

# Knowledge network structure and middle management involvement as determinants of TMT members' ambidexterity: A multilevel analysis

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## ABSTRACT

Even though scholars have widely asserted that ambidextrous organizations need ambidextrous managers, we still know relatively little about the emergence of ambidextrous behaviours among top management team (TMT) members. The purpose of this study is to gain a deeper understanding about how TMT networks and middle management involvement in decision-making collectively shape the ability of TMT members to deal successfully with the exploration–exploitation paradox. Through in-depth interviews and a multilevel analysis of internal networks of 123 TMT members in 20 public hospitals, results suggest that leaders' centrality and the density of TMT networks shape the ability of TMT members to behave ambidextrously. The framework of this paper also incorporates the role of middle management, critical in linking the strategic apex and the operating core, and thereby supporting TMT members' ambidextrous behaviour. Various theoretical and practical implications are discussed.

## 1. Introduction

In order to sustain a competitive advantage over time, scholars have argued that organizations need to search for and develop new knowledge (exploration) while building upon and refining existing knowledge (exploitation) (March, 1991). This ability, often referred to as organizational ambidexterity, enables them to meet current demands and to adapt to changing internal and external demands (Gibson and Birkinshaw, 2004). However, exploration and exploitation have been shown to be contradictory in nature and the pursuit of both leads to inherent tensions within organizations (Jansen et al., 2006). Scholars have therefore argued that ambidextrous organizations need ambidextrous leaders who do not prioritize exploitation over exploration but rather try to resolve the paradox and engage in and support the emergence of both (Gibson and Birkinshaw, 2004; O'Reilly and Tushman, 2004; Smith and Tushman, 2005). For instance, earlier studies have shown that senior leaders may identify cognitive frames and processes that help recognize structural features facilitating them to navigate strategic contradictions (Miron-Spektor et al., 2018).

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Even though most research on organizational ambidexterity has been conducted within medium to large, for-profit organizations, managing the tension between exploration and exploitation is equally important for public organizations. Such organizations, for instance in healthcare, need to explore and understand new diseases and develop effective treatments while exploiting and improving the efficiency of their operations to reduce costs (Salas-Vallina et al., 2019). Moreover, given that healthcare organizations are considered to be professional services firms, we argue that when senior leaders deal with inherent tensions when pursuing exploration and exploitation, they also need to involve other professionals and apply their knowledge and insights (Cross and Sproull, 2004; Levin et al., 2011). Even though earlier research on top management team (TMT) ambidexterity has already considered managers' positions in a network (Rogan and Mors, 2014), much more remains to be understood about whether and how the structure of a network among senior leaders in the TMT affects their ability to act ambidextrously (Smith and Tushman, 2005). In some TMTs, for instance, the locus of integration occurs at the chief executive officer (CEO) level (i.e. high CEO centrality), where s/he acts as the central actor receiving and providing knowledge to the rest of the TMT. In other TMTs, members may share the responsibility for dealing with strategic contradictions, making the interchange of information and knowledge more decentralized (TMT density). We argue that the network structure of TMTs explains the ability of TMT members to pursue exploration and exploitation, and investigate the role CEO centrality and TMT dynamics in fostering TMT members' ambidexterity.

Recent literature has stressed the importance of middle managers in strategic decision-making by embracing the strategic apex and the operating core (Glaser et al., 2021). The role of middle managers is also related to experimenting with new practices and championing them to TMT members (Tarakci et al., 2018). Certain studies highlight the costs of middle management to organizations (Robertson, 2015). In the context of our study, the healthcare sector, middle managers are professional workers with managerial roles such as anesthetist, dermatologists, surgeons, etc. and their teams are integrated by professionals in their same field of knowledge (i.e. the leader of dermatologists has his/her own team of dermatologists) (Burgess et al., 2015). They usually enjoy high status in their professions which may manifest in a highly influential managerial elite (McGivern et al., 2015) with expert power in their teams, who can even exercise coercive power over TMT members, impeding the implementation of strategies. In this case, TMT members' perception regarding middle managers' involvement in decision-making will affect the implementation of strategies formulated by them. Specifically, we argue that it may undermine the effectiveness of the internal network structure of a TMT and TMT members' individual ambidexterity.

This study contributes to the ambidexterity literature and, specifically, to the growing body of studies exploring the micro-foundations of organizational ambidexterity. So far, individual ambidexterity has mainly focused on employees' ambidexterity (e.g., Caniëls et al., 2017) rather than analyzing individual ambidexterity at the TMT level (Kapoutsis et al., 2019). The important role of TMT members in uniting and pursuing contradictory demands (Mazzelli et al., 2020; Smith and Tushman, 2005) underscores the need to examine the emergence of ambidexterity among TMT members. Moreover, individual ambidexterity has mostly been explained by processes such as knowledge inflows (Bidmon and Boe-Lillegraven, 2020; Mom et al., 2007; Tempelaar and Rosenkranz, 2019; Zimmermann et al., 2020), whereas structural explanations have received less attention. As an exception, Rogan and Mors (2014) have analyzed network density from the managers' egocentric network perspective and its effect on managers' ambidexterity. This study moves beyond earlier insights by analyzing the full network structure of the TMT and its effect on members' ambidexterity using a mixed-methods design and combining elements of quantitative and qualitative research methods. Concretely, analyses using data from questionnaires and analysis of in-depth interviews reveal that a central position of CEOs within TMTs who interact intensively with other TMT members have higher levels of ambidexterity. Moving beyond this baseline relationship, we also find that the involvement of middle managers in strategic decision-making affects the relationship between CEO centrality and individual TMT member ambidexterity. In this respect, we advance research on knowledge transfer and ambidexterity (Chaudhary and Batra, 2018; Ramachandran et al., 2019; Santoro et al., 2019; Soto-Acosta et al., 2018). Finally, the present study contributes to our understanding about how industry- or organizational-specific, such as those related to the public healthcare industry (Burgess and Currie, 2013), may shape the role of middle managers (Darrell et al., 2016). In this specific context, middle managers have expert and coercive power which may critically affect strategic decision-making (Llewellyn, 2001). Such attributes of middle managers may not only be associated with the healthcare industry but also in other industries (e.g., in universities, where some professors have enough power to influence the implementation of a strategy designed by the dean and his/her team). Hence, more attention should be dedicated to understanding the role of middle managers across different industries since their involvement in decision-making may affect important outcomes of decision-making processes such as ambidexterity.

## 2. Conceptual background and hypotheses

### 2.1. Network structure and individual ambidexterity

In 1991, March (p. 71) suggested that individual exploration activities are those related to searching for, discovering, creating and experimenting with new opportunities; whereas individual exploitation activities are those related to selecting, implementing, improving, and refining existing certainties. Based on this conceptualization, research on individual ambidexterity has accelerated in recent years (Pertusa-Ortega et al., 2021) and has mainly focused on employees' ambidexterity (e.g., Caniëls et al., 2017). From this point of view, ambidexterity occurs through contextual factors that can help individuals divide their time between exploration and exploitation (Gibson and Birkinshaw, 2004). Such contextual ambidexterity is different from the sequential and structural approaches, in which ambidexterity can be achieved through temporal cycles of exploration and exploitation or through separated spaces (for example, organizational units) destined to explore or exploit (O'Reilly and Tushman, 2013). It can be practiced horizontally, vertically and organizationally because it can penetrate across multiple organizational levels (Kassotaki et al., 2019). However, most of the

research has been focused on the organizational level and has shown its connection with knowledge management (Borini et al., 2021; Dezi et al., 2019; Rossi et al., 2020) and innovation management (Chen and Liu, 2020; Del Giudice et al., 2021) among others. Recent research has deeply examined individual ambidexterity among managers (Kapoutsis et al., 2019; Lawrence et al., 2021; Li et al., 2015). It is generally accepted that ambidextrous managers are those who are capable of searching for new knowledge and experiences, technologies, markets, routines, structures, systems, or beliefs, while simultaneously being sensitive to reinforcing the existing knowledge base (Tushman and O'Reilly, 1996; Van Doorn et al., 2022).

Another characteristic of ambidextrous managers is their ability to refine and renew their knowledge (Floyd and Lane, 2000). Equally to the organizational knowledge transferred in merger and acquisitions (Zhang et al., 2020) at the micro perspective, TMT members need to shape new competences internalizing, as part of the organizational knowledge base, information and initiatives that diverge from their view of strategy (Burgelman, 1991). But developing new competences requires a shift from the old to the new, and this presents a challenge because it also requires a shift in the roles that managers play, as well as in the relationships between those roles (Floyd and Lane, 2000). Examples from the literature illustrate that when searching for knowledge and information within their network, managers engage in both related and unrelated knowledge search (Hansen, 2002). In the same way, the work by Vanha-verbeke et al. (2012) on the links between knowledge and networks found that the role of knowledge flow between partners provides them with access to new knowledge and enables them to combine complementary competences. In summary, the larger a manager's network of direct contacts, the greater the possibilities to identify and acquire knowledge associated with exploration and exploitation purposes (Hansen, 2002; Nahapiet and Ghoshal, 1998). Additionally, Rogan and Mors (2014) found that a manager's internal position in a network characterized by multiple connections is related to his/her ambidexterity levels. This paper contributes to Rogan and Mors' study by hypothesizing that the position of the CEO in the knowledge network of the top management team will positively impact individual ambidexterity of each member of the team and this effect will be reduced if middle management is included in strategic decision making.

## 2.2. Hypotheses

Senior managers are crucial in balancing strategic contradiction and recognizing and accepting the simultaneous existence of contradictory forces (Smith and Tushman, 2005). In fact, leadership research has studied how leaders support followers in the attempt to become innovative, creative, and ambidextrous (Gong et al., 2009; Rosing et al., 2011; Shin and Zhou, 2003). According to Rosing et al. (2011), ambidextrous leaders are able to engage in and support the emergence of both explorative and exploitative behaviours. Drawing on this idea of ambidextrous leadership, Kauppila and Tempelaar (2016) focus on a leadership style that combines high-performance expectations with strong managerial support encouraging individuals to exhibit higher ambidexterity. Such supportive leaders need to encourage employees to act autonomously in how they divide their resources between exploration and exploitation activities (Carmeli and Halevi, 2009; Gibson and Birkinshaw, 2004; Smith and Lewis, 2012). Moreover, CEOs with high levels of trust and who perceive the knowledge from others to be very reliable increase their perceived self-efficacy and motivation of other team members, which contribute to their learning (García-Granero et al., 2018; Jarvenpaa and Majchrzak, 2008). Additionally, high levels of perceived self-efficacy incentivize managers to set and commit to challenging goals (Bandura, 1993), such as pursuing exploration and exploitation.

