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Managers' brokerage for business model innovation: A case study

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Business model innovation is recognized as a key process for strengthening firms' performance in situations of strong competitive pressure and environmental changes. This process is driven by intra-organizational advice networks between managers, which exchange different types of advice based on organizational learning mechanisms such as cognitive search (how to conceptualize and create a novel business model) and experiential learning (how to adapt and experiment a novel business model. Investigating what are the key figures emerging from such network is essential for an in-depth understanding of the business model innovation process. By focusing on a multi-unit firm operating in the personal care service industry, we use Social Network Analysis (SNA) to examine the brokerage role of managers when sharing different types of advice towards a novel business model. Our results show that middle-level managers connect different managerial groups in different networks; however, differences exist between groups of middle managers, confirming their peculiar nature within organizations.

KEYWORDS
advice sharing, brokerage, business model innovation, middle management, social network analysis

1 | INTRODUCTION

Business model innovation is increasingly recognized as a key process for succeeding in turbulent competitive landscapes and explaining different performances among firms (Foss & Saebi, 2017). In times of social and economic changes, business model innovation has become a strategic priority for managers and entrepreneurs (Kraus et al., 2020; Zott & Amit, 2010) and has aroused growing interest among scholars to advance its theoretical understanding (Arend, 2013; Baden-Fuller & Mangematin, 2013; Foss & Saebi, 2017; Ritter & Lettl, 2018). Business models have been defined as simplified and aggregated representations of the relevant activities of a firm (Wirtz et al., 2016; Zott & Amit, 2010), and business model innovation represents the activity of modifying an existing business model or designing and implementing a novel one (Massa & Tucci, 2014). Business models describe how value is created, and thus, they capture the essential features of how the business is conducted (Zott et al., 2011). Because they act as platforms between the firm's strategy and practice (Teece, 2010), they can help firms to identify objectives that can be successfully achieved in the running of the business.

Within an organization, the reworking of managers' individual creativity, through social interaction, facilitates the search for new economic opportunities and boosts the process of business model innovation (Bock et al., 2012; Hock et al., 2016; Schneckenberg et al., 2018). A recent stream of research refers to business model innovation as a process and mainly addressed the different stages, organizational capabilities, organizational learning mechanisms as well as the leadership characteristics that enable it to take place (Foss &

Saebi, 2017). In this vein, business model innovation consists of a complex process that contemplates a high risk of failure and relies upon human interactions and networks to be successful (Berends et al., 2016). In a study focusing on different types of innovation processes occurring at firm-level, including business model innovation, Björk (2012, p. 17) stated that 'the characteristics of the network in which people jointly create and develop ideas stand out as an increasingly important factor influencing creativity' and 'different network structures have shown to be of importance for different innovations'. Indeed, Moellers et al. (2020) found that fostering business model innovation in multi-business firms requires innovation brokerage practices, and the presence of individuals that broker between different units to spread information and knowledge for facilitating the adoption of innovation.

Our research adopts a brokerage perspective to investigate how managers' position relates to the flows of information supporting the intra-organizational process of business model innovation. Extant research has recognized how such process is characterized by the interactions between managers according to their formal and informal relationships (Berends et al., 2016; Foss & Saebi, 2017; Schneckenberg et al., 2021). However, we still do not know much about how groups of managers specifically interact for developing business model innovation, therefore, limitations still remain in understanding business model innovation as the outcome of a creative process of dissemination and consolidation of new knowledge. Investigating brokerage roles is a well-recognized perspective for understanding how social interactions generate innovation (Belso-Martinez et al., 2015; Boari & Riboldazzi, 2014; Melkas & Harmaakorpi, 2008), but it has been neglected so far to investigate the process of business model innovation. A brokerage perspective helps to overcome these shortcomings, because it enables to look at behaviours and decisions behind such process while identifying these behaviours based on managers' position in the organization.

Firms supporting the internal diffusion of knowledge enable their innovative potential (e.g., Aalbers et al., 2014). Previous research widely explored the importance of advice networks as vehicles of knowledge diffusion within an organization (Lomi et al., 2014; Perry-Smith & Mannucci, 2017). According to Hock (2015), advice seeking is strictly related to the practical execution of innovative actions, and it has a significant importance when studying innovation processes in general and business model innovation in particular. Intra-organizational advice networks are characterized by the presence of actors who mediate the flow of advice between two other actors, thus acting as brokers (Burt, 1992; Shi et al., 2009) and benefit from this structural position by increasing their relevance in the network. Recent studies highlighted the role of internal brokering to ensure the most appropriate and timely diffusion of knowledge (Currie & White, 2012; Delmestri & Walgenbach, 2005; Paruchuri, 2010; Stea et al., 2017), as well as its influence on the strategy's implementation (Shi et al., 2009). However, despite the growing body of literature, some significant shortcomings remain. Research has so far neglected how relationships between managers are associated to the process of business model innovation. Little is known about what role managers at different hierarchical levels play in the creation and dissemination of know-how for business model innovation. Previous studies have focused on the goals and individual contributions of middle managers but have neglected the relationships between groups of managers within organizations. Therefore, there are limitations in our theoretical understanding of the role that middle managers play in strategic processes and, especially, in the process of business model innovation. Previous research, although focusing on the most significant dimensions of the process of business model innovation, has not so far reached definitive results on how managers perform their role. Some studies addressed how top management teams affect the process of business model innovation, but they neglected the role played by managers at different hierarchical levels (Bashir & Verma, 2019; Sirmon et al., 2011; Zhang & Li, 2010). In particular, research explaining the role of middle management remains substantially absent, despite the fact that the managerial literature has long recognized its significance in the strategic process (Wooldridge et al., 2008). Chesbrough (2010) argues that an organization should identify the leaders of the business model innovation process, and he highlights the need to investigate how middle managers combine personal objectives with those of the overall organization. Additionally, none of these studies have examined the role of middle managers from a brokerage perspective. Therefore, investigating the brokerage relationships between groups of managers at different hierarchical levels contributes to fill this gap and to develop a holistic view of the business model innovation process.

This leads to the following unexplored research questions: What are the brokerage roles of managers in intra-organizational networks aimed to support business model innovation? In order to address this research gap, our paper analyses a multi-unit firm specialized in personal care services, and concentrates on the advice networks established by managers for innovating the firm's business model. In particular, we focus on two different types of advice: (1) advice related to cognitive search mechanisms, that is, the exchange of advice needed for conceptualizing the business model and realizing one or more of its components; (2) advice related to experiential learning mechanisms, which considers the exchange of advice for adapting and experimenting the novel business model (Berends et al., 2016). As described at the beginning of this introduction, scholars have discussed the importance of both the conceptualization and design mechanism and the trial-and-error approach in business model innovation: Hence, this study looks at the advice exchange that explicitly relate to these mechanisms—the conceptualization/creation of the business model and its adaptation/experimentation. Our methodology is based on the application of Social Network Analysis (SNA), which is used to describe the brokering role of managers by drawing on the Gould and Fernandez's (1989) typology.

Our paper is structured as follows. Section 2 provides the theoretical framework adopted in this study. Data and methodology are presented in Section 3. Section 4 illustrates the results of the brokerage analysis, and Section 5 concludes and provides some managerial implications.

2 | THEORETICAL FRAMEWORK

Business model innovation is a type of organizational innovation that goes through a highly creative process whereby a firm identifies and adopts a new portfolio of opportunities (Johnson et al., 2008; Teece, 2010). Originating in managerial practice, in recent years the concept of business model has been accorded increasing relevance, especially in the fields of strategy (Bock et al., 2012; Casadesus-Masanell & Zhu, 2013; Teece, 2010), technology and innovation management (Chesbrough & Rosenbloom, 2002; Massa & Tucci, 2014; Tripsas & Gavetti, 2000), and sustainability (Evans et al., 2017; Schaltegger et al., 2016; Stubbs & Cocklin, 2008).

