, the competition among partners (multilateral coopetition) can strengthen the power of the focal firm which is in a position to gain more potential profits. For example, empirical insights from a recent review on coopetition (Le Roy and Czakon, 2016) show how in network environments cooperation with competitors led to better performance. Nevertheless, the problem of competing partners is controversial, whereas a venture can be advantageous having competing firms in its portfolio if this process is not coupled with a strong process of communication and trust, partners can decide to interrupt their relations (White and Siu-Yun Lui, 2005). However, this last concern is more based on the process of appropriation of rents, that is beyond the scope of our paper. To conclude our model, we present the following propositions:

P7a. A new tie, despite its nature, can ameliorate the creation of knowledge recombination rents if it relies upon shared resources with other ties.

P7b. A new tie, despite its nature, can reduce the creation of knowledge recombination rents if it relies upon competing resources with other ties.

Managerial implications and suggestions
In the below list, a summary of the whole set of propositions we created is reported:

- Internal fit: P1a, P1b, P2a, P2b, P2c, P3, P4.
- External fit: P5a, P5b, P6, P7a, P7b.

This paper has the ambitious aim of structuring a model that can easily offer a “map” to evaluate many implications of starting a new collaboration in relation to its impact in terms of increase or decrease of the network value of the whole portfolio.

In relation to the evolution stage, our model would represent an encouragement for entrepreneurs/start-uppers to invest heavily in external collaboration with the aim of fast-developing strong relations that can last (Lacam and Salvetat, 2017; Reagans and McEvily, 2003). This approach would “quickly” accrue a consistent stock of social capital, which can be leveraged to get access to external resources and partners’ skills (Yli-Renko et al., 2001) (P1a). Due to a lack of well-developed internal capital, especially in terms of human and financial capital, instead it is not recommendable to interact and partner only with arm-length partners or on a sporadic basis since the cost of controlling the relation would be too high (White and Siu-Yun Lui, 2005; Williamson, 1975) (P1b).

For an established business, instead, the situation is almost the reverse. Partnering only with well-known counterparts, may trap the firm in its own strategic space (Uzzi, 1997; Wassmer, 2010), reducing the possibility to renovate social capital and to span the traditional competition territories (proposition 2a). This approach may indeed pose the firm in a strong defensive position rather than be proactive and catch or even promote market changes, that can be better addressed by continuously exploring new partnerships (Rothaermel, 2001) (P2b). However, as proposed, a balance view seems to be the best solution: a bundle of partners who can really sustain the implementation of any strategic

Knowledge transfer within relationship portfolios
action (Batocchio et al., 2016), coupled with a larger in number “periphery” represented by new relationships to sound the competitive arena and track new innovation leads (Capaldo, 2007; Tiwana, 2008) (P2c). Thus, for relationship managers of established companies, the suggestion is to carefully map the whole set of firm’s relations to evaluate those more strategic to be kept stable, while continuously engaging with new explorative collaborations (Lavikka et al., 2015).

In relation to the strategy adopted, we would recommend investing in relational resources to partner with trustful and well-known partners when the firm’s strategy is devoted to exploit and consolidate positions and rip benefits of an innovation, for example (Ozcan and Eisenhardt, 2009). In this case, strong relations will definitely help in implementing and executing such actions (Batocchio et al., 2016) since the adaption capability in the knowledge transfer will be higher (Williams, 2007) with minor coordination costs (White and Siu-Yun Lui, 2005; Williamson, 1991) (P3). Contrary, due to the intrinsic uncertainty of an exploratory project, the firm and its relationship managers should engage with a plurality of subjects that gradually will be evaluated and in case replaced (White and Siu-Yun Lui, 2005) if not of a transversal utility among different knowledge platform (Lavikka et al., 2015) (P4).

Looking at the experiences of firms in dealing with alliances and collaborative relationships, we have pointed out how a specific strategy experience in partnering may improve the ability to recombine the knowledge coming from that type of interaction (P5a) thanks a better adaption (Williams, 2007). However, this effect may also create a path dependency (Koka and Prescott, 2008; Zollo and Winter, 2002), which may lead to reiterate an erroneous adaption to of knowledge transfer in case of changing strategy (P5b). To moderate this clashing effects, we encourage any firms to establish formal structures that could keep track of repertory routine so that the tacit knowledge derivate from the experience may be replicate in an easier manner (Ozcan and Eisenhardt, 2009; Williams, 2007) (P6).

Finally, in terms of sharing of resources among different relationships, relying on the possibility of replication of routines and with non-exclusive resources (Williamson, 1991) may increase the potential creation of network value (P7a). Instead for the opposite condition, i.e. locking-in resources to specific relationships may reduce the ability to leverage them on different projects (Le Roy and Czakon, 2016), and the relative synergetic value arising (P7b).

Conclusion
In the last two decades, inter-organizational relationships have become increasingly important to the survival and success of firms, especially those firms whose competitive advantage depends upon innovation (e.g. Chung et al., 2006). Few contributions have approached in a comprehensive way the problem of potential transfers of knowledge within a portfolio of relationships. The prevalent literature deals with partnerships individually in a dyadic perspective even if multiple relations co-exist and, thus, analyses of this type completely disregard potential interactions that multiple ties could have (Lavie, 2009).

Our work aims to confer a theoretical orienting compass, in the tradition of RV, which propose to a fit (Zajac et al., 2000) a contingent variable, either internal or external, in relation to a firm’s relationships portfolio. Contributing to a growing field of research (e.g. Zhao, 2014), we presented a holistic framework on the network rents, especially dedicated to the simultaneous management of more than one tie.

Our main contributions to the literature are basically two: first, we clearly defined the concept of knowledge recombination rents applied to a firm’s inter-organizational portfolio; and, second, we inquired which contingencies may hinder or propel the creation of such rents. Our concept goes beyond the dyadic relational rents since refers to network rents
specifically the ones arising from the recombination of knowledge within a firm’s ego-network. This affirms again that the value of a knowledge transfer is not always and only determined by the exchange itself. Rather, such value can be increased after the exchange thanks to a recombination with other “pieces” of knowledge obtainable from the firm’s network, so related to other business relationships (Woolfall, 2006).

Regarding our second contribution, a first category of conditions, evolution stage and contents of strategy, relates to the internal situation of the firm and how this should be aligned with the portfolio structure for boosting recombination of knowledge in the network space (internal knowledge recombination rents). The second category of conditions considers the portfolio itself. The knowledge transfer can be increased in state of consonance of the overall portfolio (actual ties fit) and/or of previous experience (past ties fits) (external knowledge recombination rents).

The value of our model is to have put together, in a same framework, all the vital attributes to look at, beyond the partnerships dyadic level. Such theoretical contributions combined represent also strong managerial implications of this work; first our work indicates an additional crucial area of attention for relationship managers as much as any other manager involved in external partnerships, such as an R&D director, an alliance manager, a supply chain manager and not least the whole general direction. Such managers should pay equally attention to the dyadic level of the relation (Dyer and Singh, 1998; Lavie, 2006), which represents the actual value of the relation and of the knowledge transfer, but also to the value that such knowledge can acquire after the exchange, thanks indeed to a recombination. While traditional practitioner-oriented literature about alliance managers (e.g. Lynch, 1993; Spekman et al., 2000) considers mostly the first aspect, in recent evolutions (e.g. Zoogah and Peng, 2011) a general emphasis on the adaptive capacity of such a manager to design a coherent portfolio is much more prominent and we echo such claims. Yet, we offered a quite detail and practical tool formed by seven propositions that should be checked before engaging with a new relationship as detailed reported in the managerial implication section. The possibility of evaluating ex ante, not only the value of the relationship but also its potential to increase firm performance after the interaction, is a powerful tool at disposition of alliance managers or any other manager deputy to the management of external relationships.

We see particularly two contexts where our model and its application could be crucial: the first is in relation to a firm with an incumbent position (Christensen and Bower, 1996), that it is not favorable to radically innovate. Thus, the primary task of a relationship manager is structuring a relationship portfolio that can sustain innovation and delivering externally the strategic renewal not achievable internally (e.g. Liebeskind et al., 1996; Rothaermel, 2001). However, in doing so the consideration of the specific past experience should be taken into account, as we shown in our P3 and P4. Yet, a manager should try to continuously renovate the geometry of its relationship portfolio, as shown in P2a–P2c. The ability of a manager to control in advance the impacts of a new collaboration results similarly crucial in situations of strong ambiguity, for example where to clearly assess the effects of a relationship the time span is quite long. Examples of this could be referred to the biotechnology sector where a trial conclusion and the related approval from the public agency (e.g. Food and Drug Agency (FDA) in USA) may take years, usually more than ten; a period long enough to seriously compromise the ability company to survive if a wrong relationship is started. The possibility of having an ex ante detailed evaluation of the fit of a new collaboration with the regards of the overall portfolio structure can reduce the risk of uncertainty and the negative effects.