On the other hand, research on networks describes a central position in a network as an individual's involvement in exchanging resources with other members in the network (Abualqumboz et al., 2020; Baldwin et al., 1997; Mehra et al., 2006). In knowledge networks, resource exchanges are associated with crafting solutions to problems, giving employees' confidence or even convincing others of the adequacy of a proposal (Cross and Sproull, 2004; Phelps et al., 2012). Thus, centrally positioned individuals, such as a CEO with a central position, are characterized by high knowledge inflows and outflows, allowing them to receive abundant knowledge but also to provide it to others (Brass and Burkhardt, 1992; Ibarra, 1993; Mehra et al., 2006; Serrat, 2017). Network scholars have also argued that relationships between different members to search for information or solve problems are aimed at creating actionable knowledge (Cross and Sproull, 2004; Levin et al., 2011). Hence, CEO's centrality in knowledge networks supports other TMT members in becoming more knowledgeable, gaining confidence and becoming more motivated to combat consistency and behave ambidextrously. Based on these insights, this paper hypothesizes that CEO centrality in TMT knowledge networks nurtures TMT members' ambidexterity.

**Hypothesis 1.** CEO centrality in TMT knowledge networks is positively associated with TMTs members' individual ambidexterity.

For TMT members to balance exploration and exploitation, managers' interconnections with others have proven to be influential (Rogan and Mors, 2014). Members of TMTs have distinct knowledge to contribute to the group (Smith and Tushman, 2005; Wegner, 1987) that can help team members deal with the paradox in order to be more ambidextrous. One way to generate strategic alternatives and reconcile any potential contradictions could be through shared decision-making (García-Granero et al., 2018; Mihalache et al., 2014). In fact, intense interaction between the distinct members of a TMT can even create a collective mind or group-level cognition (Smith and Tushman, 2005; Weick and Roberts, 1993). This collective mind has also been labeled a transactive memory system through which TMTs generate, distribute and integrate distinct knowledge and resolve conflicting agendas (Heavey and Simsek, 2017). These teams involve processes of constant interrelation and all members are responsible for integrating explorative and exploitative knowledge. Smith and Tushman (2005), from a strategic point of view, labeled such teams *teamcentric*, in which TMT members are responsible for integrating explorative and exploitative activities.

Importantly, the network literature refers to connectedness to characterize a social network that is characterized by dense relations through which individuals share resources, such as information or knowledge related to the completion of their job (Aggarwal et al.,

2020; Phelps et al., 2012; Reagans and McEvily, 2003). In situations where individuals interact with a high number of group members, the group and the individual will benefit (Sparrowe et al., 2001) because individuals will increase their awareness of other group members. By exchanging knowledge, they learn about each other's responsibilities, task behaviors, expectations and accountability (Argote and Fahrenkopf, 2016). Managers will have a strong idea of other members' roles in the team (Cao et al., 2010; Lovelace et al., 2007). Discussion and exchange of ideas also create psychological safety among individuals (Kim et al., 2021; Wiersema and Bird, 1993). Hence, in densely connected TMT networks, an increase in the knowledge exchanged will increase the visibility and accountability of other TMT members' work, which in turn will generate a feeling of acceptance. This feeling of acceptance will create the empathy and confidence necessary to face the risks associated with combining challenging ambidextrous agendas. It is therefore hypothesized that dense structures in TMT knowledge networks develop TMT members' ambidexterity.

**Hypothesis 2.** Knowledge network density in TMT is positively associated with TMTs members' individual ambidexterity.

Several authors have discussed the role of middle managers in strategy (Azambuja et al., 2022; Hambrick, 1981; Heyden et al., 2017) and their interactions with TMT members (Heyden et al., 2020; Kauppila and Tempelaar, 2016; Mom et al., 2007) in explaining the emergence of ambidexterity (Mom et al., 2009; Salas-Vallina et al., 2021; Taylor and Helfat, 2009). For instance, Mom et al. (2007) showed that managers engage in higher levels of exploration and exploitation when acquiring top-down and horizontal or bottom-up knowledge flows. They explain that top-down knowledge inflows from people at higher hierarchical levels than the manager are positively related to exploitation. In contrast, horizontal and bottom-up knowledge inflows from peers and individuals at lower hierarchical levels are positively related to exploration. In light of Mom et al.'s (2007) results, we suggest that when middle managers are involved in decision-making, the interchange will increase exploratory behaviours among TMT members because they receive bottom-up knowledge inflows. However, studies from the organizational change and adaptation literature have put forward an alternative argument. Scholars have argued, for instance that because middle managers are more aligned with old technologies (Hortovanyi et al., 2021; Taylor, 2010) their interaction with TMT members will make them focus more on maintaining the status quo and perpetuating exploitation. The reason for this is that TMT members determine organizational pay and promotion policies, and middle managers may be eligible for promotion and compensation opportunities (Taylor and Helfat, 2009). Given that potential profits from new technologies may fluctuate in the early stages, sometimes even cannibalize profits from existing products, managers may prefer to undermine a new technology and focus on exploiting the old business (Taylor, 2010). As such, studies (Floyd and Wooldridge, 1996) suggest that TMT members are generally considered to be the main driver of discontinuous change, whereas middle managers are expected to support incremental change.

Previous research has not taken into account what happens if the middle manager holds high expert and coercive power (Yukl and Falbe, 1991). In the context of Spanish public hospitals, middle managers are doctors who have highly specialized knowledge and also permanent positions. Their peers regard them as experts because they must be highly qualified in their specialization in order to obtain the position. Moreover, they hold permanent positions unlike middle managers. This means middle managers can exert high coercive power, provided that TMT members cannot hire (or fire) whoever they want, and that middle managers can contact patient organizations to press for additional resources.

Additionally, TMT members' salaries tend to be lower than those of middle managers because TMT members are not "on call". As a result, middle managers do not usually seek promotion to senior management positions and find it difficult to share a vision with someone in a temporary position. In conclusion, it can be assumed that middle managers, instead of being biased towards exploitation in order to obtain short-term returns and gain promotion (Taylor and Helfat, 2009), are more interested in exploring new treatments and researching new cures. Therefore, pushing TMT members to make investments in their departments and direct more resources to medical advancement in their specialties (Burgess et al., 2015). The involvement of middle managers in strategic decision-making will therefore affect the dynamics of TMT members' decision-making, which in turn will affect their level of ambidexterity.

In their interaction with TMT members in making decisions, middle managers will make TMT members feel that they do not have the authority to implement their exploratory and exploitative ideas. This will reduce the positive effect that the TMT network structure may have in nurturing ambidextrous behaviors among TMT members. On the one hand, TMT members operating in a leader-centered network may not be as confident or as motivated to accept challenging agendas (Bandura, 1993; García-Granero et al., 2018; Jarvenpaa and Majchrzak, 2008) if they perceive high middle management involvement in decision-making. They may judge that such complex and contradictory agendas may not be resolved because middle managers may intervene and decide collectively whether or not the changes are implemented. In such a case, CEO centrality can be costly and require effort, time and energy to assure that team members develop the necessary roles and responsibilities to explore and exploit. So, as previously mentioned, high middle management involvement in TMT decision-making may have a negative response by CEOs (i.e., leaders) who occupy centralized positions in the network because such leaders may not be able to facilitate team interactions and prompt commitment to collective goals and hinder the possibility of developing existing (exploitation) or new knowledge (exploration). Stated formally, the hypothesis follows.

**Hypothesis 3a.** Middle management involvement negatively moderates the relationship between CEO centrality in TMT knowledge networks and TMT members' individual ambidexterity, such that the relationship between CEO centrality and TMT members' individual ambidexterity is less positive if middle management involvement is high.

On the other hand, TMT members in dense TMT networks, are aware of each other's responsibilities and feel psychologically safe within the group (Cao et al., 2010; Lovelace et al., 2007; Wiersema and Bird, 1993). They are more willing to take the risk to perform ambidextrously, yet may feel burdened when the involvement and the requirements of middle management are high. In TMTs with dense (relative to sparse) knowledge networks, fluent information and resource exchange is likely to render middle management involvement less relevant for individual ambidexterity. Middle management is likely to provide redundant resources and information

that add little to top managers' ambidexterity. In the case of low middle management involvement, communication among team members is facilitated, decisions are taken with consensus and information flows interchangeably. It is therefore hypothesized the involvement of middle management in decision-making will hamper the positive effect between dense TMT networks and TMT members' individual ambidexterity.

**Hypothesis 3b.** Middle management involvement negatively moderates the relationship between dense TMT knowledge networks and TMT members' individual ambidexterity, such that the relationship between team density and TMT members' individual ambidexterity is less positive if middle management involvement is high.

Fig. 1 provides a graphical illustration of the relationships specified in the hypotheses.

### 3. Methodology

#### 3.1. Public healthcare context

The healthcare sector is of paramount importance for society; nonetheless, few studies have investigated its management and specific idiosyncrasies. For instance, [Salas-Vallina et al. \(2019\)](#) studied whether inspirational leadership of heads of specialized medical units is related to individual ambidexterity of their dependent physicians. Another study by [Burgess et al. \(2015\)](#) emphasizing that organizational ambidexterity is a necessary condition in hospitals, highlighted the figure of “hybrid” middle managers as key professional workers who hold managerial responsibilities. In the case of our research context, TMT members of hospitals are appointed by the local government. Their position as top managers is temporary and dependent on the continued support from the local government. On occasion, a middle manager's salary is superior to that of a TMT member, as middle managers can have bonus payments based on their performance. Middle managers are mostly clinical practitioners who supervise a team of specialized doctors (e.g., pediatricians, cardiologists, oncologists, etc.). In this context, middle managers perform three main tasks: supervising a team of doctors in the same specialty, undertaking research on new medical advances that can be applied to their patients, and attending patients. The selection process of middle managers constitutes an additional factor that can affect the interaction with TMT members. They are not selected by TMT members but have a permanent position in the hospital. In conclusion, as middle managers hold expert power and are responsible for implementing the strategy, they can exercise coercive power if disagreement occurs with a TMT member decision. This context offers an interesting setting to examine the effects of middle and top management in hospitals.

#### 3.2. Sample and procedures

The process of collecting data was divided into two stages, in-depth interviews and surveys. In order to ensure the greatest number of participants, the general manager of the Health Department contacted the CEOs of each hospital to get TMT members' support in the study.

