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Ambidexterity penetration across multiple organizational levels in an aerospace and defense organization

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ABSTRACT

The ambidexterity framework, which comprises two contradictory, yet interrelated processes of exploration and exploitation, has been researched using a variety of perspectives. Few studies, however, provide insight into the question: how is ambidexterity managed across multiple organizational levels? To address this question, we introduce the term *ambidexterity penetration* that refers to the enactment of ambidexterity across multiple organizational levels and develop a conceptual framework about how it is practiced (*horizontally*, *vertically* and *organizationally*). We empirically showcase this framework using findings from six business units of an aerospace and defense organization and analyzing data from 30 interviews. Overall, our study contributes to ambidexterity research and offers an empirical investigation of ambidexterity penetration across multiple organizational levels in the context of the aerospace and defense sector.

Introduction

Companies facing increased competition in their sectors and shorter product life cycles (Huang and Kim, 2013; Smith et al., 2017), have been found to resort to ambidexterity within their organizational setting in order to survive and innovate (Andriopoulos and Lewis, 2009; Birkinshaw and Gupta, 2013). Ambidexterity, however, is extremely hard to achieve, as it comprises two contradictory yet complementary processes of exploration and exploitation that have to be managed at the same time (Wilden et al., 2018). Exploration refers to innovation, creativity, frequent change and experimentation, whereas exploitation addresses cost efficiency, implementation, routinization of processes, and goals achievement (Beckman, 2006; Duncan, 1976; March 1991).

The concept of ambidexterity has been studied using a variety of perspectives (Junni et al., 2015; Raisch and Birkinshaw, 2008) such as organizational learning (Kang and Snell, 2009; Kostopoulos and Bozionelos, 2011; Prieto-Pastor and Martin-Perez, 2015), technological innovation (Smith et al., 2017), organizational adaption (Gupta et al., 2006), strategic management (Heracleous and Wirtz, 2009), entrepreneurship (Koryak et al., 2018) and organizational design (Papachroni et al., 2015). Scholars have also examined different organizational factors that may affect ambidexterity, such as environmental factors, organizational structure and strategy, as well as its impact on a firm's performance (Davis et al., 2009; Junni et al., 2015; Kauppila, 2010; Raisch and Birkinshaw, 2008). Finally, in their attempt to describe the internal structure of organizations and how organizations manage to balance ambidexterity, researchers have proposed four approaches to ambidexterity: contextual (Stokes et al., 2015), structural (Huang and Kim, 2013), cyclical (or punctuated equilibrium) (Kang and Snell, 2009; Romanelli and Tushman, 1994; Smith et al., 2017; Wang and Rafiq, 2014) and reciprocal (Lavie et al., 2010; Simsek et al., 2009).

Even though literature on ambidexterity has increased exponentially in recent years, only few studies provide insight into how

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ambidexterity is managed at multiple organizational levels (Birkinshaw and Gupta, 2013; Burgess et al., 2015; Junni et al., 2015; Turner et al., 2013). The reason behind this scarcity is that organizational ambidexterity is a construct, which has a complex structure (Good and Michel, 2013; Junni et al., 2015), and thus, it is difficult to clarify how senior executives (top management) assign the responsibility for the simultaneous management of tensions between exploration and exploitation at each level (Birkinshaw and Gupta, 2013; Miron-Spektor et al., 2018).

Through our study, therefore, we contribute to ambidexterity research by taking a more comprehensive approach to ambidexterity management at multiple levels and define this enactment of ambidexterity across levels as *ambidexterity penetration*. This study is also highly relevant from a practical perspective for multiple actors of any aerospace and defense organization, as they are encouraged to reflect on their behaviors in the particular business environment. Finally, in the organizational context under study even though all four approaches to ambidexterity (contextual, structural, cyclical and reciprocal) have been utilized in various combinations in different units (Kauppila, 2010; Turner et al., 2013), we chose to focus our attention on contextual ambidexterity (Wang and Rafiq, 2014), where senior executives, project leaders and employees pursue explorative and exploitative activities simultaneously at each level (Good and Michel, 2013).