Further research in relation to our study can be moved in two directions: an interpretation of the appropriation scheme for the knowledge recombination rents, moving from a potential to a concrete level of incremented firm performance. Also, an empirical
validation of our proposition must be done to strengthen our results. One good applicative example is represented by the whole technology- and knowledge-intense sector such as the biotechnology and pharmaceutics, Internet of things and the 2.0 web (e.g. Caputo et al., 2016; Trequattrini et al., 2016). Moreover, future research could investigate the impact of knowledge recombination rents in the different phases of a maturity stage of firm, particularly, it would be interesting to understand how they would impact phases of crisis, decline and rejuvenation (e.g. McKinley, 1993; Stopford and Baden-Fuller, 1990).

A limitation of our study is the broad generalization that we made in our propositions, which can be affected also by other conditions independent from what we have called internal and external fits. These considerations are rooted in the general environments, like a balancing effect in the relationship portfolio pertinent to the geographic localization of the firm (the cluster or district effect) (Lacam and Salvetat, 2017) or the structural situation of the industry which can widely change the general proactive orientation of those engaging in partnerships.

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Knowledge transfer in a start-up craft brewery

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Abstract

Purpose – The purpose of this paper is to explore the role of the entrepreneur in the knowledge transfer (KT) process of a start-up enterprise and the ways that role should change during the development phase to ensure mid-term business survival and growth.

Design/methodology/approach – An in-depth, qualitative case study of Birra Flea, an Italian Craft Brewery, is presented and analysed using Liyanage et al.’s (2009) framework to identify the key components of the KT process, including relevant knowledge, key actors, transfer steps and the criteria for assessing its effectiveness and success.

Findings – The entrepreneur played a fundamental and crucial role in the start-up process, acting as a selective and passionate broker for the KT process. As Birra Flea matures and moves into the development phase, the role of the entrepreneur as KT’s champion needs to be integrated and distributed throughout the organisation, with the entrepreneur serving as a performance controller.

Research limitations/implications – This study enriches the knowledge management literature by applying a framework designed to provide a general description of KT, with some modifications, to a single case study to demonstrate its effectiveness in differentiating types of knowledge and outlining how KT can be configured to support essential business functions in an SME.

Practical implications – The analysis systematises the KT mechanisms that govern the start-up phase of an award-winning SME, with suggestions for how to manage KT during the development phase. Seldom are practitioners given insight into the mechanics of a successful SME start-up; this analysis serves as a practical guide for those wishing to implement effective KT strategies to emulate Birra Flea’s success.

Originality/value – The world’s economy thrives on SMEs, yet many fail as start-ups before they even have a chance to reach the development phase, presenting a motivation to study the early stages of SMEs. This study addresses that gap with an in-depth theoretical analysis of successful, effective KT processes in an SME, along with practical implications to enhance the knowledge, experience and skills of the actors that sustain these vital economic enterprises.

Keywords Knowledge transfer in start-ups, SME start-ups, SME development, SME business processes, Craft beer

Paper type Case study

Introduction

Through a case study of Birra Flea, an Italian Craft Brewery founded by entrepreneur Matteo Minelli, we explore the changing role of entrepreneurs in the knowledge transfer (KT) process during the start-up and development phases of an SME. Birra Flea is an interesting business that is constantly growing. Due to an advantageous connection between one of the authors and Minelli, Minelli’s role is analysed with a particular focus on his ability to engage other people in the process of establishing the brewery.

KT is recognised a process that is laborious, time-consuming and difficult, and is often thought of as costless and instantaneous (Szulanski, 2000). And the lack of a clear-cut
definition or proven best practice means KT is not easily understood. In this paper, we use Liyanage et al.’s (2009, p. 122) model of KT to analyse the process of KT from an entrepreneur to the managers that will ultimately see the start-up succeed or fail. Liyanage et al. describe KT as follows:

Knowledge transfer is about identifying (accessible) knowledge that already exists, acquiring it and subsequently applying this knowledge to develop new ideas or enhance the existing ideas to make a process/action faster, better or safer than they would have otherwise been. So, basically knowledge transfer is not only about exploiting accessible resources, i.e. knowledge, but also about how to acquire and absorb it well to make things more efficient and effective.

SMEs are widely considered to be the lungs of the world economy (Massaro et al., 2016), yet only 50 per cent survive beyond five years (Wee and Chua, 2013). Such stark statistics provide a compelling motivation to study the early stages of SME development and the actors that breathe life into these vital economic enterprises, making their knowledge management practices particularly important. In fact, where competition is not based on physical and financial capital, as is typically the case for SMEs, the knowledge, experience and skills of the people involved in a business become especially relevant to its survival (Man et al., 2002).

Through this empirical case study, we seek to describe the role of the entrepreneur in driving business performance from a KT perspective. We also provide practical insights to improve the long-term resilience of SMEs. A literature review of learning through KT in SME start-ups is provided as background, followed by our research question. We then present the Birra Flea case study using Liyanage et al.’s (2009) framework to identify the key components of the KT process for analysis. Our findings, conclusions and perspectives on future research complete the paper.

Literature review
This literature review explores how small enterprises, especially start-ups, use knowledge to begin and grow. Knowledge plays a crucial role in creating value for companies and has a major influence on their survival. Penrose (1959) outlines two kinds of knowledge relevant to a company’s success: entrepreneurial knowledge and managerial knowledge. Entrepreneurial knowledge relates to an individual recognising and developing a business opportunity, and managerial knowledge refers to developing the business processes associated with that opportunity. To understand the learning mechanisms that govern the development of each type of knowledge in the context of our investigation, the following sub-sections outline learning and KT in SMEs as they start-up and then develop. The literature review concludes with our research question.

KT in SMEs and start-ups
Massaro et al. (2016) argue that resource constraints, coupled with different managerial capabilities and processes, result in different knowledge management processes for SMEs than for larger companies – a position that has found some consensus over the past few years (Wong and Aspinwall, 2004; Desouza and Awazu, 2006; Durst and Edvardsson, 2012; Wee and Chua, 2013). Wong and Aspinwall (2004) were among the first to “redress the imbalance by putting KM [knowledge management] in the context of small business”. Contrary to scholarly thinking at the time, they supported the idea that SMEs have specific features that need to be understood before appropriate knowledge management practices can be implemented. Even if the main differences between SMEs and large companies are the size and their level of resources, they also have different characteristics, ideas and needs. Expanding on this thinking, Desouza and Awazu (2006) outlined five aspects of knowledge management peculiar to SMEs: the dominance of socialisation in the SECI cycle (Nonaka, 1991; Nonaka and Takeuchi, 1995; Nonaka and Toyama, 2003); the prominence of common
knowledge; a moderate fear of losing knowledge through employee attrition; a tendency to exploit external sources of knowledge; and the centrality of people in knowledge management practices. Their study concludes with the assertion that it is wrong to assume an SME’s KM practices are similar to larger organisations.

Durst and Edvardsson (2012) provide further important insights, explaining that SMEs are different from big companies because SMEs tend to be informal and non-bureaucratic with few rules or structures. Also, controls tend to be based on the owner/manager’s personal supervision. Coupling this kind of structure with a lack of financial sources and expertise (Bridge and O’Neill, 2012) contributes to a concentration of knowledge in the mind of the owner and a few key employees (Durst and Edvardsson, 2012), which ultimately leads to an informal type of KT. Wong and Aspinwall (2004) describe informal KT as “corridor knowledge sharing”. Durst and Wilhelm (2012) describe it as knowledge sharing during company birthday parties.

In analysing why KT is so important for SME start-ups, part of the answer is given by Wee and Chua (2013), who argue that less than half of SMEs survive beyond their fifth year. Man et al. (2002) argue that where competition is not based on physical and financial capital, the knowledge, experience and skills of the business’s owner and its employees become especially relevant to the company’s survival. Given that intellectual capital (Cuozzo et al., 2017) is, arguably, the most abundant asset for most SMEs when starting up, these claims when combined make the knowledge management practices of SMEs particularly important. The social and economic importance of SMEs has led other scholars to study start-up processes, with contributions that impact on the KT literature. For instance, Kolvereid and Isaksen (2006) studied start-ups in the Norwegian context, noting the importance of transferring the entrepreneur’s knowledge to business processes in order to create new business ventures with positive occupational impacts.