**Interviews.** In the first stage, CEOs were interviewed to gain a better understanding of the context. The interviews gave rise to some interesting questions, such as the power of middle managers. Questions related to exploration and exploitation were asked to adjust the questionnaire's vocabulary to their understanding. The interview was very open and included, but was not limited to, questions such as “What kind of activities occupy your daily routine?”; “How do you allocate resources?”; “How do you manage your team?”; “How do you decide whether to explore or exploit?”; and “What sort of relationship do you have with middle managers?” The interviews lasted around 1 h. Three CEOs were interviewed from hospitals of different sizes, the largest of which had 7,000 employees. Since the government has such an important influence on the CEOs of public hospitals, the general manager of the Health Department in

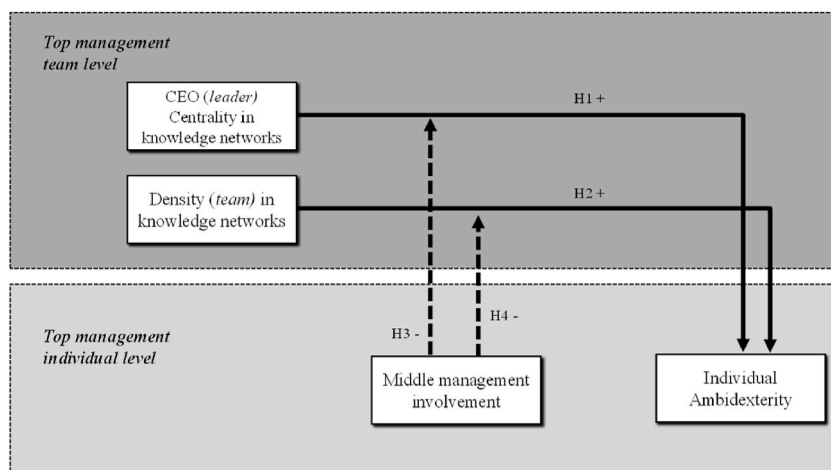


Fig. 1. Study hypotheses.



Valencia was also interviewed.

Managers were provided with March's (1991) definition. Concretely, March (1991) proposes that exploitation and exploration are basically two different learning activities between which organizations divide their attention and resources. Whereas exploitation is associated with activities such as "refinement, efficiency, selection, and implementation," exploration refers to notions such as "search, variation, experimentation, and discovery" (p. 102). Managers responded by identifying the kind of activities they thought best fit with these definitions of exploration and exploitation.

Regarding exploration, one of the CEOs explained:

"A change in the organization chart. At this moment, we have two big pyramidal structures, one led by doctors and another led by nurses. In the doctors' pyramid, the leaders are doctors who head up one specialization, such as oncology, cardiology, radiology ... I would like to create the position of director of care, who would be above the medical director and the nursing director, in order to avoid having two pyramids. And then I would also like to create a structure based on teams because no disease can be cured by only one medical specialist, only cataracts, and you still need an anesthetist. So, I would rather have a team of different specialists for each disease than teams of many specialists for the same disease. For example, in breast cancer, you need a surgeon but also a psychologist and other specialists. And at present, the structure comprises a team of surgeons who are specialized in breast cancer surgery."

With regard to exploitation, the same CEO explained:

"I have in mind three examples: one is the emergency department that now works more efficiently because everyone in that department has done a training course. And the second example is the waiting list. We have reduced the waiting list from 300 days to 120 days. And finally, the new outpatient surgery program. Some surgeries do not require the patient to be in the hospital the day before the surgery. So, we have set up an 'outpatient surgery' program in which the patient comes at 8 a.m. for the surgery instead of staying in the hospital the night before. This has reduced costs in the hospital and it works very well."

During the conversation, it was natural to talk about middle managers. CEOs think that in hospitals, middle managers are characterized by expert and coercive power, which may hinder efforts by TMT members to engage in ambidextrous behaviors. For instance, one of the interviewees' comment is quoted below:

"It took me a year to implement a structural change that I wanted to make. It was hard to convince the middle manager"; or "There are middle managers who are good leaders with their people, but when they come to us, they do not negotiate with us. They come with pressures and demands. They tell us: 'I need this', but they behave incorrectly. They do not seem to grasp that they are part of top management as well. They are not good at the role of liaison."

In other cases, middle managers leverage their expert power and negotiating abilities in order to help TMT members understand the needs of their departments. Quoting a manager from another interview:

"X is a very good leader in his department; his team would die for him if necessary. But he is also a leader for us. During the negotiation process, he is capable of bargaining and once concluded, he is able to accept team members' needs. Communication is fluid in both senses: our needs and his needs for his department."

**Survey data collection.** In the second stage, the questionnaire was submitted to the University of Valencia's ethics committee for evaluation. Minor changes were implemented (e.g., a sentence was included that informed participants about the confidentiality of their responses) and the procedure was successfully approved. The questionnaire was then submitted to the CEOs previously interviewed to ensure that all questions were comprehensible in the specific context. TMT members and CEOs were invited to reply via an email that included an introductory letter and a link to a confidential survey. A feedback report was sent to each team with the main results of the research. Survey data were collected from mid-January to mid-April 2019.

The questionnaire was replied by top managers of twenty public hospitals within the Valencian Community in Spain. This region has a total number of 22 public hospitals, but one hospital chose not to participate, and another was in the process of becoming part of a private institution. Each hospital comprised a TMT with an average size of 6.15 employees ( $SD = 2.13$ ; range 2–10). In total, 123 TMT members out of 154 replied to the questionnaire. The response rate was about 80%, which is well above the 10–12% rate common for surveys targeting top executives (Hambrick and Cannella, 1993; Simsek et al., 2005). Among the employees in the sample, 62 (60.2%) were female and the average tenure with their team was 59.15 months ( $SD = 206.10$ ). Respondents' were on average 56.5 years old ( $SD = 6.09$ ), had been in the organization on average 197.68 months ( $SD = 149.34$ ), and their experience in this sector/industry was 366.90 months ( $SD = 96.62$ ). With regard to CEOs or team leaders, 9 (45%) were female and the average tenure working with their team was 29.83 months ( $SD = 15.80$ ). On average, CEOs were 58.85 years old ( $SD = 5.83$ ), had been in the organization 190.55 months ( $SD = 155.20$ ), and their experience in this sector/industry was 388 months ( $SD = 70.59$ ).

### 3.3. Measurements

#### 3.3.1. Dependent variable

**TMT member individual ambidexterity.** The individual ambidexterity scale by Mom et al. (2007) was adapted to the hospital context. We calculated individual ambidexterity by multiplying exploration and exploitation factors. To verify the robustness of the findings, several analyses were performed using an alternative operationalization of ambidexterity, namely the additive factor. Results did not alter the pattern of the findings of this study.

**Table 1**

Means, standard deviations and bivariate correlations among study variables.

| Variables                                                           | Mean   | SD     | 1    | 2     | 3     | 4    | 5    | 6     | 7     | 8     | 9     | 10    | 11    | 12    | 13    | 14    | 15    |
|---------------------------------------------------------------------|--------|--------|------|-------|-------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| <b>Level 1: Individual Level</b>                                    |        |        |      |       |       |      |      |       |       |       |       |       |       |       |       |       |       |
| 1. Gender <sup>a</sup>                                              | .60    | .49    |      |       |       |      |      |       |       |       |       |       |       |       |       |       |       |
| 2. Job/team tenure <sup>b</sup>                                     | 59.15  | 206.10 | .12  |       |       |      |      |       |       |       |       |       |       |       |       |       |       |
| 3. Organizational tenure <sup>b</sup>                               | 197.68 | 149.34 | -.05 | -.06  |       |      |      |       |       |       |       |       |       |       |       |       |       |
| 4. Industry tenure <sup>b</sup>                                     | 366.90 | 96.62  | .04  | -.24* | .17   |      |      |       |       |       |       |       |       |       |       |       |       |
| 5. Number of external ties                                          | 7.26   | 5.31   | .07  | .06   | -.03  | -.10 |      |       |       |       |       |       |       |       |       |       |       |
| 6. Involvement of middle management                                 | 4.92   | 1.47   | .20* | .04   | -.20* | .03  | -.02 |       |       |       |       |       |       |       |       |       |       |
| 7. Individual ambidexterity                                         | 32.68  | 9.42   | .14  | .10   | -.06  | .10  | .05  | .45** |       |       |       |       |       |       |       |       |       |
| <b>Level 2: Team/Leader Level</b>                                   |        |        |      |       |       |      |      |       |       |       |       |       |       |       |       |       |       |
| 1. Gender <sup>a</sup>                                              | .45    | .51    |      |       |       |      |      |       |       |       |       |       |       |       |       |       |       |
| 2. Job/team tenure <sup>b</sup>                                     | 29.83  | 15.80  | .17  |       |       |      |      |       |       |       |       |       |       |       |       |       |       |
| 3. Organizational tenure <sup>b</sup>                               | 190.55 | 155.20 | -.21 | -.19  |       |      |      |       |       |       |       |       |       |       |       |       |       |
| 4. Industry tenure <sup>b</sup>                                     | 388    | 70.59  | -.33 | -.26  | .34   |      |      |       |       |       |       |       |       |       |       |       |       |
| 5. Number of external ties                                          | 5.80   | 5.03   | .22  | .37   | -.23  | -.35 |      |       |       |       |       |       |       |       |       |       |       |
| 6. Team size                                                        | 6.15   | 2.13   | .03  | -.15  | -.19  | -.05 | .18  |       |       |       |       |       |       |       |       |       |       |
| 7. CEO centrality: Solutions to specific problems                   | .86    | .09    | .12  | .19   | .03   | .54* | .33  | -.04  |       |       |       |       |       |       |       |       |       |
| 8. CEO centrality: Identification of information sources            | .86    | .09    | .29  | .42   | -.23  | .22  | .34  | .04   | .77** |       |       |       |       |       |       |       |       |
| 9. CEO centrality: Helps to think about problems creatively         | .85    | .09    | .02  | .20   | .22   | .48* | -.09 | -.47* | .75** | .59** |       |       |       |       |       |       |       |
| 10. CEO centrality: Expresses confidence in proposals or ideas      | .89    | .09    | .03  | .00   | -.12  | .42  | .08  | -.10  | .76** | .64** | .75** |       |       |       |       |       |       |
| 11. CEO centrality: Provides credibility for ideas to third parties | .89    | .12    | .11  | .10   | -.01  | .43  | .11  | -.03  | .80** | .73** | .77** | .94** |       |       |       |       |       |
| 12. TMT density: Solutions to specific problems                     | .81    | .09    | -.05 | .22   | -.09  | .42  | .01  | -.32  | .73** | .70** | .82** | .69** | .71** |       |       |       |       |
| 13. TMT density: Identification of information sources              | .81    | .09    | -.02 | .31   | -.12  | .33  | -.01 | -.38  | .67** | .74** | .81** | .66** | .69** | .98** |       |       |       |
| 14. TMT density: Helps to think about problems with creativity      | .79    | .10    | -.11 | .15   | .05   | .41  | -.20 | -.55* | .55*  | .46*  | .84** | .66** | .63** | .91** | .91** |       |       |
| 15. TMT density: Expresses confidence in proposals or ideas         | .82    | .09    | -.11 | .11   | -.11  | .40  | -.15 | -.37  | .61** | .56*  | .78** | .70** | .69** | .95** | .94** | .95** |       |
| 16. TMT density: Provides credibility for ideas to third parties    | .83    | .09    | -.06 | .15   | -.11  | .43  | -.14 | -.34  | .65** | .61** | .78** | .71** | .74** | .95** | .94** | .93** | .99** |

Note: N at Level 1 = 103, Level 2 = 20. <sup>a</sup> Coded as 0 = Male, 1 = Female. <sup>b</sup> Measured in months. \*\* $p < .01$ , \* $p < .05$ .