Ambidexterity penetration across organizational levels

In this study, we introduce a model that sheds new light on how organizational ambidexterity is managed across multiple organizational levels. We build on Andriopoulos and Lewis's (2009) approach on how exploration-exploitation tensions are managed across the three levels of management (top management level, middle management level and employee level), while also incorporating recent research output into our framework (Bledow et al., 2009; Chandrasekaran et al., 2012; Papachroni et al., 2016; Turner et al., 2013). It must be stressed, however, that even though Andriopoulos and Lewis (2009) identify three paradoxes of innovation at each level that constitute contradictory yet complementary poles (Bednarek et al., 2017; Sharma and Bansal, 2017), in our research, we offer an alternative approach, where interrelated tensions of innovation and cost efficiency appear in different degrees of detail at each of the levels. According to scholars, the impact of tensions depends on an individual's approach, where individuals view tensions either as both/and paradoxes or as either/or dilemmas (Knight and Paroutis, 2017; Miron-Spektor et al., 2018; Smith et al., 2017). In this study, we adopt the either/or approach.

Tensions appear to be highly important at three organizational levels: at the firm level, within projects and at the employee level. Thus, at the senior management level, top executives seek to fulfill two interrelated goals: stable revenues to increase cost efficiency (exploitation) and innovative ideas to propel high performance (exploration) (Angwin et al., 2009; Gedajlovic et al., 2012; March 1991; Mihalache et al., 2014; Mom et al., 2009). At the middle management level, project leaders seek to develop high quality customer relationships (Chang, 2015), fulfill multiple roles, switch between short term and long term orientations (Burgess et al., 2015), while focusing on clearly set goals (exploitation) and by using innovative ideas (exploration) (Mom et al., 2015, 2007; Rosing et al., 2011). Finally, at the employee level, individuals confront continuous challenges, such as discipline (exploitation) and creativity (exploration) (Andriopoulos and Lewis, 2009; Chandrasekaran, 2009; Hirst et al., 2018; Junni et al., 2015; McClean and Collins, 2011; Miron-Spektor et al., 2018; Prieto-Pastor and Martin-Perez, 2015).

Ambidexterity, however, has to be managed not only at each level, but even across levels (Chang, 2015). For instance, even though decisions about exploration and exploitation can take place at the senior management level (Halevi et al., 2015), they have to be implemented at the project level by project leaders and employees (Chandrasekaran et al., 2012). Exploration-exploitation tensions, therefore, can penetrate within organizations at the same level (horizontal ambidexterity), across levels (vertical ambidexterity), and through the entire organization (organizational ambidexterity).

More specifically, in the context of horizontal ambidexterity penetration, it is important to explore how individuals at each level can effectively balance tensions while making exploitation-exploration decisions. For instance, the senior management may face difficulties in assessing how to best allocate financial resources in order to increase the firm's performance, while simultaneously taking into account the environmental dynamism, the organizational structure and the strategic orientation of the organization (Andriopoulos and Lewis, 2009; Chandrasekaran et al., 2012; Davis et al., 2009; Gedajlovic et al., 2012; Kauppila, 2010; Raisch and Hotz, 2010). When comparing organizational levels, Papachroni et al. (2016) state that senior managers face tensions of innovation and efficiency, while employees at the lower organizational levels deal with the operational tensions of this dual demand. The authors explain that individuals perceive the relationship between innovation-efficiency differently, a fact that creates different sub-tensions at the lower organizational levels (Sheep et al., 2017). For example, at the senior management level, innovation is usually related to strategic innovation (Gedajlovic et al., 2012; Halevi et al., 2015), while at the middle management level, innovation is perceived as a process of generating innovative ideas in order to achieve higher efficiency (Papachroni et al., 2016).