Some studies focused on how the process leading to business model innovation can be operationalized, by explaining the activities that enable systematic business model innovation (Bucherer et al., 2012; Frankenberger et al., 2013; Heikkilä et al., 2018; Laudien & Daxböck, 2017). Moreover, as firms often carry out the process of business model innovation by interacting within their network, the development of shared knowledge has been recognized as a suitable managerial solution to counterbalance the constraints coming from the interdependence with other organizations involved (Berglund & Sandström, 2013). Previous literature also explored the organizational capabilities and processes needed to nurture business model innovation (Demil & Lecocq, 2010; Teece, 2018). Mezger (2014) argues that business model innovation refers to a dynamic capability that consists of sensing business model opportunities, seizing them through the development of valuable and unique business models, and reconfiguring the firms' competencies and resources coherently. Previous research investigated how the generation and feeding of dynamic capabilities that fuel the business model innovation process is influenced by organization design (Bocken et al., 2020; Fjeldstad & Snow, 2018) and is intertwined with strategic leadership, especially of the top management team (Schoemaker et al., 2018).

Business models are multidimensional constructs that refer to 'how an interrelated set of decision variables in the areas of venture strategy, architecture, and economics are addressed to create sustainable competitive advantage in defined markets' (Morris et al., 2005, p. 727). According to recent research, business model innovation occurs when the key elements of an organization are changed for addressing external challenges and developing a new approach for creating and delivering value (e.g., Casadesus-Masanell & Zhu, 2013; Fjeldstad & Snow, 2018; Pedersen et al., 2018; Zott et al., 2011; Zott & Amit, 2007). Business model innovation needs a significant openness to change, in organizational practices and managerial commitment, to develop new ideas and suggestions, adopting a different and holistic approach compared with the traditional entrepreneurial model, which requires a deep understanding of the environmental context in which the organization is operating (Hensel & Visser, 2019; João-Roland & Granados, 2020; Lange et al., 2015). Andersen et al. (2022) investigated the business model innovation process in small and medium enterprises engaged in digital transformation and found critical the pursuit of new opportunities in the external environment, conveying a sense of urgency, evaluating new opportunities through experimentation and making decisions by combining data and intuition. However, empowering leadership and team creativity were found to be necessary but not sufficient to ensure the business model innovation process (Amoroso et al., 2021).

Within the growing body of literature that has recently developed, among the studies that focused on business model innovation as a process, organizational learning theories investigated the ways of social interaction with which organizational actors exchange information and knowledge to develop innovative solutions for the business model (Schneckenberg et al., 2021). In an uncertain environment exposed to rapid changes, the continuous research and experimentation of new options is an integral part of the business model innovation process. Accordingly, even in highly innovative contexts such as, for example, the digital platforms of the sharing economy, it becomes necessary to develop innovation processes of the business model and to identify new mechanisms for the creation of value (Grieco, 2022). Business models have been considered as cognitive artefacts or patterns of action within processes of organizational learning (Baden-Fuller & Mangematin, 2013; Massa & Tucci, 2014). Cognitive search is a forward-looking process in which actors conceptualize the creation and selection of alternatives based on the expected consequences. In this perspective, scholars have suggested that conceptual processing is prevalent in the business model innovation process and precedes its implementation (e.g., Chatterjee, 2013; Cortimiglia et al., 2016). Business model innovation occurs through social interaction modalities that tend to elaborate the conceptual abstraction of the strategy, defining its rules, routines and activities (Gavetti & Rivkin, 2007). Similarly, Martins et al. (2015) found that analogical reasoning and conceptual combinations constitute the mental processes on which innovative logic decisions in business models are based. Bitetti and Gibbert (2022) investigated, from a cognitive perspective, the configuration of different patterns of sensing capabilities as antecedents of business model innovation across generations of business owners, avoiding the cognitive barriers that may arise in the early stage of the process. Experiential learning, on the other hand, is a backward-looking learning process in which completed experiences are coded into routinized actions and maintained or abandoned based on the success or failure associated with them. In this view, business model innovation has been considered as a process of trial-and error-learning (Mezger, 2014), effectuation (Chesbrough, 2010) or experimentation (McGrath, 2010).

Because knowledge creation is a core element in the process of business model innovation and originates from social interaction, previous research explored how it emerges from the different organizational learning mechanisms employed (e.g., Berends et al., 2016; Sosna et al., 2010). Berends et al. (2016) showed that business model innovation relies on social interactions between managers, which foster organizational learning and the ability to develop innovative solutions through the iteration of cognitive search and experiential learning. Amongst these social interactions, internal communication and advice exchange are fundamental for creativity and innovation within organizations (Linder & Sperber, 2017): They influence the innovation process in general (Lomi et al., 2014; Perry-Smith &

Mannucci, 2017), as well as the business model innovation process in particular (França et al., 2017; Hock et al., 2016), because they support the sharing of knowledge and ideas and facilitate creativity. As pointed out by Hock et al. (2016), 'knowledge and information transfer is crucial, when redeploying resources for new value-creating opportunities'. Sharing novel perspectives and suggestions through intra-organizational advice networks represents an effort in the search for innovative solutions, because it supports the development of new knowledge. Indeed, as pointed out by Leih et al. (2015), extensive internal communication is needed for successfully design and implement a novel business model, because knowledge and information sharing are fundamental for organizational change.

Recent research has investigated the role of inter-organizational networks in the innovation processes of business models. Micheli et al. (2020) focused on the role of network flexibility on the business model innovation process, analysing the impact of the difference in size between the companies in the network and the change in links over time. In addition, Spieth et al. (2021) addressed the effects on the business model innovation process of the alliance network and its evolution over time. However, although the importance of inter-organizational networks on the BMI process is evident, there is essentially no research that has entered the intra-organizational black box to understand the impact of informal relationships and links between managers.

A contribution to overcoming these shortcomings and the resulting theoretical gaps may come from a brokerage perspective, contextualized to the business model innovation process. In a relationship involving three actors where two of them are the actual parties in the transaction, the third one is the intermediary, or broker (Mc Evily & Zaheer, 1999); brokerage is a process through which intermediaries facilitate transactions between other actors (Marsden, 1982).

Previous research highlighted the relevance of brokerage roles in developing innovation (Hargadon, 2002). Some studies focused on inter-organizational relationships (Belso-Martinez et al., 2015), the linkage between internal brokers and market knowledge (Cillo, 2005) or brokerage evolution (Soda et al., 2021); the link with trust, leadership, and social capital has also been discussed (Fleming & Waguespack, 2007). However, it has been overlooked how groups of managers operate within organizations, modelling the flow of information to innovate the business model. Advice sharing supports managers when they are in charge of crucial decisions and want to be informed of other people's perceptions (Bonaccio & Dalal, 2006; Stea et al., 2017). As illustrated by Täuscher and Abdelkafi (2017, p. 160), managers are 'increasingly confronted with the task of creating innovative business models', and their work can be eased by tools and techniques that encourage collaboration and knowledge sharing. Managers' capabilities in interpreting the market evolution and external challenges and opportunities, supported by a strong internal cooperation system, are key to business model innovation (Leih et al., 2015). By drawing on an innovation-diffusion model based on network theory, Jacobson et al. (2014) claimed that the engagement of all members of a firm is important in the innovation process, and opinion leaders should be supported in spreading information about this process, rather than forcing individuals to uncritically implement new directives for achieving the target. Ma et al. (2020) showed that advice-seeking has a strong impact on CEO's decisions, for example with regard to the adoption of a novel strategy. Alexiev et al. (2010, p. 1356) described the effects of top-managers' advice-seeking on organizational outcomes, showing that this behaviour 'is an important determinant for firms pursuing exploratory innovation'. In his seminal work on organizational knowledge, Nonaka (1994, p. 30) highlights the role of top and middle-level managers in knowledge creation and intra-organizational diffusion, specifying that 'top managers' concepts become operational conditions for middle managers who then decide how to realize the concepts'. In this vein, Groskovs and Ulhøi (2019) agreed with this view of the role of middle managers, by pointing out that they should be able to collect, interpret, and manage relevant information from different unites and individuals for supporting the business model innovation process.