Table 2

HLM analysis on individual ambidexterity.

|                                                                     | Model C     |      | Model 1        |      | Model 2        |       | Model 3        |      | Model 4       |      | Model 5       |      |
|---------------------------------------------------------------------|-------------|------|----------------|------|----------------|-------|----------------|------|---------------|------|---------------|------|
|                                                                     | Coefficient | s.e. | Coefficient    | s.e. | Coefficient    | s.e.  | Coefficient    | s.e. | Coefficient   | s.e. | Coefficient   | s.e. |
| Intercept                                                           | 33.41***    | 1.15 | 33.35***       | 1.06 | 33.36***       | 1.10  | 33.30***       | 1.00 | 33.28***      | 0.97 | 33.32***      | 1.04 |
| <b>Level 1 Variables</b>                                            |             |      |                |      |                |       |                |      |               |      |               |      |
| Gender                                                              | 1.50        | 1.64 | 1.82           | 1.67 | 1.56           | 1.66  | 1.84           | 1.65 | 1.79          | 1.65 | 1.83          | 1.65 |
| Job/team tenure                                                     | .01*        | .00  | .01            | .01  | .01            | .01   | .01            | .01  | .01           | .01  | .01           | .01  |
| Organizational tenure                                               | .00         | .00  | .01            | .00  | .00            | .00   | .01            | .00  | .00           | .00  | .00           | .00  |
| Industry tenure                                                     | -.01*       | .01  | -.01*          | .01  | -.01*          | .01   | -.01*          | .01  | -.01*         | .01  | -.01*         | .01  |
| Number of external ties                                             | -.01        | .17  | .00            | .17  | .00            | .17   | .00            | .17  | .00           | .17  | .00           | .17  |
| <b>Level 2 Variables</b>                                            |             |      |                |      |                |       |                |      |               |      |               |      |
| Gender                                                              | 2.21        | 2.47 | .52            | 2.41 | .32            | 2.65  | .64            | 2.04 | 1.48          | 1.74 | 1.90          | 2.02 |
| Job/team tenure                                                     | -.03        | .10  | -.02           | .09  | -.05           | .10   | -.06           | .08  | .00           | .08  | -.03          | .09  |
| Organizational tenure                                               | .00         | .01  | -.01           | .01  | .00            | .01   | -.01           | .01  | .00           | .01  | .00           | .01  |
| Industry tenure                                                     | .00         | .02  | .01            | .01  | .01            | .02   | .00            | .01  | .00           | .01  | .00           | .01  |
| Number of external ties                                             | .00         | .22  | -.04           | .20  | -.03           | .20   | .11            | .19  | -.01          | .19  | .09           | .19  |
| Team size                                                           | -1.16       | .71  | -.52           | .64  | -.77           | .68   | .10            | .65  | -.41          | .64  | -.69          | .65  |
| CEO centrality: Solutions to specific problems (1)                  |             |      | 33.23**        | 8.43 |                |       |                |      |               |      |               |      |
|                                                                     |             |      | (H1a)          |      |                |       |                |      |               |      |               |      |
| CEO centrality: Identification of information sources (2)           |             |      |                |      | 24.59* (H1b)   | 8.83  |                |      |               |      |               |      |
| CEO centrality: Helps to think about problems with creativity (3)   |             |      |                |      |                |       | 43.08*** (H1c) | 8.91 |               |      |               |      |
| CEO centrality: Expresses confidence in proposals or ideas (4)      |             |      |                |      |                |       |                |      | 36.58** (H1d) | 8.28 |               |      |
| CEO centrality: Provides credibility for ideas to third parties (5) |             |      |                |      |                |       |                |      |               |      | 25.60** (H1e) | 5.99 |
| <b>Model deviance</b>                                               |             |      |                |      |                |       |                |      |               |      |               |      |
|                                                                     | 773.45      |      | 765.09         |      | 766.41         |       | 762.96         |      | 762.91        |      | 729.15        |      |
|                                                                     | Model C     |      | Model 6        |      | Model 7        |       | Model 8        |      | Model 9       |      | Model 10      |      |
|                                                                     | Coefficient | s.e. | Coefficient    | s.e. | Coefficient    | s.e.  | Coefficient    | s.e. | Coefficient   | s.e. | Coefficient   | s.e. |
| Intercept                                                           | 33.41***    | 1.15 | 33.44***       | .90  | 33.41***       | .90   | 33.49***       | .72  | 33.46***      | 0.85 | 33.45***      | 0.95 |
| <b>Level 1 Variables</b>                                            |             |      |                |      |                |       |                |      |               |      |               |      |
| Gender                                                              | 1.50        | 1.64 | 1.88           | 1.64 | 1.82           | 1.63  | 1.90           | 1.63 | 1.91          | 1.64 | 1.91          | 1.65 |
| Job/team tenure                                                     | .01*        | .00  | .01            | .01  | .01            | .01   | .01            | .01  | .01           | .01  | .01           | .01  |
| Organizational tenure                                               | .00         | .00  | .01            | .00  | .01            | .00   | .00            | .00  | .00           | .00  | .01           | .00  |
| Industry tenure                                                     | -.01*       | .01  | -.01†          | .01  | -.01†          | .01   | -.01†          | .01  | -.01†         | .01  | -.01†         | .01  |
| Number of external ties                                             | -.01        | .17  | .00            | .17  | .00            | .17   | -.01           | .17  | .00           | .17  | .00           | .17  |
| <b>Level 2 Variables</b>                                            |             |      |                |      |                |       |                |      |               |      |               |      |
| Gender                                                              | 2.21        | 2.47 | 1.52           | 1.98 | 1.26           | 2.03  | 2.37           | 1.55 | 2.18          | 1.95 | 1.55          | 2.13 |
| Job/team tenure                                                     | -.03        | .10  | -.04           | .07  | -.06           | .07   | -.04           | .05  | -.03          | .07  | -.04          | .07  |
| Organizational tenure                                               | .00         | .01  | -.01           | .01  | -.01           | .01   | -.01           | .01  | .00           | .01  | .00           | .01  |
| Industry tenure                                                     | .00         | .02  | .01            | .01  | .02            | .01   | .01            | .01  | .01           | .01  | .01           | .01  |
| Number of external ties                                             | .00         | .22  | .10            | .17  | .11            | .17   | .24            | .16  | .23           | .18  | .29           | .20  |
| Team size                                                           | -1.16       | .71  | .06            | .52  | .24            | .56   | .71            | .56  | .10           | .54  | -.06          | .54  |
| TMT density: Solutions to specific problems (1)                     |             |      | 50.95*** (H2a) | 9.92 |                |       |                |      |               |      |               |      |
| TMT density: Identification of information sources (2)              |             |      |                |      | 51.42*** (H2b) | 10.74 |                |      |               |      |               |      |

(continued on next page)



Table 2 (continued)

|                                                                     | Model C     |      | Model 6            |      | Model 7             |      | Model 8           |       | Model 9           |       | Model 10            |       |
|---------------------------------------------------------------------|-------------|------|--------------------|------|---------------------|------|-------------------|-------|-------------------|-------|---------------------|-------|
|                                                                     | Coefficient | s.e. | Coefficient        | s.e. | Coefficient         | s.e. | Coefficient       | s.e.  | Coefficient       | s.e.  | Coefficient         | s.e.  |
| TMT density: Helps to think about problems with creativity (3)      |             |      |                    |      |                     |      | 56.84**<br>(H2c)  | 12.27 |                   |       |                     |       |
| TMT density: Expresses confidence in proposals or ideas (4)         |             |      |                    |      |                     |      |                   |       | 48.91**<br>(H2d)  | 11.44 |                     |       |
| TMT density: Provides credibility for ideas to third parties (5)    |             |      |                    |      |                     |      |                   |       |                   |       | 45.60**<br>(H2e)    | 10.26 |
| <b>Model deviance</b>                                               | 773.45      |      | 760.96             |      | 760.90              |      | 756.17            |       | 760.23            |       | 762.1               |       |
|                                                                     | Model C     |      | Model 11           |      | Model 12            |      | Model 13          |       | Model 14          |       | Model 15            |       |
|                                                                     | Coefficient | s.e. | Coefficient        | s.e. | Coefficient         | s.e. | Coefficient       | s.e.  | Coefficient       | s.e.  | Coefficient         | s.e.  |
| <i>Intercept</i>                                                    | 33.41***    | 1.15 | 33.49***           | 1.03 | 33.48***            | 1.09 | 33.45***          | .98   | 33.44***          | 0.95  | 33.48***            | 1.01  |
| <b>Level 1 Variables</b>                                            |             |      |                    |      |                     |      |                   |       |                   |       |                     |       |
| Gender                                                              | 1.50        | 1.64 | .14                | 1.64 | .11                 | 1.59 | .33               | 1.48  | -.04              | 1.55  | -.33                | 1.60  |
| Job/team tenure                                                     | .01*        | .00  | .01                | .01  | .02                 | .02  | .02               | .01   | .01               | .01   | .02                 | .02   |
| Organizational tenure                                               | .00         | .00  | .01**              | .00  | .01**               | .00  | .01*              | .00   | .01*              | .00   | .01**               | .00   |
| Industry tenure                                                     | -.01*       | .01  | .00                | .01  | .00                 | .01  | .00               | .01   | -.01              | .01   | -.01                | .01   |
| Number of external ties                                             | -.01        | .17  | .20 <sup>†</sup>   | .10  | .22*                | .09  | .20 <sup>†</sup>  | .11   | .21 <sup>†</sup>  | .11   | .20 <sup>†</sup>    | .10   |
| Involvement of middle management                                    |             |      | 3.23***            | .73  | 3.47***             | .68  | 2.91**            | .78   | 3.15**            | .76   | 3.39***             | .68   |
| <b>Level 2 Variables</b>                                            |             |      |                    |      |                     |      |                   |       |                   |       |                     |       |
| Gender                                                              | 2.21        | 2.47 | .15                | 2.14 | -1.22               | 2.10 | -.19              | 1.67  | .46               | 1.39  | -.16                | 1.53  |
| Job/team tenure                                                     | -.03        | .10  | -.03               | .08  | -.04                | .07  | -.05              | .07   | .02               | .07   | -.02                | .06   |
| Organizational tenure                                               | .00         | .01  | -.01               | .01  | -.01                | .01  | -.01 <sup>†</sup> | .01   | .00               | .01   | -.01                | .01   |
| Industry tenure                                                     | .00         | .02  | .01                | .01  | .01                 | .01  | .01               | .01   | .00               | .01   | .00                 | .01   |
| Number of external ties                                             | .00         | .22  | .04                | .13  | .02                 | .11  | .18               | .13   | .08               | .12   | .09                 | .12   |
| Team size                                                           | -1.16       | .71  | -1.03 <sup>†</sup> | .52  | -1.03 <sup>†</sup>  | .49  | -.32              | .47   | -.83              | .50   | -1.16*              | .48   |
| CEO centrality: Solutions to specific problems (1)                  |             |      | 25.88**            | 7.05 |                     |      |                   |       |                   |       |                     |       |
| CEO centrality: Identification of information sources (2)           |             |      |                    |      | 25.42**             | 7.04 |                   |       |                   |       |                     |       |
| CEO centrality: Helps to think about problems creatively (3)        |             |      |                    |      |                     |      | 37.62***          | 7.39  |                   |       |                     |       |
| CEO centrality: Expresses confidence in proposals or ideas (4)      |             |      |                    |      |                     |      |                   |       | 30.98**           | 7.76  |                     |       |
| CEO centrality: Provides credibility for ideas to third parties (5) |             |      |                    |      |                     |      |                   |       |                   |       | 18.04**             | 5.61  |
| <b>Cross-Level Interactions</b>                                     |             |      |                    |      |                     |      |                   |       |                   |       |                     |       |
| CEO centrality (1) X involvement of middle management               |             |      | -23.50**<br>(H3a1) | 7.77 |                     |      |                   |       |                   |       |                     |       |
| CEO centrality (2) X involvement of middle management               |             |      |                    |      | -29.50***<br>(H3a2) | 5.90 |                   |       |                   |       |                     |       |
| CEO centrality (3) X involvement of middle management               |             |      |                    |      |                     |      | -16.45*<br>(H3a3) | 7.47  |                   |       |                     |       |
| CEO centrality (4) X involvement of middle management               |             |      |                    |      |                     |      |                   |       | -17.28*<br>(H3a4) | 7.34  |                     |       |
| CEO centrality (5) X involvement of middle management               |             |      |                    |      |                     |      |                   |       |                   |       | -23.27***<br>(H3a5) | 4.80  |
| <b>Model deviance</b>                                               | 773.45      |      | 733.23             |      | 730.47              |      | 732.40            |       | 732.31            |       | 729.15              |       |