Furthermore, in the context of vertical ambidexterity penetration, senior executives can promote ambidexterity in two ways: by communicating explorative and exploitative activities directly through interpersonal interactions with the middle management teams (Heyden et al., 2018), and by communicating exploration and exploitation related goals indirectly to employees who have direct communication with the middle management (Elenkov et al., 2005; Jansen et al., 2009; Shrivastava and Nachman, 1989; Zimmermann et al., 2015). This can be achieved through formal, as well as informal communication, face-to-face meetings, explicit task objectives, and regular discussions (Jansen et al., 2016; Mom et al., 2007). Some organizations also use scorecards and disciplined project management (Chandrasekaran et al., 2012; Turner and Lee-Kelley, 2013), as well as different incentive schemes to achieve vertical ambidexterity penetration (Faisal Ahammad et al., 2015; Junni et al., 2015; Papachroni et al., 2015; Patel et al., 2013). In this way, decisions are connected across levels to ensure that the organization has the ability to adhere to its goals and adapt to changes (Chandrasekaran, 2009). Strategic-level decisions are therefore aligned with project-level activities (Paroutis et al., 2016)

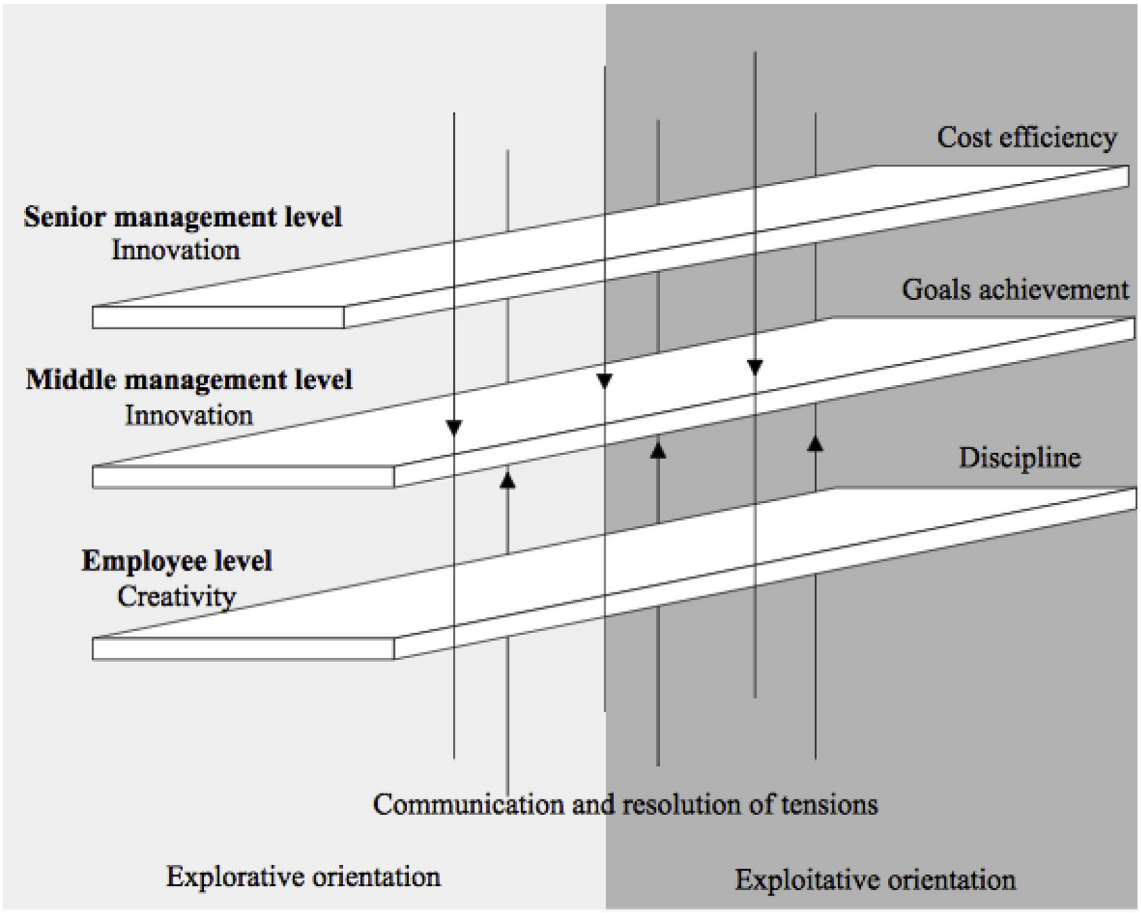

Fig. 1. Framework of ambidexterity penetration in the aerospace and defense organization.

and the higher the level of alignment, the higher the effectiveness of organizations to function ambidextrously (Chandrasekaran et al., 2012; Junni et al., 2015; Patel et al., 2013).