Irrespectively of their position in the firm's hierarchical structure, change agents can support the internal sharing of personal perspectives and suggestions, while facilitating the transition to a new system (van Nistelrooij & de Caluwé, 2016). In business model innovation, the process of change is driven through the involvement of managers and employees (Groskovs & Ulhøi, 2019; Schneckenberg et al., 2018), and managers acting as brokers can facilitate this process by supporting flexible interaction processes. Indeed, Kelley et al. (2009) found that managers acting as brokers directly influence intra-organizational connections and, therefore, shape the network of organizational members involved in entrepreneurial innovation project; moreover, Burgess and Currie (2013) and Currie and White (2012) demonstrated that a substantial contribution to strategy development and implementation is made by middle managers with brokering roles, which are able to facilitate (or limit) the sharing of knowledge within a firm. In network theory, a broker is considered an actor which can connect two other network actors that otherwise would have not had the opportunity to be related (Burt, 1992), and in management and organization studies this concept has often been applied to the figure of middle managers (Currie et al., 2015). The work of Shi et al. (2009, p. 1455) provides an exhaustive overview of how the literature on middle management consider these managers as mediators between organizational actors at different levels, as well as coordinators of strategic guidelines to be translated into operational activities, and highlights that 'middle managers are likely to occupy the structural positions necessary to become brokers within the organization'.

However, middle managers are not the only actors that should be considered as brokers, because brokerage can apply also to top managers (e.g., Cross et al., 2001; Zupan & Kaše, 2007), whereas there is not a strong evidence in the literature about the brokering role of lower level managers in intra-organizational advice networks. In addition, little research investigated the brokering role played by managers in the process of business model innovation. Only in recent years, in their study on the activities carried out by middle managers for changing the business model, Groskovs and Ulhøi (2019) focused on the importance of these actor because of their direct relationship with the top management, as well as the knowledge of the practical problems

related to the application of new practices and processes, which make them particularly suitable for operating as a sort of 'transmission belt' between groups. They shed light on the importance of the relational element in business model innovation, and how middle managers can benefit of their structural position for enabling organizational changes. However, weaknesses in the theoretical understanding of the managers' brokerage roles still remain.

3 | DATA AND METHODS

3.1 | The case study

We focus on an empirical case study using original data from an Italian multi-unit leading enterprise operating in the personal care service industry. Case studies enable an in-depth understanding of empirical phenomena in real-life contexts, by providing a detailed description of the processes that are the object of the analysis (Yin, 1994).

This enterprise is active in Northern and Central Italy, and it supplies services to over 7000 people on a daily basis in the following sectors: childhood, disabled people, elderly, and healthcare. Its social mission is dedicated to the design of welfare models and the promotion of social innovation in collaboration with public institutions and local communities, which implies high specialization, coordination, and internal and external cooperation. In 2016, the enterprise started a process for implementing a novel business model focused on the offering of novel health services—not covered in previous activities—for entering into new market niches. This process lasted around 1 year and involved all the 136 managerial figures, from the top to the lower level managers. In this vein, according to the classification operated by Foss and Saebi (2017), we are considering an adaptive BMI, because it is new to the enterprise and it relates to all components of the business model.

3.2 | Social network analysis and data collection

We used a quantitative approach based on Social Network Analysis (SNA) for mapping and analysing intra-organizational advice relationships between all 136 managers, because all managers have been involved in the discussion towards the development of the novel business model. This often happens in business model innovation, because the adoption of a completely new business model implies that all organizational units and areas must be involved in the decisional process (Do Vale et al., 2021; Heyden et al., 2017; Khanagha et al., 2014). SNA is a method for analysing network data using theoretical concepts and techniques for uncovering the relationships between actors and groups (Prell, 2012). By assuming that knowledge sharing through advice networks is always feasible amongst managers, they can exchange multiple forms of advice, leading to the development of multiple directed networks, that is, networks where the advice flows have a direction from actor *i* to actor *j*. Therefore, we focus on two aspects of organizational learning, namely cognitive search and experiential learning (Berends et al., 2016), searching for the exchange of advice between managers about: conceptualization and creation of the business model (related to cognitive search); adaptation and experimentation of the business model (related to experiential learning).

Data have been collected through an online questionnaire including a section for collecting managers' socio-demographic and employment information (gender, age, educational level, role within the enterprise, tenure, and past working experiences) and a section for mapping their relationships using a roster method (Scott & Carrington, 2011). The complete list (roster) of the 136 managers working in the enterprise has been presented in a table form to the respondents, which could report the presence of advice exchanges with each one of the individuals listed in the questionnaire by specifying the type of exchange (related to the mechanisms of cognitive search and experiential learning) and its direction (advice received or sent). The following question has been used in the questionnaire: 'Please indicate if, in the last year, you have provided (Out) or received (In) knowledge or suggestions from one or more of the following managers with regard to: (a) concepts and ideas for one or more business model components; (b) the creation of one or more business model components; (c) changing business model components according to previous experiences; (d) actions to learn and validate business model components'. We did not investigate the usefulness of advice, that is, if the advice exchange has produced an effect on managers' behaviour and their capacity of elaborating knowledge, because our main objective was to map the relational patterns between managers and understand their brokering roles.

Data collection took place between December 2017 and March 2018; privacy issues have been addressed before the development of the questionnaire together with the Chief for the Human Resources (HR) Department, who also contributed to test the questionnaire. We received 102 questionnaires, yielding a response rate of 75%. Studies using SNA require high response rates, because even a few missing nodes in the network could be characterized by high connectivity, therefore producing biased results if they are not included in the analysis (Cronin, 2016). Response rates higher than 60%–70% are usually considered acceptable (Kossinets, 2006; Žnidaršič et al., 2017); moreover, in this research, we controlled for statistical differences, in terms of personal attributes such as gender and managerial category, between respondents and non-respondents (following an approach similar to Maoret et al., 2020), and we found no significant differences between the two groups.

3.3 | Brokerage analysis

We use brokerage analysis to detect which brokerage roles emerge in the advice interaction between managers, by adopting the Gould and Fernandez's (1989) typology. This typology is not new to management and organization studies investigating advice networks between managers (see Lee et al., 2019), and we followed this

approach because of its capacity to distinguish between internally-oriented and externally-oriented brokers, which is important to explore how managers behave in the business model innovation process within the firm.

Gould and Fernandez (1989) combined affiliation information and network structure to define five types of brokerage roles. Affiliation is defined by actors' membership to a specific group; in our study, it is defined by five managerial categories: lower level management (which includes coordinators and project managers); middle-level management—specialists; middle-level management—production managers; middle-level management—legal and financial managers; top-level management (which includes directors and the president of the organization). We decided to consider three different categories of middle managers because, according to Wooldridge et al. (2008, p. 1192), 'what makes middle managers unique is their access to top management coupled with their knowledge of operations'; hence, multiple middle management categories are identifiable by following this approach—depending on their functions and positioning towards the other managerial levels.

A manager acts as a 'Coordinator' if she/he brokers her/his group members, that is, circulating advice within the group. 'Gatekeepers' receive advice from members of other groups and spread it with their peers. On the contrary, 'Representatives' give advice to members of other groups, using knowledge acquired from their peers. A 'Consultant' is a manager that transfers advice between colleagues belonging to the same group, receiving knowledge from one of them and providing it to others. The fifth brokering role is called 'Liaison': managers that behave as 'Liaisons' are involved in a triadic advice exchange where no one belongs to the same group. The graphical illustration of these roles is presented in Figure 1. The first two types of brokerage roles can be classified as internally-oriented, because managers broker towards others in their group, whereas the last three types can be classified as externally-oriented, because managers broker towards others in different groups (Aalbers & Dolfsma, 2015).

Each manager presents a brokerage score for each one of the roles illustrated in Figure 1. Scores are computed by counting the number of times each actor exhibits a network structure that is attributable to one of these roles. A detailed description of how brokerage scores are estimated is available in Appendix A. In this study, we use the relative brokerage score, which is normalized by dividing the raw score by a randomized expected value given group sizes. The analysis was carried out using the software UCINET (Borgatti et al., 2002).

4 | RESULTS

Table 1 illustrates the descriptive statistics of the respondents: Most of the managers are women (77%) with a high level of education and a long experience in the sector, as demonstrated by the average tenure (11 years) and the presence of more than one out of two managers that have worked before for similar enterprises. The majority of respondents is made by lower level managers (55), followed by production managers (16) and top-level managers (12) (Table 2).