|                                                                  | Model C     |      | Model 16          |      | Model 17          |      | Model 18                      |       | Model 19          |       | Model 20          |      |
|------------------------------------------------------------------|-------------|------|-------------------|------|-------------------|------|-------------------------------|-------|-------------------|-------|-------------------|------|
|                                                                  | Coefficient | s.e. | Coefficient       | s.e. | Coefficient       | s.e. | Coefficient                   | s.e.  | Coefficient       | s.e.  | Coefficient       | s.e. |
| Intercept                                                        | 33.41***    | 1.15 | 33.54***          | .87  | 33.51***          | .87  | 33.56***                      | .71   | 33.55***          | 0.83  | 33.55***          | .92  |
| <b>Level 1 Variables</b>                                         |             |      |                   |      |                   |      |                               |       |                   |       |                   |      |
| Gender                                                           | 1.50        | 1.64 | .07               | 1.52 | .09               | 1.51 | .07                           | 1.51  | .01               | 1.50  | −.09              | 1.54 |
| Job/team tenure                                                  | .01*        | .00  | .02               | .01  | .02               | .01  | .01                           | .01   | .02               | .01   | .02               | .01  |
| Organizational tenure                                            | .00         | .00  | .01*              | .00  | .01*              | .00  | .01*                          | .00   | .01*              | .00   | .01*              | .00  |
| Industry tenure                                                  | −.01*       | .01  | .00               | .01  | .00               | .01  | .00                           | .01   | .00               | .01   | .00               | .01  |
| Number of external ties                                          | −.01        | .17  | .22*              | .10  | .21 <sup>†</sup>  | .10  | .19                           | .11   | .21 <sup>†</sup>  | .11   | .21 <sup>†</sup>  | .11  |
| Involvement of middle management                                 |             |      | 2.92**            | .68  | 3.00***           | .69  | 2.86**                        | .68   | 2.96***           | .66   | 3.01***           | .61  |
| <b>Level 2 Variables</b>                                         |             |      |                   |      |                   |      |                               |       |                   |       |                   |      |
| Gender                                                           | 2.21        | 2.47 | 1.51              | 1.85 | .98               | 1.79 | 1.86                          | 1.38  | 1.99              | 1.75  | 1.31              | 1.92 |
| Job/team tenure                                                  | −.03        | .10  | −.02              | .05  | −.03              | .05  | −.02                          | .04   | .00               | .05   | −.02              | .06  |
| Organizational tenure                                            | .00         | .01  | −.01              | .01  | −.01              | .01  | −.01 <sup>†</sup>             | .00   | −.01              | .01   | −.01              | .01  |
| Industry tenure                                                  | .00         | .02  | .02 <sup>†</sup>  | .01  | .02 <sup>†</sup>  | .01  | .01*                          | .01   | .01 <sup>†</sup>  | .01   | .01               | .01  |
| Number of external ties                                          | .00         | .22  | .06               | .12  | .11               | .11  | .26*                          | .12   | .21               | .13   | .28 <sup>†</sup>  | .15  |
| Team size                                                        | −1.16       | .71  | −.29              | .40  | −.09              | .40  | .37                           | .43   | −.22              | .41   | −.46              | .42  |
| TMT density: Solutions to specific problems (1)                  |             |      | 41.75**           | 9.36 |                   |      |                               |       |                   |       |                   |      |
| TMT density: Identification of information sources (2)           |             |      |                   |      | 43.05**           | 9.39 |                               |       |                   |       |                   |      |
| TMT density: Helps to think about problems creatively (3)        |             |      |                   |      |                   |      | 50.31***                      | 10.39 |                   |       |                   |      |
| TMT density: Expresses confidence in proposals or ideas (4)      |             |      |                   |      |                   |      |                               |       | 40.91**           | 10.21 |                   |      |
| TMT density: Provides credibility for ideas to third parties (5) |             |      |                   |      |                   |      |                               |       |                   |       | 35.50**           | 9.31 |
| <b>Cross-Level Interactions</b>                                  |             |      |                   |      |                   |      |                               |       |                   |       |                   |      |
| TMT density (1) X involvement of middle management               |             |      | −21.95*<br>(H3b1) | 8.41 |                   |      |                               |       |                   |       |                   |      |
| TMT density (2) X involvement of middle management               |             |      |                   |      | −20.58*<br>(H3b2) | 7.34 |                               |       |                   |       |                   |      |
| TMT density (3) X involvement of middle management               |             |      |                   |      |                   |      | −13.05 <sup>†</sup><br>(H3b3) | 6.32  |                   |       |                   |      |
| TMT density (4) X involvement of middle management               |             |      |                   |      |                   |      |                               |       | −17.56*<br>(H3b4) | 7.66  |                   |      |
| TMT density (5) X involvement of middle management               |             |      |                   |      |                   |      |                               |       |                   |       | −21.82*<br>(H3b5) | 7.63 |
| <b>Model deviance</b>                                            | 773.45      |      | 729.18            |      | 728.91            |      | 727.42                        |       | 729.28            |       | 729.11            |      |

Note: N at Level 1 = 103, Level 2 = 20. Model deviance assesses the goodness-of-fit index, smaller values of deviance indicate better model fit. \*\*\* $p < .001$ , \*\* $p < .01$ , \* $p < .05$ , <sup>†</sup> $p < .10$ .

### 3.3.2. Independent variables

All network measures were calculated using UCINET (version 6.682; Borgatti et al., 2002).

**CEO Centrality in TMT knowledge networks.** Following Cross and Sproull (2004), the network was measured in terms of useful knowledge relations with each team member. First, they were asked to name each person in the team. Then, they were asked to rate the specific ways each of the people named usually help them on a scale of 1 (contributed very negatively) to 7 (contributed very positively). The scale items, taken from Cross and Sproull (2004), were the following: “Gives me concrete solutions to specific problems”; “Helps me identify sources of information to solve problems”; “Helps me think about my problem in an original or creative way”; “Gives me confidence about my proposals or ideas”; “Provides credibility and legitimacy to my ideas in front of others.” The final measure of CEO or leader centrality was calculated as leaders’ normalized in-degree centrality (Sparrowe et al., 2001) within knowledge network matrices.

**Knowledge network density in TMT.** Density was measured based on team members’ responses over all other team members to Cross and Sproull’s (2004) items described above. Because valued data was used, measures of TMT were computed as the sum of the values of all ties, except those relations with team leaders, divided by the number of possible ties (Hanneman and Riddle, 2005). The measure therefore indicates the mean strength of ties through every possible tie within teams.

### 3.3.3. Moderator variable

**Involvement of middle management in strategic decision-making.** The measure created by Wooldridge and Floyd (1990) was employed. TMT members were asked to rate on a seven-point scale from 1 (not at all involved) to 7 (fully involved) their perception of the involvement of middle management in five aspects of the strategic process: (1) identifying problems and proposing objectives, (2) generating options, (3) evaluating options, (4) developing details about options, and (5) taking the necessary actions to put changes into place. The mean scores of the replies for each of the five scale items constituted the measure of middle management involvement.

### 3.3.4. Control variables

Control variables were entered at employee (level 1) and leader (level 2) levels that could affect the dependent variable or provide alternative explanations for the findings. At level 1, the variables included were employees’ gender, job tenure, organizational tenure, industry tenure, and number of external ties. The number of external ties was calculated by asking respondents whom they consult outside their team about a problem in their work. At level 2, team size and leaders’ gender, job tenure, organizational tenure, industry tenure, and number of external ties were used.

### 3.3.5. Analytical approach

In the sample, employees were clustered in teams, supervised by a leader. To justify the nested nature of the data, hierarchical linear modeling 2 (HLM2) was used, with restricted maximum likelihood (RML), in running the models. (e.g., Hofmann, 1997). To estimate the amount of variance in individual ambidexterity predicted by variation among TMTs, a null (one-way ANOVA) model was tested on individual ambidexterity as the dependent variable. This allowed the amount of between-team variance in individual ambidexterity to be determined by examining the level-2 residual variance of the intercept ( $\tau_{00}$ ), the level-1 residual variance ( $\sigma^2$ ), and by computing ICC [1]. ICC [1] represents the proportion of variance in the outcome variable that lies between groups and is calculated as level-2 variance/(level-1 variance + level-2 variance). The results revealed that  $\tau_{00} = 14.40$ ,  $p < .01$ ,  $\sigma^2 = 74.99$ , and  $ICC1 = 14.40/(74.99 + 14.40) = 0.16$ , showing that 16% of the variance in individual ambidexterity resided between teams.

## 4. Results

Table 1 provides descriptive statistics and correlations among the study variables at level 1 and level 2.

### 4.1. Hypotheses testing

To test the hypotheses, intercepts-as-outcome, and intercepts-and-slopes-as-outcome models were employed (Raudenbush and Bryk, 2002; Table 2). Level-one variables were group-mean centered and level-two variables grand-mean centered (Enders and Tofighi, 2007).