**Learning during the start-up and development phases of SMEs**

There is particular interest within knowledge management research on the development of small firms and the role that creating, capturing and transferring knowledge plays in Penrose’s (1959) argument – i.e. that business expansion is associated with the acquisition and application of knowledge (Yli-Renko et al., 2001; Bell et al., 2004; Acs et al., 2009) and with internationalisation (Kuivalainen et al., 2012).

Zhang et al. (2006) conceptualise the SME learning process with a framework based on interviews with managers. The social relevance of SMEs is described as a location of KM practices to provide an important lens on their evolution. They also note an interesting difference between KT in innovative SMEs and stable SMEs. Stable firms are incremental and adaptive, with reactive KT driven by a limited group of individuals, while innovative firms are more proactive in engaging with external environments. Another contribution by Akhavan and Jafari (2007) comes from the Iranian context, where SME learning practices present basically similar characteristics to other contexts (i.e. the interactive participation of employees and a flat structure with CEO support and commitment). Interestingly, their analysis also outlines the absence of a correlation between the implementation of learning practices and the size of the organisation.

KT in SMEs also plays a crucial role in the transition from the start-up phase to the development phase because managing and growing a business is subtly different from the entrepreneurial skills needed to start a business. Furthermore, while creativity and flexibility are “key to initiating the experiences necessary to explore new opportunities, management and technical competence are important” (Macpherson and Holt, 2007, p. 178). Development requires business results and, of course, for the organisation to survive (Hsu, 2006), which is why scholars have explored so many different aspects of this issue. Lee and Jones (2008), for instance, focus on the role new communication instruments play in the
learning process and how entrepreneurs use them to acquire the social capital necessary to support business development. Midler and Silberzahn (2008) use an analytical framework based on three bodies of knowledge – project management, organisational learning, and entrepreneurship – to examine how the development phase of start-ups are managed through a succession of exploration projects. Focussing on Taiwanese high-tech firms, Wu (2007) demonstrates that dynamic capabilities significantly help to leverage entrepreneurial resources that benefit start-up performance. In a similar direction, Van Gelderen et al. (2005) demonstrate that learning is a vital issue when starting a small business because it helps to improve short- and long-term business performance, promotes personal development, and brings a sense of personal satisfaction.

Macpherson and Holt (2007) undertook a dedicated review of the empirical evidence in support of learning in SMEs during start-up and development. They investigate the specific entrepreneurial and organisational factors that impact upon small firm learning and knowledge management and their links to growth, outlining the different aspects discussed within the research stream. Much of the literature deals with the role of the entrepreneur and the management team in terms of their human capital and developing systems of management and social capital, but some focusses on systems and their function in providing absorptive capacity (Alavi and Leidner, 2001).

In terms of entrepreneurial and managerial human capital, scholars attribute the success of the start-up and the growth to the personal aptitude of the entrepreneur and their ability to remain open to learning from experience (Gray and Gonsalves, 2002). In this view, some knowledge sources are identified as key: relevant industry experience (Jo and Lee, 1996), soft managerial skills (Leach and Kenny, 2000) and prior business experience in formal planning (Olson and Bokor, 1995). In other words, research on human capital suggests that entrepreneurial quality (Kakati, 2003) requires a broad range of abilities for translating resources into rents.

Two main aspects of an entrepreneur’s ability to create structures, systems, processes and a culture that enables knowledge application, learning and growth (Barnett and Storey, 2001; Gray and Gonsalves, 2002) have been analysed: the influence of the entrepreneur on the practice of organising; and the entrepreneur’s role in “creating a context in which knowledge and learning are valued” (Macpherson and Holt, 2007, p. 179). This branch of the literature claims that the entrepreneur’s ability to create organisations and activities that support KT and encourage learning is an important antecedent for growth. Nevertheless, some authors clearly state that organisational technologies complement but remain influenced by the entrepreneur’s decision making and technical ability (Choi and Shepherd, 2004; Perren and Grant, 2000; Lefebvre et al., 1995).

Concerning the role of the entrepreneur’s social capital, both personal (Greene, 1997) and professional (Lechner and Dowling, 2003) networks have been analysed as factors able to favour KT: “successful knowledge transfer and learning through network requires specific social skills” (Macpherson and Holt, 2007, p. 180).

Another stream identified by Macpherson and Holt (2007) focusses on systems used as independent knowledge management tools, within and across firm boundaries. Some scholars (Cagliano and Spina, 2002) particularly focus on the distinction between the bureaucratic management systems that support performance management and quality improvement and the systems that support participation, empowerment and innovation (Trequattrini et al., 2016). Another group of studies more explicitly investigates the influence of organisational boundaries, claiming that organisations with the ability to acquire knowledge externally and distribute it internally are more competitive (Lichtenstein and Brush, 2001; Corso et al., 2003; Liao et al., 2003). According to these scholars, systems are adjusted in the exploitation period to expand knowledge, and old systems are abandoned during the exploration period in favour of new ones that capture new intangible sources of knowledge (Macpherson and Holt, 2007).
Moving forward from this literature review, the aim of our research is to explore the role the entrepreneur plays in the KT process of a start-up and how that role changes during the development phase of an enterprise. Therefore, the question guiding our research is:

RQ1. What features characterise an entrepreneur’s KT during the start-up phase of a new enterprise and how might those features change during the development phase?

Research methodology and data collection
A case study methodology is appropriate for answering this research question because it allows researchers to “capture various nuances, patterns, and more latent elements that other research approaches might overlook” (Berg, 2007, p. 318). This is especially so where the actions of participants form the main subject of an investigation. Case studies also allow the use of a comprehensive set of data collection methods (Creswell et al., 2007, p. 75), such as direct observations, participant observations, interviews and the analysis of documentation, archival records, and physical artefacts (Yin, 2014, p. 106). Birra Flea is an appropriate subject for study because it represents a good example of a successful start-up company operating in a unique and growing segment of the craft beer industry. And its development derives from KT processes involving the entrepreneur. For Birra Flea, KT is a relevant and complex process. As researchers, we were provided with an opportunity to investigate issues relevant to our research question in a practical context where the participants’ experiences were critical to the outcome (Bhattacherjee, 2012), but where we had little or no control over their behaviour (Yin, 2014, p. 14). Corroborating our observations with additional data sources allowed us to “clarify meaning by identifying different ways the phenomenon is being seen” (Stake, 2000, p. 444), and to synthesise the evidence and validate our findings through triangulation (Yin, 2014, p. 120). Additionally, these data provided a rich array of evidence for understanding the social and operational context in which KT is implemented, and make that context “intelligible to the reader” (Dyer and Wilkins, 1991, p. 634). Practitioners will be able to translate our findings into day-to-day practice, with an awareness of the steps that are crucial in both the start-up and development phases.

To support our analysis, a research protocol was implemented following the prescriptions stated in Yin (2014). This protocol was used to validate the results in terms of construction, internal, and external validity. Tables I and II present the validation strategy.

Ensuring the selected case is an appropriate subject for study is the first step in internal validation. We chose Birra Flea because of the outstanding results they have achieved compared to the standard growth path of their competitors. While a normal craft brewery would usually take several years from commencing operations to develop a production capacity of 100,000 bottles, Birra Flea was able to ship this amount within six months of their first customer request. Further, one particular characteristic of the case study – the entrepreneur – supports the case study’s internal validity, as, through him, we were able to isolate the business results from the influence of features that are not under consideration.

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<td>External validity</td>
<td>Validation with external references</td>
<td>Construction of the findings</td>
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Table I. Validation of the results
A common critique of the case study methodology involves problems with the generalising the findings. Yin (2014, p. 48) counters that case studies are not designed to provide statistical generalisations. Rather, they seek to deliver analytical generalisability from the observations of a phenomenon with the aim of offering theoretical explanations that can be applied to identify similar cases. Given one of our aims is to provide insights beyond mere empirical descriptions, we externally validated our conclusions with a triangulation process comprising our data sources and external references. Table II outlines the external validation strategy. The sources listed in the last column are further detailed in Table III.