The advice networks related to the cognitive search and experiential learning mechanisms are illustrated in Figures 2 and 3. Managers are represented by network nodes, which are characterized by different shapes according to the managerial category. The arrowhead of the ties represents the advice flow direction.

Legend: circle nodes = lower level managers; square nodes = -specialists; up triangle nodes = production managers; down triangle nodes = legal and financial managers; diamond nodes = the top-level managers.

Figures 2 and 3 show that lower level managers are mostly located at the boundaries of the networks, whereas top managers are strategically central in both networks. Because of the different mechanisms intervening in the two learning modes aimed to develop business model innovation (cognitive search and experiential learning), we would have expected different network structures; however, the two networks show a high and statistically significant correlation (0.766), which means that there is a high probability to observe the same relationships between pairs of managers in both networks. This correlation has been calculated using the Quadratic Assignment Procedure (QAP), because network data are non-independent by definition and therefore it is not possible to use the classical Pearson correlation (Scott & Carrington, 2011). Managers have around seven connections (average degree) in both the cognitive search and the experiential learning network, and the two networks have a similar density, that is, the ratio between the number of observed ties on the total number of possible ties (Table 3). Hence, managers create similar network patterns independently by the type of advice exchanged.

Tables 4 and 5 illustrate the average centrality scores, by managerial group, observed in the two networks—with a specific focus on In-degree, Out-degree, and Betweenness centrality. In SNA, centrality is measured at actor level; we calculated In-degree centrality as the number of advice ties received by a manager, Out-degree centrality as the number of advice ties given by a manager, and Betweenness centrality as the number of times a manager was positioned in the

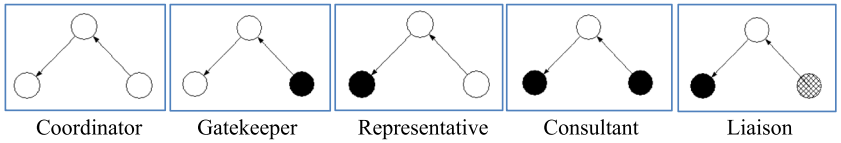

FIGURE 1 Brokering roles identified by Gould and Fernandez (1989). Coordinator Gatekeeper Representative Consultant Liaison. *Legend*: Arrowheads indicate the direction of the advice flows, whereas the colours of the nodes distinguish between different managers' groups.

TABLE 1 Descriptive statistics

Variable	Description	Type	Mean	Std. dev.	Min.	Max.
Gender	Gender	Dummy (0 = woman 1 = man)	0.23	0.43	0	1
Age	Age (in years)	Continuous	44.5	8.5	27	66
Educational level	Qualification (type)	Categorical (%)	High-school degree = 18.6% Bachelor or master degree = 55.9% PhD or specialization = 25.5%			
Tenure	Tenure (in years)	Continuous	11.1	8.4	1	32
Past working experience	Previous experiences in similar organizations	Dummy (0 = no 1 = yes)	0.54	0.50	0	1

TABLE 2 Formal roles of the respondents and corresponding category used for the brokerage analysis

Formal role	Number of respondents	Managerial role category
Service coordinators	53	Low-level management (low)
Project managers	2	
Specialists	11	Middle-level management (mid_a)
Production managers	16	Middle-level management (mid_b)
Legal and financial managers	8	Middle-level management (mid_c)
Directors	11	Top-level management (top)
President	1	

shortest (advice) path linking two managers together (Prell, 2012). Then, the score for each managerial group was estimated as a simple average of all centrality scores of its members. Lower level managers show the lowest scores of In-degree, Out-degree, and Betweenness centrality, whereas top-level managers have the highest scores of In-degree and Betweenness centrality. The latter also show Betweenness centrality that greatly increases in the Experiential learning network compared with the Cognitive search network, which suggests the presence of deliberate behaviour from these individuals for connecting managers who need practical information on the adaptation and the experimentation of the new business model. With regard to the middle-level managers, specialists (mid_a) are quite active in spreading advice, as well as in receiving it from others, but their average Betweenness centrality in the Cognitive search network is lower compared with the other middle-level managers. However, in the Experiential learning network their Betweenness centrality is higher compared with the other middle-level managers. Therefore, middle-level managers are more or less central according to the learning mechanism that is activated and the underlying advice exchange.

The results from the brokerage analysis provide additional insights on managers' networking activities. Table 6 shows the managerial groups' average brokerage scores, by managerial group and brokering roles. The individual scores for all managers are illustrated in Appendix B. According to Currie and White (2012), knowledge brokering is mainly a group phenomenon and, therefore, it is more appropriate to focus on group brokerage scores rather than individual scores. The majority of managers are externally-oriented (prevalence of the following brokering roles: Representative, Consultant, and Liaison) in both networks, especially in the case of production managers (mid_b) and legal and financial managers (mid_c). The latter are among the most externally-oriented managers, because they mostly act as Consultants and Liaisons. On the other hand, the relevance of the Liaison role interpreted by lower level managers in the cognitive search network becomes much less prominent in the experiential learning network, whereas the specialists (mid_a) become more internally-oriented in the experiential learning network. Top-level managers are more internally-oriented in the cognitive search network, but in the experiential learning network, they increase their externally-oriented focus.

Figures 4 and 5 illustrate the reduced graphs derived from the outputs of the brokerage analysis,[1] and Table 7 provides a summary of the managerial implications of the type of brokerage for each managerial role category. The managerial groups showing an higher propensity to be externally-oriented by acting as Liaisons are highlighted in red and they belong to the middle management: production managers (mid_b) and legal and financial managers (mid_c). In the cognitive search network, they act as transmission belts between the top management (top) and the specialists (mid_a), whereas in the experiential learning network, legal and financial managers act as Liaisons between the top management and the production managers. The lower level managers (low) are externally-oriented but mainly act as Representatives: In Figures 4 and 5, we can see that they suggest their proposals to the top management and the specialists in the cognitive search network, whereas only to the top management in the experiential learning network. The specialists are strong Liaisons in the cognitive search network between the top management and the production managers, and the low management and the top management, but in the experiential learning network, they act mainly as Gatekeepers, receiving advice from the production managers. Finally, the top management is

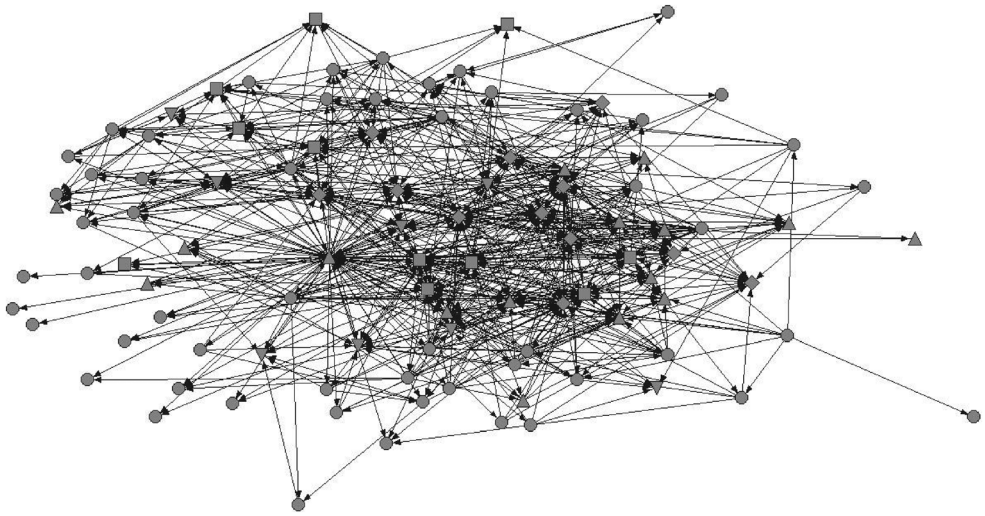

FIGURE 2 Cognitive search network. *Legend*: circle nodes = low-level managers; square nodes = specialists; up triangle nodes = production managers; down triangle nodes = legal and financial managers; diamond nodes = top-level managers