**Main effects of CEO Centrality and Team Density in TMT knowledge networks.** Hypothesis 1 posits that CEO centrality in TMT knowledge networks positively predicts managers’ individual ambidexterity. As illustrated in Table 2, the effect of CEO centrality on individual ambidexterity was significant for *solutions to specific problems* ( $\gamma = 33.23$ ,  $p < .01$ ; Model 1), *identification of information sources* ( $\gamma = 24.59$ ,  $p < .05$ ; Model 2), *helping to think about problems creatively* ( $\gamma = 43.08$ ,  $p < .001$ ; Model 3), *expressing confidence in proposals or ideas* ( $\gamma = 36.58$ ,  $p < .01$ ; Model 4), and *providing credibility for ideas to third parties* ( $\gamma = 25.60$ ,  $p < .01$ ; Model 5). Therefore, Hypothesis 1 was supported. Hypothesis 2 predicts that team density in TMT knowledge networks will be positively related to these managers’ individual ambidexterity. As Table 2 shows, this was significant for *solutions to specific problems* ( $\gamma = 50.95$ ,  $p < .001$ ; Model 6), *identification of information sources* ( $\gamma = 51.42$ ,  $p < .001$ ; Model 7), *helping to think about problems creatively* ( $\gamma = 56.84$ ,  $p < .01$ ; Model 8), *expressing confidence in proposals or ideas* ( $\gamma = 48.91$ ,  $p < .01$ ; Model 9), and *providing credibility for ideas to third parties* ( $\gamma = 45.60$ ,  $p < .01$ ; Model 10). Hypothesis 2 was also supported.

**Interactions between Involvement of middle management and CEO Centrality, and Involvement of middle management and Team Density.** Hypothesis 3a predicts that involvement of middle management moderates the relationship between CEO centrality and managers’ individual ambidexterity, so that for high involvement of middle management, this relationship is more negative than

for low involvement of middle management. Table 2 shows that the involvement of middle management  $\times$  CEO centrality interaction on individual ambidexterity is significant for *solutions to specific problems* ( $\gamma = -23.50, p < .01$ ; Model 11), *identification of information sources* ( $\gamma = -29.50, p < .001$ ; Model 12), *helping to think about problems creatively* ( $\beta = -16.45, p < .05$ ; Model 13), *expressing confidence in proposals or ideas* ( $\gamma = -17.28, p < .05$ ; Model 14), and *providing credibility for ideas to third parties* ( $\gamma = -23.27, p < .001$ ; Model 15). The interaction models show that Hypothesis 3a was supported. Simple slope tests (Aiken et al., 1991; Preacher et al., 2006) indicated that the relationship between CEO centrality in TMT knowledge networks and managers' individual ambidexterity is positive and significant if involvement of middle management is low ( $\gamma = 49.38, t = 8.76, p < .001$ ; Fig. 2), ( $\gamma = 54.91, t = 7.81, p < .001$ ; Fig. 3), ( $\gamma = 54.06, t = 9.66, p < .001$ ; Fig. 4), ( $\gamma = 48.26, t = 8.96, p < .001$ ; Fig. 5), ( $\gamma = 41.31, t = 9.58, p < .001$ ; Fig. 6) but non-significant if involvement of middle management is high ( $\gamma = 2.38, t = 0.17, p > .05$ ; Fig. 2), ( $\gamma = -4.08, t = -0.37, p > .05$ ; Fig. 3), ( $\gamma = 21.17, t = 1.54, p > .05$ ; Fig. 4), ( $\gamma = 13.70, t = 0.97, p > .05$ ; Fig. 5), ( $\gamma = -5.23, t = 0.55, p > .05$ ; Fig. 6), hence confirming the predicted pattern of interaction. Figs. 2–6 illustrate this finding at low (mean  $-1$  SD) versus high (mean  $+1$  SD) CEO centrality in TMT knowledge networks (Aiken et al., 1991).

Hypothesis 3b predicts that involvement of middle management moderates the relationship between TMT density and managers' individual ambidexterity, such that for high involvement of middle management, this relationship is more negative than for low involvement of middle management. Table 2 shows that the involvement of middle management  $\times$  TMT density interaction on individual ambidexterity is significant for *solutions to specific problems* ( $\gamma = -21.95, p < .05$ ; Model 16), *identification of information sources* ( $\gamma = -20.58, p < .05$ ; Model 17), *helping to think about problems creatively* ( $\gamma = -13.05, p < .10$ ; Model 18), *expressing confidence in proposals or ideas* ( $\gamma = -17.56, p < .05$ ; Model 19), and *providing credibility for ideas to third parties* ( $\gamma = -21.82, p < .05$ ; Model 20). The interaction models indicate that Hypothesis 3b was supported. A simple slope analysis (Aiken et al., 1991; Preacher et al., 2006) was also run, which further verified the positive and significant relationship between team density in TMT knowledge networks and managers' individual ambidexterity if involvement of middle management is low ( $\gamma = 63.70, t = 9.66, p < .001$ ; Fig. 7), ( $\gamma = 63.63, t = 9.86, p < .001$ ; Fig. 8), ( $\gamma = 63.37, t = 7.91, p < .001$ ; Fig. 9), ( $\gamma = 58.46, t = 8.52, p < .001$ ; Fig. 10), ( $\gamma = 57.32, t = 9.65, p < .001$ ; Fig. 11), but it is non-significant if involvement of middle management is high ( $\gamma = 19.80, t = 1.20, p > .05$ ; Fig. 7), ( $\gamma = 22.47, t = 1.44, p > .05$ ; Fig. 8), ( $\gamma = 37.26, t = 2.45, p < .05$ ; Fig. 9), ( $\gamma = 23.35, t = 1.40, p > .05$ ; Fig. 10), ( $\gamma = 13.68, t = 0.86, p > .05$ ; Fig. 11). Therefore, Hypothesis 3b was supported. Figs. 7–11 represent this relationship at low (mean  $-1$  SD) and high (mean  $+1$  SD) levels of density in TMT knowledge networks.

## 5. Discussion

The growing interest in ambidexterity is not surprising, given its contribution to a firm's competitive advantage (Gibson and Birkinshaw, 2004; He and Wong, 2004; O'Reilly and Tushman, 2013). The challenge intrinsic to succeeding at ambidexterity is also well known. Ambidexterity has even been treated as a paradox due to the contradictory activities entailed in exploration and exploitation (Miron-Spektor et al., 2018; Smith, 2014). Managers are naturally inclined towards exploitation and consistency (Smith and Tushman, 2005), but in most settings, their shift towards ambidextrous behaviors is a key contribution to organizational ambidexterity (Tempelaar and Rosenkranz, 2019).

In hospitals, both types of learning contribute to performance (Burgess et al., 2015; Salas-Vallina et al., 2019). On the one hand, TMT members must provide efficient functioning of the hospital by reducing time on waiting lists or avoiding overhead costs caused by unnecessary overnight stays. On the other hand, they need to introduce disruptions to hospital functioning by, for instance, modifying the organizational design or investing in new equipment, even if this means fighting the status quo and shaping a new organizational

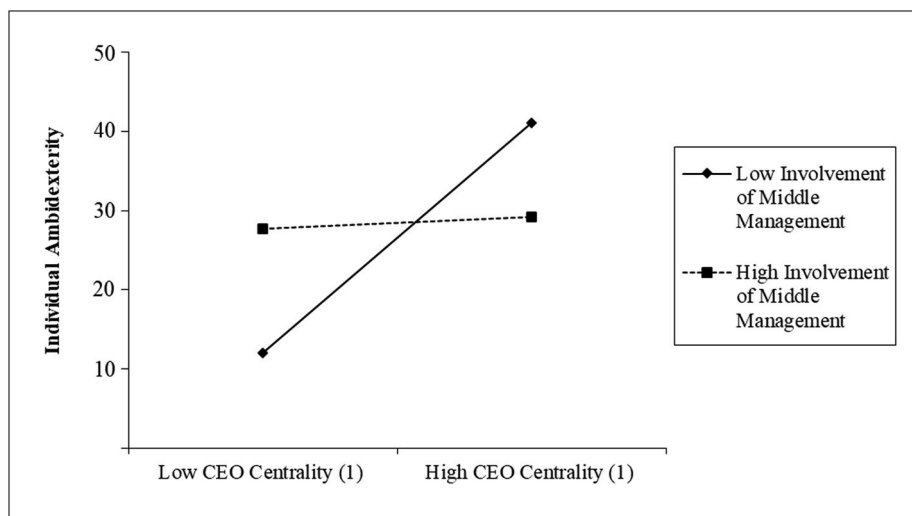
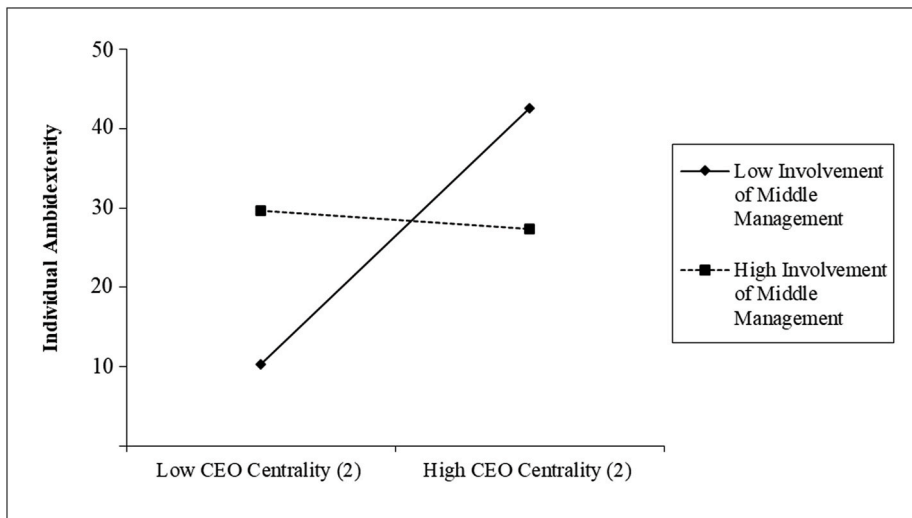
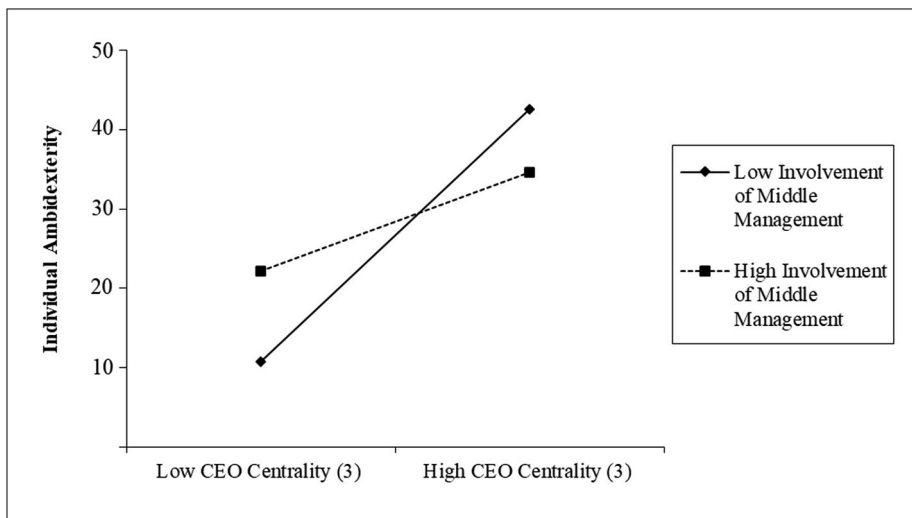


Fig. 2. The interaction of CEO centrality: Solutions to specific problems (1) and involvement of middle management on individual ambidexterity.