<table>
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<td>Master brewer and director of production</td>
<td>Birra Flea</td>
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| Internal documents | Financial statements | Birra Flea | 2013–2016 | ID 1–4 |
| | Start-up business plan | Birra Flea | 2013–2016 | ID 5 |
| | Product costing report forms | Birra Flea | 16 March 2017 | ID 6–7 |

| Website and media releases | Official company website | Birra Flea | 1 September 2016 | WM1 |
| | Bianca Lancia Award I° Classified – | UnionBirrai | 26 February 2016 | WM2 |
| | Noel Award I° Classified – | UnionBirrai | 26 February 2016 | WM3 |
| | Beer experts website | untappd.com | 9 March 2017 | WM4 |
| | Beer experts forum on Facebook | alfabeti della birra | 9 March 2017 | WM5 |
| | Beer experts website (untappd.com) | www.cronachedibirra.it | 9 March 2017 | WM6 |
| | “China Beer Award” media release | Independent experts from China | 28 December 2016 | WM7 |
| | | Hong Kong, and Taiwan | | |
Birra Flea’s start-up and development process

Birra Flea is a small enterprise located in Gualdo Tadino in the Italian Region of Umbria. Established in 2013, the company exclusively focuses on producing and selling beer. Within its first three years of operation, Birra Flea has shown exceptional performance in terms of production capacity, the number of customers and markets served, product variety and product excellence.

Production capacity

Birra Flea commenced production with a small brewing plant, including bottling and packaging equipment, and an initial capacity of 2,250hl per year. After three years, their production capacity had increased to 8,144hl – an expansion of more than 260 per cent. Their current bottling and packaging capacity is over 10,000hl per year.

Customers and markets

The company’s first order was for 100,000 bottles of a private-label beer brand for a major distribution chain to be produced within six months of the date of the order. As a result of this successful experience, Birra Flea began to develop its own line of craft beers. They designed the beers to meet the tastes of various markets for both private labels and their own line of Flea-brand beers. By 2016, their turnover had reached €2m. Flea beers account for approximately 60 per cent of sales and are primarily sold to hotels, restaurants, and through catering channels. The remaining 40 per cent is related to private-label products, mainly for large supermarket chains and modern distribution. The company currently serves over 2,000 customers, and its line of products includes ten different brands.

Product variety and excellence

During its short history, Birra Flea has also received several important awards certifying their high level of technical knowledge. In 2015, Flea beers were recognised among the seven coolest craft beers of Italy by a jury of national beverage experts. In 2016, two of their four original-recipe beers won first prize in a national contest sponsored by the Associazione Unionbirrai (United Brewery Association). At the end of that year, they won second and third prize at the China Beer Awards, an international competition established in Hong Kong where the beers are judged by a jury of 11 independent experts from China, Hong Kong and Taiwan.

The entrepreneur

The architect of Birra Flea is the owner of the brewery, Matteo Minelli, a young entrepreneur with past success in the start-up and development process of a renewable energy company listed on the alternative Italian market (AIM). Minelli started his career in a small family-owned building and construction company. Taking inspiration from a trip to Germany, he anticipated impending market saturation and diversified the family business into photovoltaic plant installations. He was the first entrepreneur in the territory to invest significant resources in large owner-operated energy production plants, taking advantage of all the incentives energy production brings. A new company was founded in 2008 and, with substantial momentum in sales, customers, and profits, it reached a significant turnover of €60m within a few years. In 2013, to boost financial development and prepare the organisation to work on a larger scale, the company listed on the AIM on the Milan Stock Exchange.

Concurrently, Minelli was also responding to a passion for craft beer. In founding Birra Flea, he was transposing his entrepreneurial experience to a whole new industry, and this would prove crucial to the launch of the brewery.
Data collection

The case data were principally gathered between September 2016 and May 2017. The sequence and timeline of the data collection began with an initial interview with Minelli to capture his story in narrative form. After three more informal meetings and visits to Birra Flea as observers, seven semi-structured interviews with Minelli and key participants in the start-up were conducted to focus on specific aspects of the KT process.

The informal meetings and interviews averaged 60 mins in length. They were tape-recorded and then transcribed. When tape recording was not possible, notes were taken. Following an inductive approach, meetings with interviewees involved open questions. Since data gathering and data analysis were conducted in parallel, we were able to pose increasingly specific questions and probe deeper into initial ideas as the project and data collection progressed. The interview data were complemented with relevant internal documents, and other media sources. Table III lists the details of the collected data along with the references used to present the results.

Data analysis involved several iterative rounds of reflection between data and theory, as well as triangulating the data from different sources (Yin, 2014, pp. 120-121). An ongoing research relationship with the subject of the case study provided us with the opportunity to test our initial theoretical understandings with key informants throughout the data gathering and analysis phase. The overall analysis was also verified and accepted as accurate by multiple key informants at Birra Flea (Yin, 2014, pp. 120-122).

Analytical framework

This section presents a description of Liyanage et al.'s (2009) theoretical framework we used to interpret the data – hereafter referred to as the Liyanage framework. This framework identifies some of the key components in the KT process, such as relevant knowledge, sources and receivers, KT steps and other elements that describe the form of transfer and measure its effectiveness.

Of the different models found in the literature (Liyanage et al., 2009; Tangaraja et al., 2015; Welschen et al., 2012; Paulin and Suneson, 2012), the Liyanage framework, shown in Figure 1, makes the most significant contributions because it delineates the elements that KT entails (Tangaraja et al., 2015). Moreover, the Liyanage framework is consistent with Argote et al.'s (2000) model, which specifies that KT can occur at both the individual and higher levels (groups, departments, divisions), not just at higher levels as claimed by Paulin and Suneson (2012). We believe these features are particularly important for analysing the start-up and development phases of a company, where KT can occur at any level or stage.

Additionally, the Liyanage framework outlines that, in KT, active participation by the knowledge source and the knowledge receiver is crucial (Tangaraja et al., 2015), even if the parties are not able to transfer knowledge due to the inherent difficulty of the task (Liyanage et al., 2009). Cranefield and Yoong (2005) assert that KT will only be successful if an organisation has "not only the ability to acquire knowledge but also the ability to absorb it and then assimilate and apply ideas, knowledge devices and artefacts effectively". Consequently, together with a willingness to share and acquire knowledge, one of the most critical factors for KT success is the receiver’s "absorptive capacity" (Liao et al., 2003).

The KT process in the Liyanage framework has three main components. In the first step, the KT process is interpreted as an act of communication between a source and a receiver, focussing on identifying a source and a receiver with the willingness to share and acquire the relevant knowledge (Carlile, 2004).

Second, the process of transfer is divided into six steps:

1. Awareness perceives a gap and identifies the knowledge that needs to be transferred from the source to the receiver.
(2) Acquisition is the entity’s ability to select and acquire externally generated knowledge that is critical to its operations (Zahra and George, 2002).

(3) Transformation translates acquired specialist knowledge to make it useful for general purposes.

(4) Association connects transformed knowledge to the internal needs and capabilities of the entity, making it useful for the receiver.

(5) Application brings the acquired, transformed, associated knowledge to bear on the problem at hand. This is the most significant step during the KT process and is the only step that leads to improved performance or creates value (Liyanage et al., 2009).

(6) Externalisation disseminates the knowledge through a feedback process. Successful KT should not be a one-way process where the receiver takes the bulk or all the benefits. KT should add value for both the receiver and the source, and lead to enhanced collaborations and relations.

In reality, the KT process may take less than six steps if the source and receiver are similar contextually, technically or structurally (Liyanage et al., 2009).

Third, the Liyanage framework provides three supporting elements:

(1) The form of KT: four modes of KT between the source and the receiver are borrowed from Nonaka and Takeuchi’s (1995) knowledge conversion model: externalisation (tacit → explicit), combination (explicit → explicit), internalisation (explicit → tacit), and socialisation (tacit → tacit).

(2) Performance measurement: to assess the accuracy and quality of the knowledge acquired and its impact on the organisation and practices.
Intrinsic and extrinsic influences: intrinsic influences are person-specific, cultural or organisational. External influences include environmental, technological, political and socio-economic factors. Each has several dimensions of context (culture, capabilities, skills, etc.) and either can positively or negatively impact the KT transfer process.

These components of the framework constitute the analytical constructs for the design and the analysis of the case using the following approach:

1. key knowledge relevant to Birra Flea’s start-up phase was identified;
2. relevant sources and receivers of knowledge were identified;
3. key pieces of KT were mapped into the six steps; and
4. supporting elements were identified.

After analysing the start-up phase, we focussed on potential KT changes during the development phase with a twofold aim. First, to investigate how the structural elements of the KT process might change during the development phase. Second, to provide entrepreneurs with practical tools to help manage KT as their company grows.

Findings
In this section, the start-up phase at Birra Flea is analysed through KT constructs, revealing two KT processes: one from external sources to the entrepreneur and another from the entrepreneur to the organisation. Through this interpretive research, the characteristics of the KT process and the role of the entrepreneur during the start-up phase are described. The section concludes with the changes likely to occur during the next phase of Birra Flea’s development.