Finally, in the context of organizational ambidexterity penetration, what is important is the effectiveness of organizations to operate ambidextrously (Gedajlovic et al., 2012; Gibson and Birkinshaw, 2004; Good and Michel, 2013) – a fact that is reflected in their performance – while also taking into account organizational structure and environmental dynamism (Carmeli and Halevi, 2009; Davis et al., 2009; Eisenhardt, 2013; Fiss, 2011; Heracleous and Werres, 2016; Raisch et al., 2009; Raisch and Hotz, 2010; Smith and Lewis, 2011; Yukl, 2008). For example, Raisch and Hotz (2010) suggest that, in standardized, centralized, and hierarchical organizations, exploitation is preferred over exploration, while Eisenhardt (2013) states that too much structure restricts organizations from being flexible, and thus promotes exploitation. In general, if there is no incentive system in place that rewards creative behavior (Bledow et al., 2009; Junni et al., 2015), exploitation is preferred over exploration even in the most entrepreneurial organizations (Martin et al., 2017), as exploitative projects have fast and predictable results, whereas explorative projects are risky and the expected returns take longer to materialize (Chandrasekaran et al., 2012; Lavie et al., 2010; Raisch and Hotz, 2010). Ultimately, in stable environments, an exploitative orientation of organizations or a balanced approach to ambidexterity leads to higher performance, whereas in dynamic environments, an exploration – oriented behavior is more effective rather than an exploitative one (Boumgarden et al., 2012; Davis et al., 2009; Gedajlovic et al., 2012; Good and Michel, 2013; Kauppila, 2010; Lavie et al., 2010; Raisch and Hotz, 2010).

Fig. 1 below presents an outline of the above framework. More specifically, it shows how the exploration – exploitation tensions unfold at each level and how ambidexterity penetrates across the levels.

As shown in Fig. 1 above, we argue that the three levels of ambidexterity penetration are related to each other. More specifically, the organizational ambidexterity penetration facilitates the exploitative or explorative orientation of an organization (Davis et al., 2009; Raisch and Hotz, 2010; Wilden et al., 2018), which in turn affects the exploitative or explorative activities of individuals at each of the three horizontal levels (Burgess et al., 2015; Papachroni et al., 2016). For example, a complex organizational structure in combination with a low environmental dynamism facilitates the exploitative orientation of an organization (Martin et al., 2017), which in turn forces the individuals to mostly focus on the exploitative activities (Lavie et al., 2010). In the same vein, the vertical ambidexterity penetration facilitates and synchronizes the effective management of ambidexterity at the three horizontal levels

Table 1
Classification of ambidexterity penetration in organizations.

Ambidexterity penetration	
High	• Horizontal ambidexterity penetration: refers to the way ambidexterity penetrates at each level o Senior management level: simultaneous focus on innovation (exploration) and cost efficiency (exploitation) by senior executives o Middle management level: simultaneous focus on innovation (exploration) and goals achievement (exploitation) by project leaders o Employees level: simultaneous focus on creativity (exploration) and discipline (exploitation) by employees • Vertical ambidexterity penetration: refers to the way ambidexterity penetrates across levels o Between the senior executives' level and that of middle managers: by using techniques such as alignment of decisions, frequent communication and resolution of tensions o Between the middle managers' level and that of employees: by using techniques such as frequent communication (ad hoc and e-mail) and resolution of tensions • Organizational ambidexterity penetration: refers to the way ambidexterity penetrates through the whole organization o Organizational structure: medium organizational structure, as too much structure restrains individual action and favors exploitative activities, and vice versa o Environmental dynamism: medium dynamism environments, as too dynamic environments need less structured organizations, and thus, more flexible individuals who focus on explorative activities, and vice versa
Low	• Missing some or all of the elements referred above.

through alignment, effective communication, and resolution of tensions among individuals (Burgess et al., 2015; Chandrasekaran et al., 2012).