**Fig. 3.** The interaction of CEO centrality: Identification of information sources (2) and involvement of middle management on individual ambidexterity.

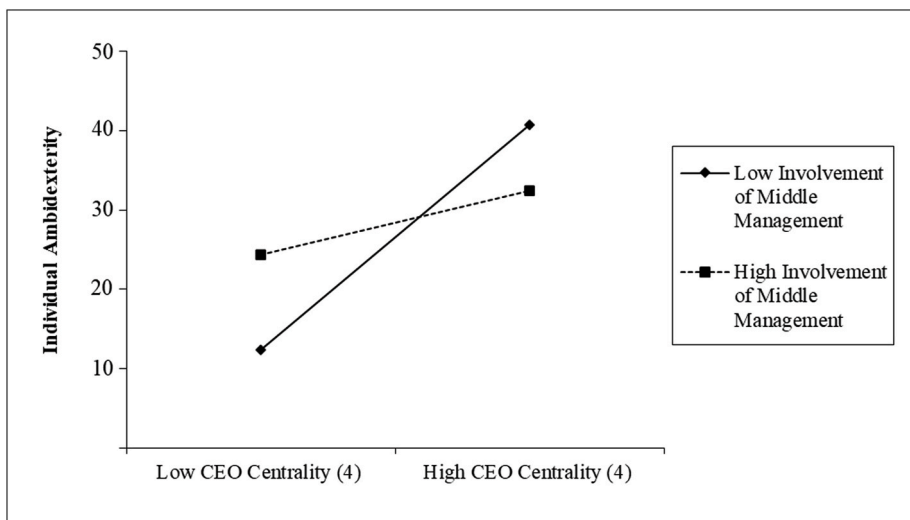


**Fig. 4.** The interaction of CEO centrality: Helps to think about problems creatively (3) and involvement of middle management on individual ambidexterity.

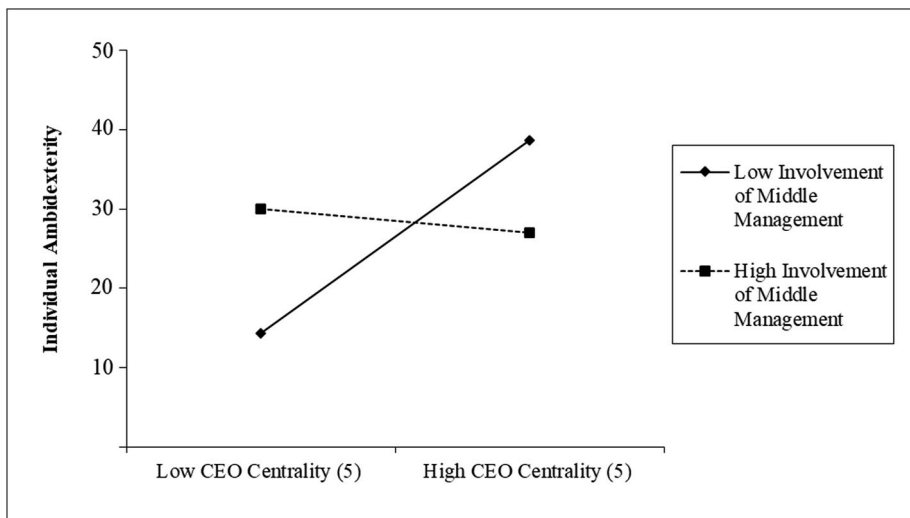
paradigm. Hence, in this context, decisions of ambidextrous managers will be decisive in making hospitals perform well in both exploration and exploitation. Nevertheless, the fact cannot be ignored that managers' behavior is influenced by the TMT network of which they are members and by their perception of middle managers, who are responsible for implementing organizational strategies. This study shows that densely connected and leader-centered knowledge networks are favorable team contexts for individual ambidexterity to emerge, provided that individuals perceive middle management as having low involvement in their decision-making process. This study adds to previous literature on TMT individual ambidexterity (e.g., [Kauppila and Tempelaar, 2016](#); [Mom et al., 2007](#); [Tempelaar and Rosenkranz, 2019](#)) by drawing on senior leadership, network and middle management research.

### 5.1. Theoretical contributions

This study contributes to organizational ambidexterity literature in a number of ways. Research on organizational ambidexterity has mainly focused on organizational-level solutions to resolve the tension between exploration and exploitation. However, more research is needed about the microfoundations of ambidexterity ([Felin et al., 2015](#); [Mom et al., 2007](#); [Papachroni and Heracleous, 2020](#); [Rogan and Mors, 2014](#)), specially at the top management level. In cases where an organizational structural or temporal solution is not possible, individuals may be able to embrace contradiction through a paradox cognition ([Miron-Spektor et al., 2011](#)). The



**Fig. 5.** The interaction of CEO centrality: Expresses confidence in proposals or ideas (4) and involvement of middle management on individual ambidexterity.



**Fig. 6.** The interaction of CEO centrality: Provides credibility for ideas to third parties (5) and involvement of middle management on individual ambidexterity.

present study contributes to understanding the underlying conditions that favor paradox cognition to emerge (Gibson and Birkinshaw, 2004; Mu et al., 2022). Amongst other aspects, certain social relationships and leader characteristics play a role in shaping individual paradox cognition and ambidexterity. In particular, the study coincides with previous authors showing that networks matter (e.g., Rogan and Mors, 2014; Simon and Tellier, 2011; Souza-Luz and Gavronski, 2019). In line with these authors, the present research shows that densely connected networks favor TMT members acting ambidextrously. It offers original findings, provided that leader-centered knowledge networks stand as an alternative team composition leading to high levels of ambidexterity. The study is also in line with literature dealing with how teams embrace paradoxical cognition (Smith and Tushman, 2005). Besides networks, leader characteristics (e.g., inspirational leadership) also matter to the emergence of individual ambidexterity (Li et al., 2015; Salas-Vallina et al., 2019). Hence, the present study contributes to extant literature by showing that leaders' (TMT members) perceptions of followers (middle managers) will influence the final level of TMT members' ambidexterity.

In terms of the structural dimension of the relations between TMT members and the impact of this architecture on their behavior, this study draws on network research (Cross and Sproull, 2004; Granovetter, 1977). The study by Rogan and Mors (2014) was the first empirical attempt to connect the two literature streams of ambidexterity and network. Nonetheless, it is important to highlight that this paper studies the properties of the network as a whole, rather than the ego network of each individual. This implied an arduous task of data collection. Simsek et al. (2005) estimated that the common response rate in surveys of top executives was between 10 and



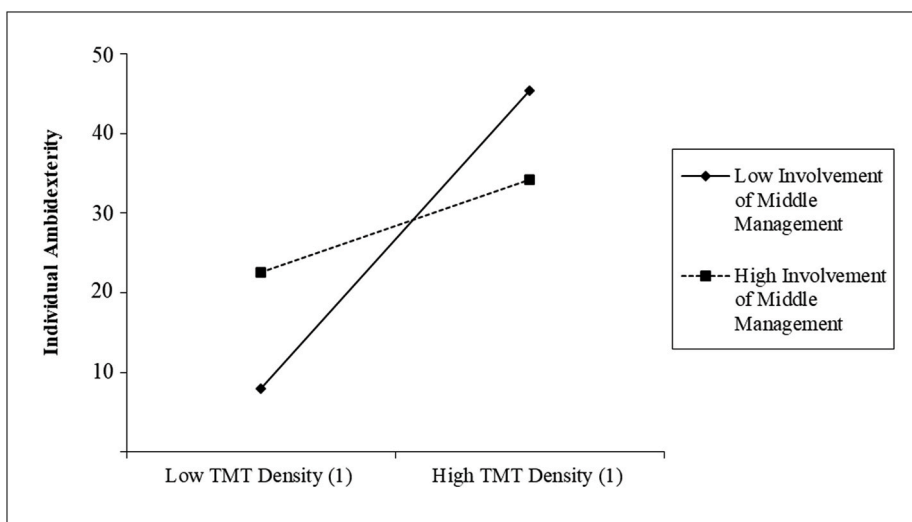


Fig. 7. The interaction of TMT density: Solutions to specific problems (1) and involvement of middle management on individual ambidexterity.

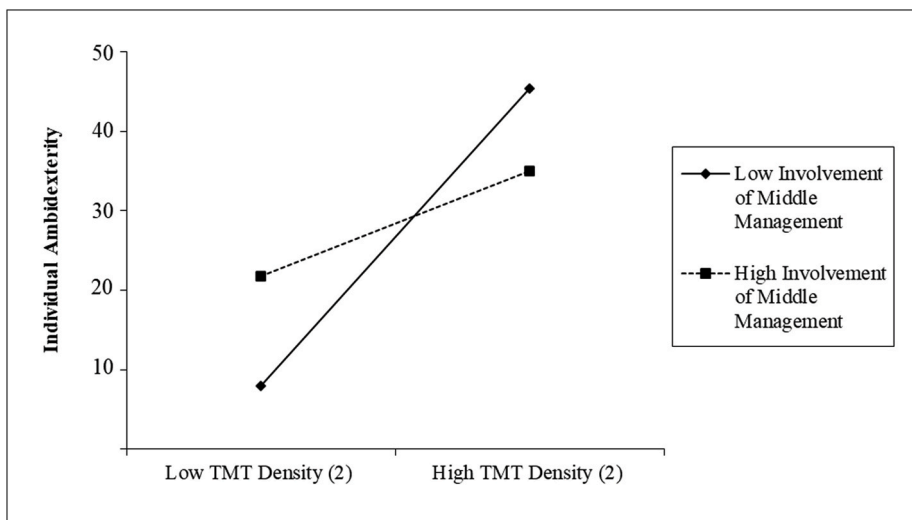
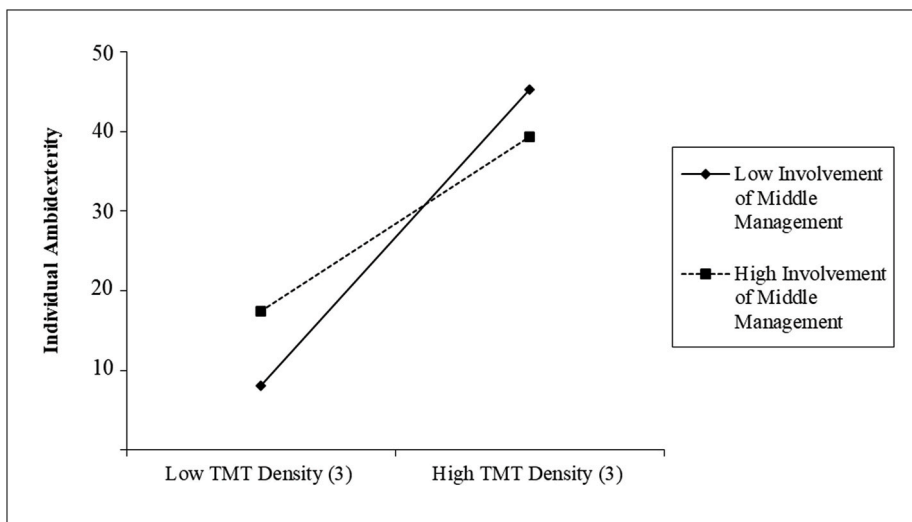