The first interview with Minelli specifically focussed on KT, revealing two KT processes at Birra Flea. On the one hand, Minelli recognised having acquired knowledge from external sources; on the other hand, he also acknowledged transferring this knowledge to internal staff and into Birra Flea’s business processes in order to set up the brewery:

Without acquiring knowledge from one side to transfer it to another side, companies would shut down. You must firstly document yourself and then relocate to those who might be the most valued, most enlightened contributors, which is the hardest thing to find (IS1).

This KT chain created a unique opportunity to analyse both processes independently: from external sources to Minelli, then from Minelli to the business. The following sub-sections systematise each process in turn.

**KT from external sources to the entrepreneur**
What emerged from the first interview with Minelli is his belief that three pieces of knowledge have been relevant to the brewery’s development:

1. general knowledge about business planning;
2. product knowledge regarding different kinds of beer and production technologies; and
3. market knowledge.

These three key findings are reinforced because they broadly align with Rae’s (2005) entrepreneurial learning model categories of “personal and social emergence; the negotiated enterprise; and contextual learning”, respectively. However, rather than drawing exact parallels to how or which knowledge is learned in each of these categories, we use the theoretical constructs in the Liyanage framework to analyse these three types
of learnings as streams in a process KT. The process of KT at Birra Flea resulting from our analysis of the interviews conducted with Minelli and key sources IS2 and IS3 is presented in Table IV.

Planning and control knowledge

The key source of this knowledge was IS5, a financial consultant who has assisted Minelli since 2008. As a graduate in business administration, a tax consultant, a specialist in the energy sector, and the partner of a consulting firm specialising in finance and company valuations, IS5 has strong skills in planning and control. Minelli was acutely aware of the importance of this knowledge in planning for cash flow and returns on investment at the outset of the business (IS1; IS5; IS6). He had already acquired some of this knowledge through collaborations with IS5 in his previous business, especially through that company’s listing process on the AIM (FN1; IS1; IS5). The ability to

<table>
<thead>
<tr>
<th>1. Key knowledge</th>
<th>Planning and control knowledge</th>
<th>Product knowledge</th>
<th>Market knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Key sources</td>
<td>Consultant (ID5)</td>
<td>Brewer (ID3)</td>
<td>Web/public knowledge</td>
</tr>
<tr>
<td>3. Transfer steps</td>
<td>Awareness</td>
<td>Need to rely on the best</td>
<td>Strategic orientation for</td>
</tr>
<tr>
<td></td>
<td>Entrepreneur’s need to plan</td>
<td>expertise available for the</td>
<td>positioning the product in a</td>
</tr>
<tr>
<td></td>
<td>investments and cash flow</td>
<td>production process of craft</td>
<td>segment not present in the</td>
</tr>
<tr>
<td></td>
<td>returns (IS1; IS5; IS6)</td>
<td>beer (IS1; IS3; FN2)</td>
<td>craft beer market (IS1; IS2)</td>
</tr>
<tr>
<td></td>
<td>Acquisition</td>
<td>Six months of collaboration</td>
<td>Individual study of blogs,</td>
</tr>
<tr>
<td></td>
<td>Collaboration in previous</td>
<td>before setting up the</td>
<td>and competitor forums</td>
</tr>
<tr>
<td></td>
<td>business experience with the</td>
<td>brewery (IS1; IS3; FN2)</td>
<td>(IS1; WM4-6)</td>
</tr>
<tr>
<td></td>
<td>stock exchange listing</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>process (FN1; IS1; IS5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transformation</td>
<td>Identifying the objectives to</td>
<td>Finding a gap in craft beer</td>
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<tr>
<td></td>
<td>Adapting planning</td>
<td>be achieved in terms of</td>
<td>products with the most</td>
</tr>
<tr>
<td></td>
<td>competencies from a listed</td>
<td>taste varieties (FN3; IS3)</td>
<td>appropriate taste and prices</td>
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<td></td>
<td>company to a start-up</td>
<td></td>
<td>for the market (IS1; IS3)</td>
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<tr>
<td></td>
<td>(IS5; IS6)</td>
<td></td>
<td>Evaluation of recipes from</td>
</tr>
<tr>
<td></td>
<td>Association</td>
<td>n/a</td>
<td>the perspective of market</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>n/a</td>
<td>gaps (IS1; IS2)</td>
</tr>
<tr>
<td></td>
<td>Application</td>
<td>Experimenting with four</td>
<td>Testing the recipes with</td>
</tr>
<tr>
<td></td>
<td>Developing a detailed</td>
<td>basic recipes in a small</td>
<td>potential customers (FN1;</td>
</tr>
<tr>
<td></td>
<td>business plan for the</td>
<td>laboratory (IS1; IS3)</td>
<td>FN2; IS1; IS3)</td>
</tr>
<tr>
<td></td>
<td>brewery (IS5; IS6; ID5)</td>
<td></td>
<td>Elaboration of a “Flea-style”</td>
</tr>
<tr>
<td></td>
<td>Externalisation</td>
<td>Defining the explicit</td>
<td>value proposition to be</td>
</tr>
<tr>
<td></td>
<td>Presentation of the business</td>
<td>protocols of four main</td>
<td>communicated to</td>
</tr>
<tr>
<td></td>
<td>plan to external partners</td>
<td>recipes and internal tests</td>
<td>customers (IS2)</td>
</tr>
<tr>
<td></td>
<td>(IS1; IS5; IS6)</td>
<td>(IS1; IS3)</td>
<td></td>
</tr>
<tr>
<td>4. Other elements</td>
<td>Form of transfer</td>
<td>From the tacit to the explicit</td>
<td>Feedback from the first</td>
</tr>
<tr>
<td></td>
<td>(externalisation) (FN1;</td>
<td>(externalisation) (FN2; IS1; IS3)</td>
<td>customers on the pre-launch</td>
</tr>
<tr>
<td></td>
<td>FN2; IS5)</td>
<td>(IS1; IS3)</td>
<td>tasting samples (FN2; FN3; IS1; IS2)</td>
</tr>
<tr>
<td></td>
<td>Performance measurement</td>
<td>The four recipes initially</td>
<td>Meeting the tastes of</td>
</tr>
<tr>
<td></td>
<td>Ability to understand and</td>
<td>developed are still the</td>
<td>consumers and making a beer</td>
</tr>
<tr>
<td></td>
<td>apply planning and control</td>
<td>foundation of Flea’s value</td>
<td>that will have wide appeal</td>
</tr>
<tr>
<td></td>
<td>mechanisms (IS4; IS6)</td>
<td>proposition (IS1; IS2; IS3)</td>
<td>among consumers (IS2; IS7;</td>
</tr>
<tr>
<td></td>
<td>Influence factors</td>
<td>Developing industrial</td>
<td>WM3; WM7)</td>
</tr>
<tr>
<td></td>
<td>Passion, open-mindedness,</td>
<td>production with a good</td>
<td></td>
</tr>
<tr>
<td></td>
<td>courage, humility, and</td>
<td>margin and an adequate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>growth-oriented</td>
<td>variety of flavours (IS1; IS2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>entrepreneurship (IS1; IS5)</td>
<td></td>
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</tbody>
</table>

Table IV. The process of transferring knowledge from external sources to the entrepreneur
transform complex planning and control mechanisms drawn from a stock exchange listing in a completely different industry and scale them down to a start-up was vital (IS5; IS6). Operationally, the knowledge was applied while preparing a business plan for the brewery (IS5; IS6; ID5) and was externalised with a formal presentation to potential partners during the start-up phase (IS1; IS5; IS6).

IS5 summarises this process, emphasising the prior experience of planning and standardising business processes at an industrial scale:

Before the company was set up, a business plan was developed, an unusual practice considering the initial dimension of the brewery. This has been done through the transfer of knowledge deriving from the listing process of the previous company on the stock exchange, making clear the need to plan the cash flows.

What was initially tacit knowledge had been transferred through continuous dialogues between Minelli and IS5 (FN1; FN2; IS5) and became explicit through a reporting, control and planning model. From a qualitative perspective, the success of the KT can be measured by Minelli’s ability to understand and apply planning and control mechanisms to prescribe the business’s evolution (IS4; IS6) – an unusual practice in the craft beer industry, as stated above.

From the interviews conducted with Minelli and IS5, it is clear that some of Minelli’s personal characteristics also positively influenced the process, particularly his openness, humility and passion (IS1; IS5). In Minelli’s own words:

Passion is fundamental. Without passion, we can’t do nothing. As entrepreneurs, it is necessary to have mental openness and do not make any secrets on anything. Even in moments of difficulty, share joys and sorrows with the closest collaborators, even because the solution could pull them out directly (IS1).