Finally, the concept of ambidexterity measurement is diverse within the ambidexterity literature. The instruments that measure ambidexterity processes are constructed according to how scholars perceive ambidexterity: either balanced or combined. Researchers use different mathematical variations to approach the above two categories, but there is no conclusive evidence that these instruments produce consistent results (Junni et al., 2013; Martin et al., 2017). At the same time, there is no consistent approach in the ambidexterity literature about how two different objectives must be balanced, traded off against one another, reconciled, or just managed (Birkinshaw and Gupta, 2013; Faisal Ahammad et al., 2015). With respect to performance measures in ambidexterity studies, these are classified into objective and perceptual. While objective measures include growth and profitability of ambidextrous organizations, perceptual measures focus on performance, which is considered absolute or relative in comparison to that of the competitors (Junni et al., 2013). Still, ambidexterity literature is unclear in explicitly defining the relationship between exploration, exploitation and firm performance. Recently Boumgarden et al. (2012) proposed a three – dimensional representation of the relationship between the three variables, according to which, ambidextrous organizations may have high performance outcomes if they achieve an approximate balance between exploration and exploitation tensions. On the contrary, if ambidextrous companies are comprised of inconsistent design elements, then, the greater the distance from a balanced ambidextrous structure, the lower the level of their performance.

In accordance with the above study, we propose a classification scheme for characterizing ambidexterity penetration, where organizations may have high ambidexterity penetration if they achieve the proper balance of exploration – exploitation tensions across organizational levels. Otherwise, they present low ambidexterity penetration, if they miss some or all of the elements needed for a more ambidextrous context. In that respect, Table 1 below highlights the criteria for a high and low ambidexterity penetration in organizations. In the next section we explain our method.

Method

Our study is based on a single case study research design (Siggelkow, 2007). The research involves exploratory analysis of six units of a leading aerospace and defense government organization with a public sector structure that operates in close cooperation with the aerospace and defense industry. We decided to study this organization as it serves as a customer for several defense projects, a fact that is commonly characterized by high pressure for ambidexterity (Havermans et al., 2015). All of its units offer services based on defense products and electronics, with engineering being one of the most important services. They operate in a multinational environment across four European countries.

Even though these units have different areas of responsibility and objectives, our main goal was to study ambidexterity processes (Miron-Spektor et al., 2018) that take place in each of the units, rather than investigate the exact nature of their operations. This is in accordance with the research conducted by Chang (2015) and Patel et al. (2013) who note in their work that organizational ambidexterity at the unit level is similar to ambidexterity found at the firm level. In a similar manner, business units in our research can be compared with each other (except for the headquarters), as all of them seek ways to achieve efficiency and innovation in the projects they undertake, and thus, their results, in terms of invested effort and achieved efficiency, can be extrapolated to the organizational outlook of the whole organization.

In addition, the primary aim of an aerospace and defense organization is to ensure the protection of the participating nations from external threats, as well as the internal security. Most importantly, the organization receives the necessary funding from its member states for every project it undertakes through decisions made by consensus. Due to its mission and its public sector structure, the organization presents a low dynamism external environment. Finally, it was observed that the internal environment of each business unit of the organization is hierarchical and consists of multiple levels, and is thus representative of a highly structured organization.

Table 2
A brief description of the business units in the aerospace and defense organization.

Aerospace and defense organization		
Business units	Area	Description
Business Unit A (headquarters)	Belgium	It is the political and administrative center of the organization. In this unit, representatives of all participating member states come together to make strategic decisions on a consensus basis.
Business Unit B	Belgium	The unit is responsible for the planning and execution of combined, joint, effects-based operations.
Business Unit C	Luxemburg	The unit brings together, in a single organization, the logistics and procurement support activities.
Business Unit D	Netherlands	The unit is responsible for planning and coordinating acquisition strategies and for managing contracts associated with the modernization of the equipment.
Business Unit E	Netherlands	The unit is responsible for the contingency planning or regional operations.
Business Unit F	Germany	The unit is responsible to deliver global surveillance services whenever and wherever directed by the organization's strategic intent.

In Table 2 below, we briefly describe the main responsibilities of the business units under investigation.

Data collection

Our data collection process lasted for more than a year. In the beginning, we decided to make a thorough archival research of the units under investigation for two reasons. First, their context was well suited for studying innovation challenges and cost efficiency. The six case units are models of ambidexterity, renowned for their excellence in explorative and exploitative innovation within the high tech industry (Andriopoulos and Lewis, 2009; Tushman and O'Reilly, 1996). Second, within this setting, we sought units where we could ensure full access to multiple levels, in order to study ambidexterity in much depth.