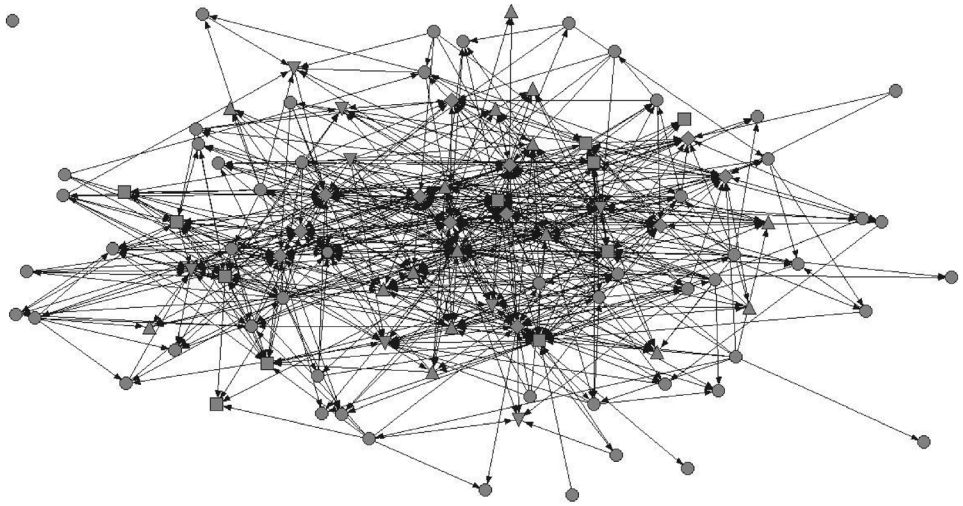

FIGURE 3 Experiential learning network. *Legend*: circle nodes = low-level managers; square nodes = specialists; up triangle nodes = production managers; down triangle nodes = legal and financial managers; diamond nodes = top-level managers

TABLE 3 Descriptive statistics of the cognitive search and the experiential learning networks

	Cognitive search network	Experiential learning network
Average degree	7.343	6.912
Density	0.072	0.068

mainly doing gatekeeping and receiving advice from all the other groups of managers.

These statistical results can be interpreted in light of the managerial implications deriving from such brokerage roles. The strategic behaviour of low level and top management is reflected in their hierarchical positions. Strategies are decided by the top management, but lower level managers have a direct experience with operations and activities delivered for their clients: Their decisions must be consistent with the intended strategy (Bowman & Ambrosini, 1997), but their actions should be directed towards informing the above levels about functionalities and challenges observed in their work, in order to properly implement novel strategic approaches—such as the business model innovation. Middle managers are mainly acting as connectors: Again, this is in line with—and influenced by—their hierarchical role, as described by Shi et al. (2009), but during a business model innovation, we observe differences between groups not just because of their position in the organizational chart, but because of their tasks. According to the classification proposed by Shi et al. (2009), legal and financial managers seem more prone to championing alternatives for conceptualizing and creating the novel business model (cognitive search), whereas because of their structural position, production

TABLE 4 Average centrality measures by managerial role (cognitive search network)

Managerial role category	In-degree (mean)	Out-degree (mean)	Betweenness (mean)
low	2.75	6.02	28.18
mid_a	11.91	10.00	219.00
mid_b	11.00	7.50	278.63
mid_c	9.75	9.19	258.13
top	18.58	8.42	341.92

TABLE 5 Average centrality measures by managerial role (experiential learning network)

Managerial role category	In-degree (mean)	Out-degree (mean)	Betweenness (mean)
low	2.45	5.85	34.49
mid_a	10.73	9.55	231.36
mid_b	11.50	5.63	151.50
mid_c	9.31	7.00	125.50
top	17.58	10.08	438.75

TABLE 6 Average brokerage scores by role category and brokering roles

Number of individuals Cognitive search	Managerial role category	Coordinator	Gatekeeper	Representative	Consultant	Liaison
55	low	0.263	0.682	1.256	0.307	0.999
11	mid_a	0.128	1.002	0.389	0.756	1.378
16	mid_b	0.201	0.797	0.738	0.303	1.298
8	mid_c	0.005	0.325	0.122	0.618	2.302
12	top	0.305	2.249	0.569	0.387	0.965
Experiential learning						
55	low	0.275	0.382	1.274	0.307	0.613
11	mid_a	0.105	1.499	0.544	0.728	1.006
16	mid_b	0.172	0.679	0.631	0.544	1.304
8	mid_c	0.000	0.179	0.000	0.530	2.101
12	top	0.230	1.643	0.801	0.636	1.082

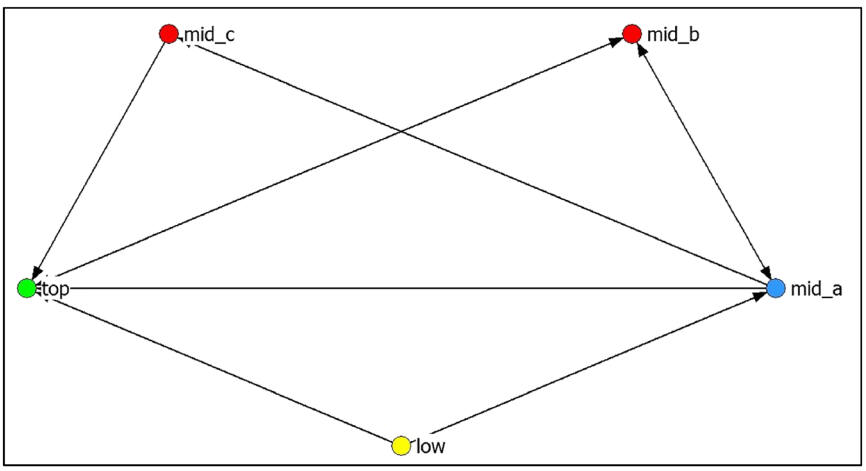

FIGURE 4 Cognitive search network roles analysis. *Legend*: blue node = multiple prevailing brokering roles; green node = mainly 'Gatekeepers'; red node = mainly 'Liaison'; yellow node = mainly 'Representatives'

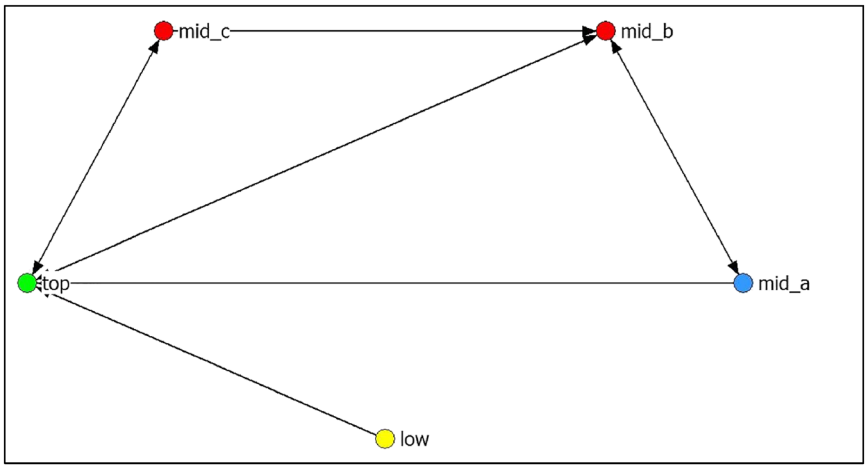

FIGURE 5 Experiential learning network roles analysis. *Legend*: blue node = multiple prevailing brokering roles; green node = mainly 'Gatekeepers'; red node = mainly 'Liaison'; yellow node = mainly 'Representatives'

TABLE 7 Managerial implications by brokerage role

Managerial role category	Brokerage role (cognitive search)	Brokerage role (experiential learning)	Managerial implications
low	Representative	Representative	Coordinators and project managers share advice deriving from 'first hand' experience. Objective: Provide practical support to managers at higher levels. At the same time, they might want to emphasize needs and expectations of their group (perhaps not enough decisive in the decision-making process)
mid_a	Mixed	Mixed	Specialists do not have a clear brokerage role. Their (precise) tasks might narrow their actions and networking strategy, hence preventing the adoption of a well-defined strategy for influencing the business model adoption process
mid_b	Liaison	Liaison	Strategy: Acting as 'conveyor belt' between other middle managers and the top management. Production managers aim to control the flow of information concerning production activities within the organization. Similar to the approach adopted by legal and financial managers, but on a different aspect—Not conflicting
mid_c	Liaison	Liaison	Strategy: Acting as 'transmission belt' between other middle managers and the top management. Legal and financial managers aim to control the flow of information concerning production activities within the organization. Similar to the approach adopted by production managers, but on a different aspect—Not conflicting
top	Gatekeeper	Gatekeeper	The top management is interested in acquiring advice to be used for informed decisions regarding the novel business model. Key element: Being in contact and receiving advice from all managers

managers can be more effective in implementing the innovation, because of the advice received and shared with other groups of managers for both cognitive search and experiential learning mechanisms. Specialists are rather different: Because of their tasks focusing on specific (and differentiated) areas of activity, they have a mixed approach based on synthesizing information from other groups when considering the advice needed for adapting and experimenting the novel business model and providing support in implementing the business model when the focus is on its conceptualization and creation.