In this phase of knowledge acquisition, two phenomena highlighted in the literature are clearly observable: a tendency to exploit external sources of knowledge (Desouza and Awazu, 2006) and the importance of prior learning events (Cope, 2003). Minelli exploited his connection with a key resource to extract knowledge about a prior learning event – the listing of his company on the AIM. These phenomena help us to understand the entrepreneur’s knowledge acquisition process.

Product knowledge

IS3 is Birra Flea’s Master Brewer and Minelli’s key source of product knowledge (IS1). He is an agriculture graduate with a PhD in food biotechnologies, specialising in beer, and many years of experience as a brewery consultant and a technologist at a beer research centre.

Minelli stressed the need for a high level of expertise to achieve his goals (IS1; IS3; FN2). Minelli knew IS3 was about to leave another brewery, and they began collaborating six months prior to launch (IS1; IS3; FN2). Through their work together, IS3’s product knowledge progressed into a search for the best taste varieties to suit their markets (FN3; IS3). Minelli established explicit research protocols, and they conducted experiments in the micro-plant, signalling the application of product knowledge. After many internal tests, the knowledge was externalised through four basic recipes (IS1; IS3).

Tacit knowledge was rapidly codified into experimental protocols, which led to four recipes that are now the foundations of Birra Flea’s value proposition (FN2; IS1; IS3).

As Minelli puts it:

I tried to get the best knowledge available in the beer field asking that all the recipes that were being developed had to be prepared according to explicit protocols kept in a safe, signing a non-competition pact out of the brewery or inside the brewery. This is a typical problem for handmade micro-breweries, but also for many other companies where knowledge and know-how are the exclusive property of those who play a key role in the final product. So, in my opinion, this is still
value added because this transfer of knowledge from the one who is a central person within the brewery to the entire organisation has been fundamental (IS1).

Minelli’s desire to develop an industrial-scale production system with good margins and an adequate variety of flavours was critical to the success of this KT. IS3 recognised this:

I’ve done laboratory protocols like in the research projects. I already knew I had to develop four recipes. I pointed to what I think could be four beers of four different styles, with the aim to make one of them please for everyone. There must be a beer for each taste (IS3).

In the knowledge acquisition phase, individualising external sources is fundamental to KT (Desouza and Awazu, 2006). However, unlike organisational learning where informal and non-bureaucratic structures support the spread of knowledge (Durst and Edvardsson, 2012), here, surprisingly, formalising the process helped KT. Minelli codified the experimental protocols used to develop the recipes, in effect, formalising ID3’s knowledge. Moreover, we observed Minelli’s great interest as his position in the technical aspects of the business became more central. This inclusion of outside externalised knowledge, in the form of a feedback loop, would become a main driver for the organisation (Choi and Shepherd, 2004; Perren and Grant, 2000; Lefebvre et al., 1995).

Market knowledge
Minelli cites open access knowledge from the web and the study of his competitors’ market choices as his main sources of market knowledge (IS1; WM4-6). His goal was to market the authenticity and originality of a handcrafted product line at a consistent price point (IS1; IS2). He scoured forums and blogs where beer experts and aficionados were known to share their opinions and preferences and, when he found a product gap with an appropriate taste and price for his own start-up, his general understanding of the market was transformed into specific knowledge (IS1; IS2). This step led to an association with the product knowledge as he evaluated ID3’s experimental recipes from the perspective of the market gap he had perceived (IS1; IS2). Market knowledge was then applied when the final four recipes were chosen, and it was externalised when they were offered to potential customers to test. Customer appraisal now constitutes one of the basic pillars of the Birra Flea value proposition (IS2).

Throughout the process, KT moved from acquiring explicit knowledge from the web to tacit knowledge (IS1; IS2). Performance measurement was a decisive factor. Customer feedback helped Minelli improve the quality of the beer to suit his market’s preferences (FN2; FN3; IS1; IS2). This knowledge acquisition was only possible because of Minelli’s willingness to meet the taste demands of customers and produce a beer with wide appeal. And it worked; the Birra Flea “style” Minelli created has already lead to several award-winning handcrafted beers (IS2; IS7; WM3; WM7).

According to IS2, Birra Flea’s Commercial Manager:

[Minelli] taught us a lot about the Flea style, that after four years we bring to our meetings; and in this Flea style there is always the willingness to satisfy the tastes of consumers.

This form of KT expresses the power of socialisation in the process of acquiring knowledge. Even though Minelli is not a marketing expert, he had the intuition to extract the knowledge he needed from potential customers, confirming Desouza and Awazu’s (2006) thesis on the dominance of socialisation in SME knowledge acquisition.

KT from the entrepreneur into business processes
From Minelli’s perspective, the second process of KT was a crucial part of the organisational, production, and commercial processes that led to starting up the brewery. The knowledge he gained from external sources was transposed into the business processes
of the organisation through some key figures in the brewery (IS1). The relevant KT to the business processes concern:

- accounting and control knowledge to periodically measure and monitor performance;
- production knowledge, which was particularly important for efficiently managing supply chains, storage, production, and packaging processes; and
- marketing and commercial knowledge, to adequately support sales goals and improve the company’s brand reputation and value proposition.

Again, adopting the theoretical constructs in Liyanage’s framework, the KT processes for these pieces of knowledge were mapped, and the results are provided in Table V.

<table>
<thead>
<tr>
<th>Key knowledge</th>
<th>Production process knowledge</th>
<th>Marketing and commercial knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting and reporting knowledge</td>
<td>Brewer</td>
<td>Commercial manager</td>
</tr>
<tr>
<td>Production process knowledge</td>
<td>Plans for incremental growth of production capacity (IS1; IS3; IS7)</td>
<td>Market development for return on investment (IS1; IS2)</td>
</tr>
<tr>
<td>Marketing and commercial knowledge</td>
<td>n/a</td>
<td>Relational skills and entrepreneurial coaching in commercial activities (IS1; IS2)</td>
</tr>
</tbody>
</table>

Table V.
The process of transferring knowledge from the entrepreneur into business practices

<table>
<thead>
<tr>
<th>Transfer steps</th>
<th>Awareness</th>
<th>Acquisition</th>
<th>Transformation</th>
<th>Association</th>
<th>Application</th>
<th>Externalisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrepreneurial need for structured controls (IS1; IS4; IS6)</td>
<td>Previous acquired competences and motivation for professional growth (IS1; IS4)</td>
<td>Adapting competencies acquired in a multinational company to business processes for a start-up (IS4; IS5)</td>
<td>Cross-functional interactions with production and commercial processes (IS2; IS3; IS4)</td>
<td>n/a</td>
<td>Design of plant production processes (IS3; IS7)</td>
<td>Structured reporting to the entrepreneur (IS4; IS6; ID6-7)</td>
</tr>
<tr>
<td>Plans for incremental growth of production capacity (IS1; IS3; IS7)</td>
<td>Previous expertise and new organisational solutions to be analysed and implemented (IS1; IS3; IS7)</td>
<td>n/a</td>
<td>Building a value proposition consistent with Flea’s style (IS1; IS2; IS3)</td>
<td>Partial ability to manage customers autonomously (IS1; IS2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market development for return on investment (IS1; IS2)</td>
<td>Relational skills and entrepreneurial coaching in commercial activities (IS1; IS2)</td>
<td>Managing the scouting, research, and relationships of customers (IS2)</td>
<td>Cross-functional interactions with production and administrative processes (IS2; IS3; IS4)</td>
<td>Non-transferable commercial knowledge for managing strategic business development (IS2)</td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other elements</th>
<th>Form of transfer</th>
<th>Performance measurement</th>
<th>Influence factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>From the tacit to the explicit (externalisation) (IS4; IS6-7)</td>
<td>Ability to understand and apply the accounting and control mechanisms required by a listed company (IS4; IS5)</td>
<td>Opportunity for professional growth, entrepreneurial control (IS1; IS4)</td>
<td>Grow the size of the business and build an organisation independent of Minelli’s daily presence (IS1; IS3; IS7)</td>
</tr>
<tr>
<td>From the tacit to the explicit (externalisation) (IS1; IS3)</td>
<td>Possibility to gradually increase production capacity (IS1; IS3)</td>
<td>The will to create Flea’s style and a strong orientation towards customer’s tastes (IS1; IS2)</td>
<td></td>
</tr>
</tbody>
</table>

Table V.
The process of transferring knowledge from the entrepreneur into business practices
Accounting and reporting knowledge

Minelli identified IS4, Birra Flea’s Administrative Manager, as the key receiver of his accounting and control knowledge (IS1). Despite graduating in business administration and having significant previous experience in the management control department of a multinational company (Black & Decker), Minelli wanted to personally focus on introducing her into the organisation (IS4).