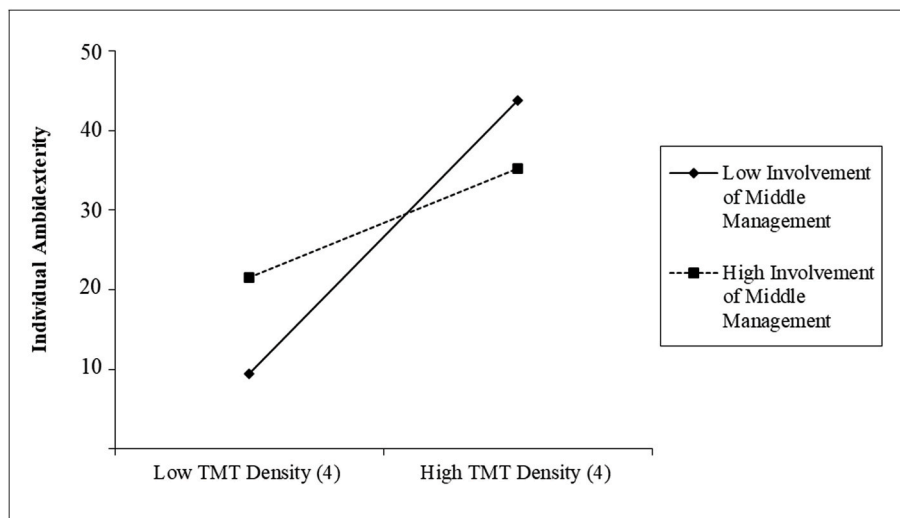
Fig. 8. The interaction of TMT density: Identification of information sources (2) and involvement of middle management on individual ambidexterity.

12%. In this study, data was gathered on twenty internal TMT networks with a total of 123 TMT members, which yielded an outstanding 80% response rate (cf. [Oh et al., 2004](#)). Finally, this manuscript contributes to middle management research. In this stream of research, middle managers are key in strategy implementation; in other words, TMT members need to take middle managers into account and convince them that their chosen strategy is the most appropriate for the organization ([Floyd and Wooldridge, 1992](#); [Tawse and Tabesh, 2021](#); [Wooldridge et al., 2008](#)). The present study shows that this is not always the case under certain boundary conditions. It is shown that middle managers in public hospitals are characterized by expert and coercive power, which may hinder efforts by TMT members to engage in ambidextrous behaviors. TMT members in CEO-knowledge-centered and TMT density network structures feel intimidated by middle management power struggles and, consequently, are discouraged from implementing their ambidextrous solutions. This result demonstrates the importance of understanding the type of organization and how it shapes the role of middle managers ([Darrell et al., 2016](#)).

The results suggest that leaders' coercive power should be kept to a minimum by giving them low involvement in decision-making. However, the results from the simple slope analysis also showed that it is not possible to make a firm conclusion about the moderating effect of high middle management involvement in the relationship between TMT structure and TMT members' ambidexterity. It is conjectured that there could be cases in which middle managers feel they are highly involved in decision-making and use coercive power, but also other cases in which they leverage their expert power and negotiating abilities in order to help TMT members understand the needs of their departments. In these cases, middle managers' involvement in decision-making could even have a positive



**Fig. 9.** The interaction of TMT density: Helps to think about problems creatively (3) and involvement of middle management on individual ambidexterity.

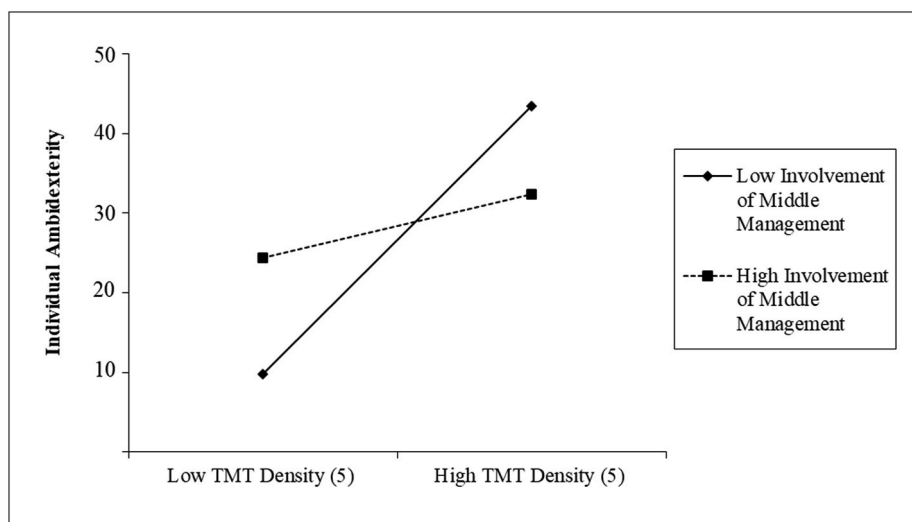


**Fig. 10.** The interaction of TMT density: Expresses confidence in proposals or ideas (4) and involvement of middle management on individual ambidexterity.

effect on the relationship between TMT knowledge structure and TMT members' ambidexterity. However, it is necessary to be cautious because the results were non-significant in the particular case of high middle management involvement (see, for instance, Fig. 2). Or simply, if there is high middle manager involvement, the relationship between TMT knowledge structure and individual ambidexterity is not affected. What is certain is the positive and significant relationship in TMT knowledge structure and managers' individual ambidexterity if involvement of middle management is low. In summary, middle managers with high expert and coercive power can create obstacles to the development of TMT members' ambidexterity in dense TMT and CEO-centered knowledge networks.

## 5.2. Practical implications

From this study, TMT members may learn that the knowledge relations that they establish with their peers are central in configuring their own ambidextrous behavior. For CEOs it is relevant to carry out their role as a leader, and for the rest of TMT members in the TMT it is important to increase the frequency of their interactions with their peers in absence of a central leader. Furthermore, TMT members working in organizations where middle managers show high expert and coercive power (such as public hospitals) should question the traditional notion that middle manager involvement benefits decision-making. TMT members will be better off, provided that middle managers are not highly involved in decision-making.



**Fig. 11.** The interaction of TMT density: Provides credibility for ideas to third parties (5) and involvement of middle management on individual ambidexterity.

It is acknowledged that this is a complicated task since middle management is key in ultimately implementing the hospital's strategy. However, TMT members should consider generating mechanisms to increase their legitimate power and involvement in decision-making while reducing that of middle managers. Legitimate and expert power is one of the most important reasons for following a superior's requests (Yukl and Falbe, 1991). For instance, top managers could provide evidence (e.g., through training) of their key role in dealing with contemporary healthcare management challenges. It is important that middle managers share TMT members' vision related to the necessity of organizations becoming ambidextrous in order to provide effective and efficient solutions for patients.

Furthermore, middle managers working in silos (as leaders of one specialty) make them more focused on their individual problems and not on the well-being of the organizations. TMT members could consider moving towards a flatter structure and creating multidisciplinary teams in which members from different specialties work together. However, this change will mean a disruption in the public healthcare system, require a change in the organizational culture, and ultimately overcome restrictions posed by government authorities. This result can be extrapolated to other organizations in which middle manager has expert and sometimes coercive power, such as in certain knowledge-intensive industries.

### 5.3. Strengths, limitations, and directions for future research

Overall, it is considered that the current study has several strengths which provide a reasonable test for the hypotheses. First, multi-source, mixed data—surveys and interviews with CEOs—were used to measure key variables, which helped to minimize potential common source biases. Second, the conceptual model was tested by applying appropriate analytical methods that matched the nested and multilevel nature of the data.

In spite of these noteworthy strengths, the present study has some limitations that point to interesting lines of approach for future research. First, the cross-sectional design of the research prevents causal inferences from being made regarding the direction of the effects observed. Even though the theoretical arguments proposed in this study state that networks affect individual ambidexterity, a reverse effect cannot be excluded. It would be helpful for future research to replicate the findings by applying longitudinal or experimental designs that are more robust in the specification of cause and effect. A second limitation is the size of the individual and team-level samples, which were limited to 103 and 20, respectively. Previous research suggests that reduced statistical potency, as a consequence of small sample sizes, may obscure interactions of small or moderate strength (Mathieu et al., 2012). Despite this possible drawback, significant interaction effects were observed in the study even though the sample was small, suggesting that the effects explained in the paper are robust. Nevertheless, further research into this question should be carried out in many organizations and with larger sample sizes at TMT network level. A third limitation is related to the measurement of middle management involvement as a perception of TMT members. A better approach could have consisted in asking middle managers directly; however, this study had limited access to this information. Even though the research was able to question multiple TMT members, it was not possible to obtain this information from middle management. Furthermore, some additional information could have also been captured, such as the mediating mechanisms through which TMT networks may affect managers' individual ambidexterity. The theoretical analysis and interview data suggest that these effects are conveyed by multiple complex and intertwined mechanisms, including empathy or trust. Future studies could focus more explicitly on determining and untangling the complex interplay of those mechanisms.

Finally, future research could usefully examine the effect of TMT members' positions in other types of networks. While knowledge networks (exemplified through items such as "Gives me concrete solutions to specific problems"; or "Helps me identify sources of

information to solve problems”) seemed especially relevant for individual ambidexterity, other network types may also be important for alternative outcomes.

## Author statement

Anabel Fernández-Mesa: Ideas; Data and funding acquisition; Writing original draft and review. Ronald Clarke: Writing original draft and review; Multilevel and network analysis; Report for respondents. Ana García-Granero: Writing original draft and review; Statistical analysis; Interviews. Justo Herrera Gómez: Data acquisition, research planning and development. Justin Jansen: Writing and review.

## Data availability

The data that has been used is confidential.

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