We collected multiple sources of evidence: (a) semi-structured, in-depth interviews (face-to-face and via e-mail), (b) documents and archival data, and (c) observations. Table 3 summarizes the data sources (interviews) for this organization. We started our study with archival material and then used interviews and observations as our main sources of inductive data. Archival data, documents, and data from observation were used to offer insights that could reinforce our interview findings (Cassell and Symon, 1994; Langley, 1999; Yin, 2009).

In order to gather information from multiple levels of the organization it was deemed appropriate to employ both face-to-face and e-mail interviews (see Appendix A). The list of questions was considered to be more effective via e-mail as it could be sent individually to several participants at once, irrespective of their geographical location or time zone (Bampton and Cowton, 2002; McKerlich et al., 2013). In that respect, five face-to-face interviews were conducted with participants in close proximity to the researchers, while all the other interviews were conducted via e-mails. Some follow-up questions were asked to improve categorization. We conducted a total of 30 interviews with individuals directly involved in the innovation and cost efficiency process (e.g. senior executives, project leaders etc.). We asked employees at multiple organizational levels to nominate other employees to participate in the study to enable representative sampling. Some of the interviews (those conducted face-to-face) were transcribed verbatim to ensure reliability (Bryman, 2012; Creswell, 2013, 2009; Saunders et al., 2009), while others (those conducted via e-mail) were used in their initial form (some illustrative quotes are presented in Appendix B).

Data analysis

Ambidexterity practices at multiple levels were observed during the process of data analysis. More specifically, three steps of analysis were used, from raw data to the final outcome, based on Miles and Huberman's (1994) work. Systematic comparisons of data, emerging categories, and literature review helped in the development of cohesive constructs and in the construction of a theoretical framework. Interview transcripts were employed as primary data for the analysis. Notes to support and refine the interpretations of emerging categories were used and the framework of this study was based on recent research to guide the integration of categories into an overall framework of the ambidexterity penetration.

Step 1 As a first step, after examining all interview transcripts, exploration and exploitation patterns were identified at each level. In this way, patterns of innovation and cost efficiency followed by senior executives could be studied, as well as innovation and goals achievement in projects, and creativity and discipline among employees. NVivo software and Excel spreadsheets were employed to help in the conceptual coding of the data. Then, broad categories that emerged from the data were used to offer general insights into ambidexterity practices and penetration, while informants were also asked specific follow-up questions in order to further improve categorization.

Step 2 As a second step, first-order concepts deriving from broad categories were linked to second-order themes, and then to aggregate dimensions. Concepts and relationships regarding ambidexterity were allowed to emerge from the data (see Fig. 2). For example, regarding ambidexterity penetration at the senior management level, we noticed that most of the informants mentioned that senior executives did not promote improvisation and idea sharing in their business units (stated as first-order concepts). Therefore, there was a limited focus on explorative activities by senior executives at that level (stated as second-order themes). Here, innovative ideas of empirically grounded first-order codes were linked to explorative activities of

Table 3
Data collected.

Cases		Interviews				
		Higher management: Strategic business unit general manager and Division directors	Senior level management: Strategic business unit senior leaders or Program managers	Middle level management: Project leaders	Employees/team members: Corporate executives	Total interviews
Aerospace and defense organization	Business Unit A				1	1
	Business Unit B	1		8	1	10
	Business Unit C		1			1
	Business Unit D	1		6	6	13
	Business Unit E			1		1
	Business Unit F			2	2	4
						30

theoretically grounded second-order categories, which were later linked to ambidexterity penetration. Accordingly, any cost savings in business units were analyzed in a similar way. Even though senior executives were trying to reduce costs in projects, however, cost savings were not always their top priority (stated as first-order concepts). In many cases, performance or schedule received precedence even at a higher cost. Consequently, there was a limited focus on exploitative activities at that level (stated as second-order themes), which in combination with the previously mentioned limited focus on explorative activities, resulted in an overall limited focus on ambidexterity at the senior management level (stated as aggregate dimension) (see Appendix C).