5 | DISCUSSION AND CONCLUSIONS

This study investigates the brokering roles of managers when establishing advice relationships aimed to innovate a firm's business model. Extant research has highlighted the relation between brokers' embeddedness (Hansen et al., 2005; Soda et al., 2019; Tortoriello & Krackhardt, 2010) and their capacity to integrate and disseminate diverse information for supporting the innovation process (Tortoriello et al., 2015); moreover, in recent years, new studies have also looked at the brokerage roles of specific groups of managers (Glaser et al., 2021). Our research is aligned with previous studies focusing on entrepreneurial- and innovation-oriented managers' behaviour, whereas it provides novel insights on brokerage roles in the process of business model innovation, which has so far been neglected.

By using SNA to explore the network patterns developed by different managerial groups, we contribute to opening the black box of how advice related to the business model innovation process is shared throughout a firm. Our findings highlight the key role of middle managers, but we extend previous literature as our in-depth analysis also identifies which brokerage roles the distinct groups of middle managers perform. To the best of our knowledge, there are no previous studies investigating how the different groups of managers at different hierarchical levels interact and which brokerage roles they perform in the process of business model innovation. Moreover, this research overcomes a recognized weakness of previous research which consists in the prevailing focus on middle managers individually, but neglecting to investigate how groups at different levels of the hierarchy perform brokerage roles (Shi et al., 2009). Our findings provide evidence of the specific role of middle managers in networking, addressing the theoretical gap on the importance of brokerage at organizational level and how groups of managers are connected (Shi et al., 2009). Mapping managers' advice networks supports the identification of existing informal links between managers and improves our understanding of how innovative initiatives, related to the business model, are spread within organizations. Based on the results emerging from our analysis, this paper provides several contributions.

First, we provide empirical evidence of the coexistence of multiple learning mechanisms differently employed by managers—cognitive search and experiential learning—which are leading to different intraorganizational advice-based networking structures. Previous literature mainly focused on a single organizational learning mechanism, thus suggesting the alternative use of cognitive research or experiential learning as the organizational learning mechanisms used by managers in the process of business model innovation (e.g., Schneckenberg et al., 2018; Sosna et al., 2010). Recent studies identify behavioural patterns in which the different mechanisms are iteratively employed by managers to create, develop, and spread knowledge aimed towards business model innovation. Accordingly, different organizational learning mechanisms are used within organizations not alternatively, but iteratively (e.g., Berends et al., 2016). Our study advances this stream of research by providing empirical evidence of the intra-organizational informal structures established in this process. We found that specific groups of middle managers are responsible for linking and coordinating other managerial groups according to the type of advice network considered—related to cognition (cognitive search) or action (experiential learning). Production managers and legal and financial managers always act as Liasion, independently from the type of advice exchanged: However, legal and financial managers broker between the top management and the specialists in the cognitive search network, whereas they broker between the top management and the production managers in the experiential learning network. This insight highlights the differences existing amongst individual learning mechanisms, as well as the presence of alternative relational strategies adopted by managers, which supports and extends Berends et al. (2016), who suggested that business model 'cannot be reduced to either organizational actions or cognitive representations but should be understood as a duality'. In this vein, observing that production managers become the recipients of advice flows from other middle managers, when it comes to discuss trial-and-error procedures, indicates that the former are considered particularly relevant when decisions actions must be translated into decisions. Our insights suggest that, within an organization, groups of managers can make use of different organizational learning mechanisms—cognitive search and experiential learning—which, therefore, coexist and can be used simultaneously between different groups. The ability of groups of managers to use or adapt to one or another of the learning mechanisms affects the effectiveness of interaction with other groups of managers within the organization. It is therefore connected to how the groups of managers perform their role in the process of innovating business models. A group of managers can use a learning mechanism when interacting with a specific group of managers and a different one with another group of managers, thus making collaboration in the business model innovation process existent and effective.

Second, a central insight from this research is the emphasis on the key role that middle managers play within a firm; in particular, the presence of a heterogeneous brokerage role played by different groups of middle managers. The brokerage role of liaison is especially important for the business model innovation process as it enables collaboration between groups of managers with different roles. A limited number of studies have focused on brokerage roles in business model innovation (e.g., Boari & Riboldazzi, 2014), but which role middle managers play has been mainly overlooked. We found that middle managers perform a key role as they act as a liaison that allows them to convey the ideas that can generate or feed the innovation process of the business model by distributing it within the organization. Middle managers not only create a bridge between top managers and low managers, but they also mediate and manage the exchange of information and knowledge between the different organizational levels. In this perspective, they can select the information and knowledge to be conveyed. Similarly, in the role of liaison, middle managers combine knowledge from different individuals or organizational units, and they can rework it and validate it before conveying it to other groups within the organization. Their brokerage role is key to unite the knowledge of different groups as well as to divide it, avoiding sharing, with a significant impact on the business model innovation process. Therefore, middle managers do not limit themselves to putting

members of the organization belonging to different organizational units in contact but can play an active role that influences the selection of innovation contents and the strategic options to be conveyed and the re-elaboration of the knowledge to be disseminated and, consequently, on the selection of the organizational actors to involve and connect in the business model innovation process. Although production managers and legal and financial managers always can be identified as Liaison, specialists do not have a clear brokerage role. The exchange of advice between managers takes place on a daily basis, and it shapes knowledge flows that do not necessarily correspond to the formal lines defined by the hierarchical system (Cross et al., 2001; Meese & McMahon, 2012). Foss and Saebi (2017) highlighted that research studies are still needed to address empirical and theoretical gaps that are crucial to understand whether business model innovation is a phenomenon originated entirely in the upper echelons or whether it also comes from middle and lower level management. Our findings bridge this gap and shed light on the multifaceted role of the middle management. In particular, we found that production managers and legal and financial managers assume a key role in supporting the spread of advice for innovating the business model; indeed, they act similarly to as a conveyor belt between groups of managers, both when these managers are searching for advice to conceptualize and create the novel business model, as well as when they are looking for advice to change and validate. Previous studies focusing on the strategic role of middle managers found evidence of their involvement in the strategy formulation process (Wooldridge et al., 2008) and highlighted their role as mediators, interpreters, and intermediaries in the implementation of strategic change (Balogun & Johnson, 2004), especially as a linchpin between top management and lower level management. We found that middle management exerts a key role as it makes possible the connection between different modes of innovation development coexisting within the organization. Middle managers are main players in achieving the combination and synthesis of innovation developed by the different groups of managers within the organization, and they basically play the same brokerage role independently from the type of learning mechanism activated: This might be a confirmation that business model innovation is a combination of different learning mechanisms (Berends et al., 2016; Spieth et al., 2021), and this is why we observe groups of middle managers adopting the same brokerage role in different advice networks. Our results suggest that is possible to theorize a leadership role in the business model innovation process that middle managers can exercise because of their role as liaison in the intra-organizational network. This leadership role is not based on authority but on the possibility of contributing to the development of the contents and the direction of innovation of the business model. Furthermore, by using different organizational learning mechanisms to connect different groups of managers, they can help overcome cognitive barriers.