Given her previous experience and Minelli’s need for systematic reporting (IS1; IS4; IS6), IS4 was keenly aware of the importance of accounting and control procedures at a very early stage, but her knowledge needed to be transformed to suit a new professional setting (IS1; IS4). Now working in a smaller context, IS4 had to collaborate with other business functions during the start-up phase, coupling administrative, commercial, and production skills to manage inventory (IS2; IS3; IS4) and assist with product pricing. These interactions were particularly important for explaining the bill of materials associated with each recipe. Part of the required knowledge was also embedded in some administrative and financial models drawn from Minelli’s prior experience and externalised to create structured reporting tools (IS4; ID6-7).

IS4’s advanced skills in accounting and finance were required to transfer Minelli’s tacit knowledge into actual liquidity and costing models in Excel (IS4; ID6-7). The models allowed for the constant performance monitoring of cash flow, product costing, and inventory levels (IS6). This aspect of the overall KT process was positively influenced by both the opportunity for the receiver to achieve professional growth and by allowing Minelli timely access to information (IS1; IS4).

IS4 reflects on the process:

On the inventories management, the entrepreneur demanded, since the beginning, a structured and systematic management and control. As for the product costing and liquidity reporting. In short, the control models that I had met in my previous multinational experience were applied, even if it was a newly-born business.

The tendencies to concentrate knowledge in the mind of the owner and some key employees (Durst and Edvardsson, 2012) and to support the owner/manager in the learning process (Akhavan and Jafari, 2007) observed during this process are coherent with findings in previous literature.

Production process knowledge

ID3, the Master Brewer, began his relationship with Birra Flea as a consultant during the start-up phase and was subsequently hired as the Production Manager. Because of his specific skills and role, ID3 was identified as the key receiver for the knowledge required to standardise production and design a plant that was ready for future increases in production (IS1).

Production processes are integral to steady growth in production capacity (IS1; IS3; IS7). ID3 provided this knowledge through his previous skills and experience, allowing the organisation to implement solutions tailored to realise this growth. The collaborative relationship Minelli and ID3 had nurtured while working on product development now progressively evolved into a KT about production processes (IS1; IS3; IS7). ID3’s knowledge was applied to the design and implementation of the production plant (IS3; IS7), which has so far proven capable of meeting growing market demand (IS1; IS3; IS7).

ID3’s implicit knowledge was transferred to the organisation through the choice of machinery and by defining work cycles; however, at this stage, his presence and knowledge were still fundamental because there were no other specialised staff who could autonomously coordinate the entire production process (IS7).
This aspect of the KT was influenced by Minelli’s goal to improve the size of the business and build an organisation independent of his daily presence (IS1; IS3; IS7). On a production level, IS3 notes the foresight present in their planning:

From the production point of view, everything has always been designed in an evolving way aiming to grow. Even with the high production increments, production processes have never been changed profoundly. Also in predicting future investment, the production cycle will not undergo major changes.

The tendency to concentrate knowledge in the mind of the owner and some key employees (Durst and Edvardsson, 2012) is also present in this KT, along with Minelli’s interest in gaining a central position as the level of technical knowledge in the production process evolved (Choi and Shepherd, 2004; Perren and Grant, 2000; Lefebvre et al., 1995).

Marketing knowledge
Marketing knowledge was transferred when training IS2, Birra Flea’s Commercial Manager, and the key receiver of business process knowledge. For this role, Minelli chose a high school friend with solid experience in agricultural trade associations and relationship management, but without specific commercial experience.

Marketing knowledge was always considered relevant for realising Birra Flea’s value proposition and developing the market share needed to gain a return on investment (IS1; IS2). Minelli served as IS2’s coach to further develop his already well-developed customer relationship skills (IS1; IS2). This knowledge progressively evolved into scouting missions and research for new market opportunities alongside customer relationship management (IS2). To achieve their goals, marketing and commercial knowledge had to be associated with product knowledge to provide IS2 with a sufficiently in-depth understanding of each product’s characteristics. Administrative knowledge associations were also required for accurate product costing (IS2; IS3; IS4). These associations embedded the Birra Flea value proposition into the business processes. The resulting Birra Flea “style” was then externalised as IS2 began to manage business relationships independently, except for the larger ones that still involve Minelli (IS1; IS2; IS3).

Minelli transferred his tacit knowledge to IS2 by affiliation and socialisation in order to acquire new customers (IS1; IS2), which then grew under IS2’s management into a commercial network of over 2000 customers. However, the KT was only partial because, as outlined in the interviews (IS1; IS2), Birra Flea’s relationships with their largest customers remain tied to Minelli. IS2 explains:

I think I have made significant growth in the business sector and following what Matteo says to go on alone, but transferring this experience is impossible because it comes from an innate decision-making aptitude. Someone like Matteo has something that is not the experience. It’s more like something that you have or do not have. If you have it, coupled with the experience, situations and many other things become more easily manageable (IS2)

Minelli’s attempts to balance the dissemination and retention of knowledge with his role as entrepreneur heavily influenced this KT process; however, overall, his strong orientation towards catering for customer tastes characterise the process. This is in keeping with a partial concentration of the knowledge in the mind of the employees (Durst and Edvardsson, 2012), as Minelli maintained control of the most strategically relevant relationships rather than delegate them to organisational technologies (Choi and Shepherd, 2004; Perren and Grant, 2000; Lefebvre et al., 1995).

Discussion: the entrepreneur’s role in KT processes during start-up and development
Applying the Liyanage model, the Birra Flea case illustrates how KT in a start-up took place in two cycles. As shown in Figure 2, Minelli triggered the first cycle of KT from external
sources into business processes, and our analysis shows that the first important factor of KT is a combination of entrepreneurial passion and exploiting knowledge from past experiences. As IS2 points out:

We started with a lot of expertise, know-how, and Matteo’s experiences as an entrepreneur in other areas. Previous experience had an impact on Minelli’s ability to plan for the business and how to combine various forms of knowledge to establish necessary functions within the brewery, such as production and marketing. Other factors, such as a desire for growth also had a great impact, especially during the start-up phase. IS5, in commenting on the factors leading to the brewery’s success, notes:

For my experience, I could describe Matteo’s entrepreneurship with three adjectives: passion, desire for growth and new realities, and intelligence.

What made the most difference in the acquisition and subsequent application of relevant knowledge was Minelli’s strategic orientation. He had a business idea and projected that idea into a medium- to long-term development horizon. As he explicitly states:

To understand the market and consumers’ tastes you can refer to statistics or sites as references, but they provide very macro and general information. The whole process depends on what you have in mind to do and how you see the positioning of the brewery in the medium-long term (IS1).

Coupled with his entrepreneurial abilities and “absorptive capacity”, Minelli’s strategy drove him to identify “knowledge relevance” and “knowledge gaps”. These were first filled through an individual acquisition path, then socialised when selecting his collaborators and establishing the brewery. In this sense, Minelli typifies what the literature defines as a “passion for inventing” and a “passion for founding” (Breugst et al., 2012) – two aptitudes that led Minelli to further extend the KT process into organisational processes.

We can conclude that, in the start-up phase, Minelli is a selective “broker” of knowledge, driven by curiosity, passion, and strategy, who takes part in the KT process with a twofold role: as both a source and a receiver. This way, he is able to trigger a combined process of entrepreneurial and organisational learning, as Figure 2 shows.

Entrepreneurial learning, from external sources to the entrepreneur, is interpreted in experiential learning theory (Bailey, 1986; Cope and Watts, 2000) as “the process whereby knowledge is created through the transformation of experience” (Kolb et al., 2001). The second cycle of KT, from the entrepreneur into business processes, gradually activates organisational learning. Dutta and Grossan (2005, p. 433) define this type of learning as “the capacity or the process within an organization to maintain or to improve performance on the basis of experience, a capacity to encode inferences from history or from experience into routines that guide future activity and behavior, systematic problem solving, and ongoing experimentation”.