Third, the relevance of middle management in intra-organizational networking is strengthened and consistent with the more limited role of top and lower level managers. Top managers mainly act as Gatekeepers, receiving advice from others and spreading it within their own group. On the other hand, lower level managers can be described as Representatives, a brokering role that is characterized by the orientation towards sharing with other groups the main ideas and thoughts coming from other members of the group. Neither top managers nor lower level managers assume a pivotal role in spreading advice for innovating the business model such as some of the groups belonging to the middle management, whose brokering role is measurable through their identification as Liaison. This leads to additional research questions about the differences between managerial groups: When looking at business model innovation in other industries, top and lower level managers can assume different brokerage roles? Our case study is supposed to provide an overview of the functioning of a large organization, but the focus on a single sector (personal care service industry) might be a limitation in terms of transferability of the results. Moreover, qualitative analysis can be used for exploring if there is a declared strategy behind managers' behaviour, or if the hierarchical organizational structure is implicitly favouring specific brokerage roles for certain managers rather than others. Studies in other industries might lead to different findings, and we call for more intra-organizational network studies to test this hypothesis—that is, that managers' brokerage for business model innovation depends on the managerial role and the type of industry in which business model innovation is designed and applied.

This research has also managerial implications. The insights from our analysis might help managers to understand how informal intra-organizational networks support knowledge diffusion for the business model innovation process and how they can be facilitated to effectively leverage internal know-how to generate innovation. Our results show how informal advice networks affect the innovation process of the business model and what role different groups of managers play. In particular, our study helps to understand the key role that middle management can play in the innovation process of the business model, overcoming the previously prevalent arguments that identify key players in top management. On the contrary, this research shows what leadership role middle managers can play in the business model innovation process. Therefore, our study helps managers understand how to foster creative and knowledge generation processes for business model innovation within an organization. In this perspective, our insights identify an antecedent for the development of organizational skills for business model innovation neglected by previous research.

Despite the above advancements, this study suffers from the following limitations. First, we have not measured the strength of the relationships between managers, in terms of intensity of the advice exchange. The analysis considers the presence or absence of advice exchange between managers, and therefore we have not been able to discuss the importance of tie strength. In management studies, tie strength has often been associated with an increase in knowledge transfer (van Wijk et al., 2008), but the presence of weak ties has been proven to boost creativity (Baer, 2010): Because there is no empirical evidence on the impact of tie strength on business model innovation, we call for more studies that can test if there is a relationship between the former and the latter. Second, it has not been possible to measure the effects of business model innovation on daily routine practices, because this process requires time to be internalized

by the enterprise. Future research could therefore focus on an in-depth evaluation of the potential effects of business model innovation, considering formal and informal barriers supporting its development. Third, we did not ask the respondents about the usefulness of advice; hence, there is no information on the effectiveness or consequences of advice, narrowing the interpretation and contribution of the results. Indeed, as pointed out by Van Doorn et al. (2017), when top-level managers acquire knowledge from the external environment without the capacity of absorbing and elaborating this knowledge, advice-seeking cannot be fully considered as a driver of entrepreneurial orientation. Further developments can control for this aspect in a future data collection. Finally, our case study can be seen as a successful case of business model innovation—that is, a situation where managers have been able to discuss the main changes related to the innovative process and a decision has been reached at organizational level. Further research can be dedicated to comparing successful cases with similar settings where, on the other hand, this process has been unsuccessful: This might help to understand if there are differences, in terms of managers' brokerage behaviour, between successful and unsuccessful cases. Moreover, studies using mixed qualitative and quantitative methods would provide a better understanding such phenomenon: In-depth interviews from a sample of managers who experienced successful and unsuccessful business model innovation processes can expand our work—in particular, they can test if the networking behaviour of middle managers has an impact on this process and investigate what are the motivations behind such behaviour.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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ENDNOTE

[1] (*page 20*, *line 417*) A reduced graph is a simpler form of the original network, where the interactions between groups of managers are summarized in the 'blocks' of a density matrix. Blocks assume a value equal to 1 (i.e., presence of a tie between two nodes) if their density score is above the average. The nodes of the reduced graph represent the different groups of managers, not the single individuals: a directed tie from group a to group b means that there is a strong presence of flows of advice from the managers of Group A to the managers of Group B. For a detailed description, see Prell (2012).

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APPENDIX A

As illustrated in Section 3.3, there are five types of brokerage roles according to Gould and Fernandez (1989): coordinator; gatekeeper; representative; consultant; and liaison. The first two types are internally-oriented, that is, the advice flow between three actors is mediated by a broker that belongs to the same group of the endpoint actor receiving (in the final step) the advice. The other three types are externally-oriented, because the broker does not belong to the same group of the endpoint actor. In this study, groups are defined by the managerial role—low level management, middle level management (considering three separate groups: specialists, production managers, and legal and financial managers), and top level management—in order to take into account the intra-organizational hierarchical structure.

If we consider three different actors (m_i, m_j, and m_k), this group identification can be written as:

- coordinator: $m_i = m_j = m_k$
- gatekeeper: $m_i \neq m_j = m_k$
- representative: $m_i = m_j \neq m_k$
- consultant: $m_i \neq m_j \neq m_k$ (and $m_i = m_k$)
- liaison: $m_i \neq m_j \neq m_k$ (and $m_i \neq m_k$)

From a computational perspective, an actor's brokerage score (w_{Ij}) is therefore estimated as:

$w_{Ij} = \sum_i^N \sum_k^N wI(ik)$, ($i \neq j \neq k$).

where N is equal to the number of network actors, and w_I *(ik)* can assume two values:

- 1 if *ijk* is true and:
  - $m_i = m_j = m_k$ (for the coordinator brokerage role)
  - $m_i \neq m_j = m_k$ (for the gatekeeper brokerage role)
  - $m_i = m_j \neq m_k$ (for the representative brokerage role)
  - $m_i \neq m_j \neq m_k$, and $m_i = m_k$ (for the consultant brokerage role)
  - $m_i \neq m_j \neq m_k$, and $m_i \neq m_k$ (for the liaison brokerage role)
- 0 otherwise.

APPENDIX B

TABLE B1 Cognitive search relative brokerage (raw scores divided by randomization expected values given group sizes)

	Managerial role category	Coordinator	Gatekeeper	Representative	Consultant	Liaison
ID1	Low management (low)	0	0	0	0	3.382
ID2		0.42	1.1	2.749	0.733	0.338
ID69		0	0	0	0	0
ID4		0	1	0	0	2.767
ID70		0	0	0	0	0
ID6		0.525	0.458	2.749	0	1.127
ID73		0	0	0	0	0
ID110		0	0	3.836	0	1.022
ID77		0	0	0	0	3.382
ID10		0	1.222	0	1.833	1.503
ID11		1.801	0	3.927	0	0
ID12		0	0	0	0	0
ID13		0	0	5.498	0	0
ID45		0	0	5.498	0	0
ID122		0	0.55	0	0.55	2.705
ID17		0	0	0	0	0
ID18		0	0	0	0	0
ID91		0	3.665	0	0	1.127
ID93		1.261	2.199	1.1	0	0.676
ID95		0	0	2.749	0	1.691
ID56		0.485	0.423	2.115	0.423	1.301
ID58		0	0	0	0	0
ID59		0	0	0	0	0
ID27		0.556	0.809	0.97	0.647	1.591
ID29		0	5.498	0	0	0
ID104		0	0	0	0	3.382
ID105		0	0	3.665	0	1.127
ID106		0	0	2.999	0	1.537
ID35		0	0	3.848	0.55	0.676
ID48		0	0	0	0	0
ID124		0	0	2.291	0	1.973
ID38		0	0	0	0	3.382
ID64		0	0	0	0	0
ID113		0	0	0	5.498	0
ID41		0	0	0	0	3.382
ID42		1.261	2.199	0	0	1.353
ID43		0	2.749	2.749	0	0
ID44		0	0	5.498	0	0
ID118		1.951	0.262	3.011	0	0.322
ID67		0	0	0	0	3.382
ID47		0	0	0	0	0
ID132		1.401	0.611	2.443	0	0.752
ID90		0	0	0	0	0
ID128		0	1.1	0	0	2.705

(Continued)