Presently, the company is planning a further stage of significant development, which raises questions about its absorptive capacity. According to Liao et al. (2003) “organizational
absorptive capacity” includes two fundamental elements: external knowledge acquisition and intra-firm knowledge dissemination. External knowledge acquisition refers to a “firm’s ability to identify and acquire externally generated knowledge that is critical to its operation” (Zahra and George, 2002). Intra-firm knowledge dissemination means “information gathered from the business environment that should be transferred to the organisation and then transformed through the internalisation process that requires distinction and assimilation”. Our interviews in the start-up phase portray Minelli’s predominant role in both externally generated knowledge acquisition and intra-firm knowledge dissemination. Even though his desire for a central place in the learning process is clear (Choi and Shepherd, 2004; Perren and Grant, 2000; Lefebvre et al., 1995), Minelli’s words emphasise the need to make the learning model more independent of his presence. As Dosi et al. (2001) point out, organisational structures only create benefits for business processes when they are able to spread and “disseminate” learning beyond the entrepreneur.

Minelli’s awareness does entail a greater role for the controller, the need to hire a general manager, and to involve the current brewery managers more:

The role of the controller, in my opinion, will become more and more strategic to keep under control numbers and cash flows. On the other hand, we need to hire a general manager who can be a general supervisor of the business processes. This is the most difficult person to enter the company because he needs to be the closest person to me and a trusted person able to integrate himself within the structure that I would like become independent from my presence. That’s why I’ve implemented a new method for the job interviews, where the managers of the company participated to find the right person. In fact, this person has to integrate with them, live with them in close contact and collaboration (IS1).

These changes forecast impending modifications to the company’s KT model that will move the major driver of KT from Minelli to the organisation (Dutta and Crossan, 2005) and change the transfer process, as shown in Figure 3. From this, we conclude that Minelli’s role during the development phase of organisational learning shifts from KT broker to KT performance controller.

Additionally, members of the organisation will need to directly manage their own external sources of KT and incorporate the knowledge they acquire into organisational learning, just as entrepreneurs must do during the start-up phase. Employees will need to grow if they are to stay aligned with the company’s strategies and develop the ability to carefully select both the knowledge and interlocutors needed to fill their knowledge gaps.

**Figure 3.**
The KT process during the development phase
Minelli must continue to play a key role in monitoring KT performance through results measured by management controls, which could extend to processes, but management controls will need to take on a new challenge – controlling the learning process.

Birra Flea demonstrates that entrepreneurial learning is crucial to the start-up process, and the entrepreneur plays a key role as a KT broker in managing the acquisition and application of knowledge. However, once a business moves into the development phase, that role must be entrusted to a general manager who can fully integrate KT and learning throughout the organisation, leaving the entrepreneur’s role free to evolve into a KT controller through KT networking and KT performance measurement.

Within the Birra Flea case, the role of the entrepreneur and its KT evolution can be discussed by linking the different research streams with an evolutionary perspective (Macpherson and Holt, 2007). In the start-up phase, the contribution of Minelli’s human capital in terms of passion (IS5) (Kakati, 2003), open-mindedness (IS1), entrepreneurial experience (FN1), and business planning skills (IS5, IS6) is evident. As reported in IS2 and IS4, these characteristics contribute to creating a context where knowledge and learning are fostered (Sadler-Smith et al., 2001). Minelli thus demonstrates the ability to create an organisational system that supports the KT and pursues the growth through learning.

Moreover, as reported in IS2, Minelli’s entrepreneurial style works as an “organizational blueprint” (Spender, 1989) that influences managing Birra Flea. Minelli’s social capital contributes significantly to his personal (Greene, 1997) and professional (Lechner and Dowling, 2003) networks, further encouraging learning and KT (Macpherson and Holt, 2007, p. 180).

However, in a knowledge systems perspective, the consolidation of “independent knowledge management tools within and across firm boundaries” (Macpherson and Holt, 2007, p. 180) is still in progress in the Birra Flea case. Indeed, the interviews with Minelli (FN3, IS1) and his partners (IS2, IS3, IS4) show that the learning dynamics are still strongly influenced by the entrepreneur in his role as KT broker. The analysis demonstrates that the main challenge for the brewery’s growth is for the organisation to acquire an absorptive capacity (Cohen and Levinthal, 1990).

Therefore, as shown in Figure 3, we show the transition from a KT model based on the centrality of the entrepreneur to a model in which the entrepreneur is a KT controller and implies a transformation of absorptive capacity. In the start-up phase, the entrepreneur was the hub of the learning process, but, in the growth phase, the organisation must develop an autonomous absorptive capacity where knowledge is acquired externally and distributed internally (Lichtenstein and Brush, 2001; Corso et al., 2003; Liao et al., 2003). Thus, the exploration and exploitation phases must become independent of the entrepreneur.

Conclusion
The start-up phase of an SME is a critical moment where knowledge management can determine the success and the sustainability of the new enterprise. With this research, we shed light on KT practices by examining the KT processes in an award-winning start-up: Birra Flea. Analysing the KT process involved the young entrepreneur Matteo Minelli, four key members of the organisation (consultant, brewer, administrative manager and commercial manager), and several publicly available resources. The analysis shows how the development of the business idea – i.e. experimenting with recipes, identifying customer segments, investment planning, etc. – required a complex combination of knowledge (planning and control, product and market knowledge) that was initially acquired by the entrepreneur and was then transferred into business processes. Conversely, as the business develops and still grows, these KT processes are being reversed, and the knowledge of the entrepreneur is being transferred into the business processes of the enterprise. The theoretical and practical implications of our research are outlined next.
**Theoretical implications**

To understand the role of the entrepreneur and the characteristics of KT, we adopted Liyanage et al.’s (2009) framework that divides the transfer of knowledge from a source to a receiver into six steps. By applying this framework, the Birra Flea start-up is interpreted through a detailed analysis of KT steps that describe how knowledge is transferred from consultants and publicly available knowledge sources to Birra Flea.

Applying Liyanage et al.’s (2009) framework to the case allows us to refine the original framework from an entrepreneurial perspective. In a complex process such as the start-up of a company, KT involves several kinds of knowledge, sources, and receivers that mutually influence each other along the transfer steps. For example, prior experimentation with basic recipes (transferring product knowledge) was fundamental to evaluating customer tastes (transferring market knowledge). Additionally, prior application of planning and control knowledge was necessary for planning the incremental growth of the company’s production capacity. Figure 4 outlines these mechanisms and shows the methodological implications of our research with reference to Liyanage’s (2009) framework.

Our findings outline the fundamental role of the entrepreneur in combining different forms of knowledge by managing the mutual influence of the KT steps. Our findings also outline how Minelli succeeded in combining different forms of knowledge and confirms some key points related to those raised in Macpherson and Holt (2007): the exploitation of planning and control knowledge acquired through previous experience; the exploration of beer recipes and customer tastes for the acquisition of the product and market knowledge; the human capital, passion, and openness that created favourable conditions for the absorptive capacity of the organisation (Garcia-Morales et al., 2006); and the social capital needed to create a favourable context for learning and KT, selecting knowledge from external sources, and transferring that knowledge to Birra Flea.

![Figure 4. Mutual influence of the KT steps of the Liyanage et al. (2009) framework](image-url)
The ongoing development phase presents another level of complexity. Here, Minelli is changing his role by transforming the company into a knowledge system that is able to realise KT from external sources without his mediation, leaving himself free to manage the organisational absorptive capacity (Cohen and Levinthal, 1990).

Practical implications
The KT interpretation of the company start-up can be extended to different industries and firm dimensions. The case shows that the development of a new business idea requires various kind of knowledge whose identification, acquisition, transformation, association, application and combination can determine the success or failure of the entrepreneurial initiative. In the craft beer business, which is characterised by a moderate level of technological complexity and specialisation, Minelli has been able to explore products and markets, while exploiting his planning and control knowledge.

Additionally, the paper offers a practical guide for those wishing to implement KT strategies for a successful start-up. Planning an approach to KT in a start-up requires identifying the types of knowledge needed, the key sources/receivers and the modes of transfer. While this is usually a tacit and unplanned process, our analysis offers an analytical explanation of the KT process that can serve to identify possible gaps in knowledge, the timing of knowledge acquisition, and the key players to identify as sources and receivers.

Future research
Future perspectives for this research are twofold. First, our evidence sheds new light on entrepreneurial learning that could be examined in light of the underpinning KT. Future research could investigate the entrepreneur’s contingent aptitude to apply exploitation and exploration, or could differentiate the types of KT and associated steps according to industry and business characteristics. Second, the business planning literature could be enriched by linking planning accuracy with the effectiveness of the KT process in acquiring products and markets.

Limitations
As outlined earlier, a common critique of case studies is the ability to generalise the findings. However, as Yin (2014, p. 48) counters, case studies are not designed to provide statistical generalisations but instead deliver analytical generalisations that offer theoretical explanations that researchers can apply to similar cases.

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Further reading


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