	Managerial role category	Coordinator	Gatekeeper	Representative	Consultant	Liaison
ID101		0.901	1.178	1.571	0.393	0.966
ID134		0	5.498	0	0	0
ID131		0	0	2.749	0	1.691
ID61		0	0	0	0	0
ID135		0	0	0	0	0
ID79		0	0	0	0	3.382
ID68		0	0	0	5.498	0
ID123		2.101	2.291	0.916	0	0.282
ID136		0.901	2.356	0.785	0.785	0.483
ID117		0	0	4.582	0	0.564
ID133		0.901	2.356	0.785	0	0.966
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ID71	Specialists: Middle-level management (mid_a)	0	0	0	0	0
ID8		0	0	0	0	3.382
ID127		0.108	0.723	0.597	0.377	2.28
ID96		0.1	0.47	0.626	0.87	2.119
ID112		0.025	0.331	0.795	1.435	1.793
ID108		0.54	1.257	0.628	2.513	0.386
ID89		0	0	0	0	0
ID36		0.573	4.998	0	0	0
ID7		0.059	0.467	0.545	1.66	1.707
ID82		0	2.115	0.423	0	1.821
ID49		0	0.66	0.66	1.466	1.668
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ID3	Production managers: Middle-level management (mid_b)	0	0	0	0	0
ID40		0	0	0	0	0
ID21		0	1.604	0.458	0.229	1.973
ID32		0	0	0	0	3.382
ID5		0.586	1.534	0.767	0.511	1.337
ID14		0	0	0	0	0
ID26		0	0	2.749	0	1.691
ID88		0	0	1.1	0	2.705
ID92		0.116	0.656	1.16	0.807	1.706
ID102		0.147	1.406	0.767	0.128	1.888
ID37		1.017	2.66	0.355	0	0.982
ID81		0.769	3.218	0.402	0.536	0.412
ID33		0.293	1.151	0.767	1.279	1.258
ID114		0	0	0	0	0
ID99		0	0	1.833	0	2.255
ID107		0.287	0.52	1.449	1.358	1.182
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ID130	Legal and financial managers: Middle-level management (mid_c)	0	0.175	0	0.825	2.767
ID23		0	1.706	0.19	0.569	1.866
ID86		0	0	0	0.611	3.006
ID74		0.041	0.719	0.359	0.826	2.188
ID46		0	0	0	0	3.382

(Continues)

(Continued)

	Managerial role category	Coordinator	Gatekeeper	Representative	Consultant	Liaison
ID52		0	0	0	0	3.382
ID121		0	0	0	0	0
ID62		0	0	0.423	2.115	1.821
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ID9	Top management (top)	0.511	2.08	1.189	0.297	0.914
ID16		0.096	1.916	0.528	0.75	1.366
ID39		1.751	3.971	0	0	0
ID109		0.072	2.907	0.379	1.137	0.622
ID22		0	1.499	1	0	1.845
ID55		0	5.498	0	0	0
ID24		0.082	0.714	0.785	0.357	2.196
ID98		0.111	2.604	0.579	0.289	1.187
ID72		0.119	1.867	0.533	0.533	1.513
ID19		0	0	0	0	0
ID119		0.185	1.86	0.97	0.566	1.194
ID31		0.733	2.071	0.869	0.716	0.739

TABLE B2 Experiential learning relative brokerage (raw scores divided by randomization expected values given group sizes)

	Managerial role category	Coordinator	Gatekeeper	Representative	Consultant	Liaison
ID1	Low management (low)	0	2.199	0	2.199	0.676
ID2		1.029	0.673	3.029	0.449	0.276
ID69		0	0	0	0	0
ID4		0	0	0	0	3.382
ID70		0	0	0	0	0
ID6		0.901	0.785	0	0.785	1.932
ID74		0	0	0	0	0
ID110		1.017	1.064	2.306	0.355	0.545
ID77		0	0	0	0	0
ID10		0	1	0	1.499	1.845
ID11		1.801	0	3.927	0	0
ID12		0	0	0	0	0
ID13		0	0	5.498	0	0
ID45		0.788	1.031	2.749	0	0.634
ID122		0	0	0	1.833	2.255
ID17		0	0	0	0	0
ID18		0	0	0	0	0
ID91		0.573	1.999	1.499	0	0.922
ID93		3.152	0	2.749	0	0
ID95		0	0	2.749	0	1.691
ID56		0.42	0.367	1.833	0.55	1.465
ID58		0	0	0	0	0
ID59		0	0	5.498	0	0

(Continued)

	Managerial role category	Coordinator	Gatekeeper	Representative	Consultant	Liaison
ID27		0.21	0.183	0.916	0.916	2.029
ID29		0	2.749	0	2.062	0.423
ID104		0	0	0	0	0
ID105		0	0	0	0	0
ID106		0	0	5.498	0	0
ID35		0	0	5.498	0	0
ID48		0	0	0	0	0
ID124		0	0	0.5	0.5	2.767
ID38		0	0	0	0	0
ID64		0	0	0	0	0
ID113		0	0	0	0	0
ID41		0	0	0	0	0
ID42		0	0	0	0	0
ID43		0	0	0.785	0.785	2.416
ID44		0	0	5.498	0	0
ID118		2.335	0	3.462	0	0
ID67		0	0	0	0	0
ID47		0	0	0	0	0
ID132		0.788	1.031	1.031	0.344	1.48
ID90		0	0	0	0	0
ID128		0	0	0	0	3.382
ID101		0.7	0.611	2.443	0	1.127
ID134		0	0	0	0	0
ID131		0	0	2.199	0	2.029
ID61		0	0	0	0	0
ID135		0	0	0	0	0
ID79		0	0	0	0	0
ID68		0	0	0	2.749	1.691
ID123		1.401	1.833	1.222	0	0.752
ID136		0	5.498	0	0	0
ID117		0	0	3.665	1.833	0
ID133		0	0	5.498	0	0
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ID71	Specialists: Middle-level management (mid_a)	0	5.498	0	0	0
ID8		0	5.498	0	0	0
ID127		0.167	0.632	1.119	0.535	1.885
ID96		0.121	0.497	0.919	0.798	1.955
ID112		0.048	0.713	0.755	1.301	1.652
ID108		0.498	1.013	1.302	1.302	0.89
ID89		0	0	0	0	0
ID36		0	0	0	0	0
ID7		0.068	0.502	0.355	1.744	1.745
ID82		0.252	1.246	0.733	0.733	1.578
ID49		0	0.887	0.798	1.596	1.364
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(Continues)

(Continued)

	Managerial role category	Coordinator	Gatekeeper	Representative	Consultant	Liaison
ID3	Production managers: Middle-level management (mid_b)	0.344	1.1	0.9	0.2	1.845
ID40		0	0	0	0	0
ID21		0	1.596	0.532	0.177	1.964
ID32		0	0	0	0	3.382
ID5		0	0	1.833	0.611	1.879
ID14		0	0	0	0	0
ID26		0	0	0	0	0
ID88		0	0	2.356	0.785	1.449
ID92		0.283	0.68	1.359	0.68	1.558
ID102		0.045	0.353	0.746	1.374	1.836
ID37		1.327	2.894	0	0	0.89
ID81		0	2.115	0.423	1.692	0.78
ID33		0.525	1.374	0.916	1.833	0.564
ID114		0	0	0	0	3.382
ID99		0	0	0	0	0
ID107		0.23	0.748	1.033	1.357	1.328
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ID130	Legal and financial managers: Middle-level management (mid_c)	0	0.156	0	0.86	2.757
ID23		0	1.279	0	1.534	1.652
ID86		0	0	0	0.647	2.984
ID75		0	0	0	0	0
ID46		0	0	0	0	3.382
ID52		0	0	0	0	0
ID121		0	0	0	0	3.382
ID62		0	0	0	1.195	2.647
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ID9	Top management (top)	0.733	3.196	0.767	0	0.551
ID16		0.064	0.649	1.008	1.388	1.474
ID39		0.648	1.506	1.186	0.715	0.938
ID109		0.833	4.772	0	0	0
ID22		0	1.294	0.97	0	1.989
ID55		0	2.749	0.785	0.393	0.966
ID24		0	0	1.19	1.108	1.969
ID98		0	1.222	0.873	0.96	1.503
ID72		0.226	1.971	0.788	0.453	1.285
ID19		0	0	0	0	0
ID119		0	0	1.649	1.649	1.353
ID31		0.260	2.352	0.397	0.964	0.959