Step 3 As a final step, a theoretical framework of ambidexterity penetration within the organization was built. Further, recent research on ambidexterity was sought and existing studies were used in order to refine the appropriate labels and understandings (Andriopoulos and Lewis, 2009; Chandrasekaran et al., 2012; Papachroni et al., 2016). The systematic, multi-level analysis of the collected data revealed variations in ambidexterity penetration across multiple levels of management in the organization under study as a result of corporate culture and environmental constraints.

Findings

Horizontal ambidexterity penetration

Three contradictory yet complementary processes of exploration and exploitation at each level appear to be highly important for the promotion of ambidexterity in the aerospace and defense organization: (a) innovation and cost efficiency at the senior management level, (b) creativity and goals achievement at the middle management level and (c) creativity and adherence to short time frames with limited budget allocation among employees.

Ambidexterity at the senior management level

More specifically, it was observed that there is a limited focus on ambidexterity at the senior management level in the organization. Cost savings are the primary goal of the senior management but not in areas where big savings could be achieved. In a lot of cases, the organization spends excessive amount of money without examining more efficient ways to do business. Also, performance seems to matter most but many times is not achieved in a cost efficient way. As the organization has a public sector structure, it presents rigidity in transferring financial resources from one project to another for a more prudent allocation of these resources. As an electronic engineer in Business Unit D put it: “Cost efficiency is considered as there is always a cap in the budget. The key strategy is to achieve the best product with the available funding. However, the projects are strongly performance oriented and there is no-profit involved in the decision-making. Cost, schedule and performance are negotiated with the contractors. Depending on the particular situation any of the three elements may be the priority and receive precedence. For example, during periods that multiple interrelated projects are in progress, the schedule is the key element that receives precedence even at a higher cost. The decisions on the precedence are made at strategic level by the senior management and are passed to the middle management (project leaders) as organization policy. Therefore, we are most efficient in following certain procedures to accomplish its tasking, while less efficient to deviate from them in order to achieve cost savings”.

At the same time, risk taking is not sufficiently supported and thus opportunities and innovation do not constitute the primary means to foster even greater performance. In most of the cases, senior management prefers to use technological advances in projects that have already been tested, rather than using new technology that may lead to the risk of incompatibility and thus may result in a failure of successful completion of the projects. Senior executives also ask employees to comply with the established plans in order to deliver the services requested. Improvisation and idea sharing are usually not requested. As a deputy general manager in Business Unit D explained: “I do encourage crosstalk and idea sharing, however, the type of our organization is rather oriented on focusing on goals, respecting deadlines and following well-established and documented processes”. Accordingly, an integrated project team leader stated:

> At strategic level (agency), we set annual goals and objectives and we assess achievements at the end of calendar year. Generally speaking, we are allowed to adjust objectives and scope based program schedule changes, however, we do not deviate from the final goal. So, certain freedom is allowed, but that is always coordinated at the project level (Team leader, Business Unit D).

The senior management makes decisions at the strategic level, and sometimes at the tactical/operational level, while the execution of these decisions takes place at the project level (middle management), with project leaders offering senior executives advice on procedural and technical matters. This is important in order to align strategic-level decisions with project-level activities and to compare organizational levels (Chandrasekaran et al., 2012; Papachroni et al., 2016). In certain cases, senior management requests proposals and assessments from the middle management, but this is more of an exception than the rule. As an electronic engineer and project leader of a technical support team put it:

> Projects are mostly worked by Integrated Project Teams (IPTs). Based on the IPT recommendations, middle management provides a recommendation to senior management, which makes the decision (Project leader for team technical support, Business Unit D).

In addition, alignment is achieved through supportive communication and explicit task objectives (Andriopoulos and Lewis, 2009; Jansen et al., 2009; Mom et al., 2009). Formal meetings are held at project level at least once a week, and at senior management level, weekly or monthly. Informal, ad-hoc discussions take place every day. Most of the employees prefer to communicate informally in the

beginning, and then proceed to more formal decisions. As an integrated project team leader in Business Unit D explained: "I personally prefer 'warming up' the subject prior to critical decisions, which means, let's do the legwork informally first before going into formal".

Ambidexterity at the middle management level

Significant ambidexterity was observed at the middle management level. It was found that project leaders seek to develop high quality customer relationships (Andriopoulos and Lewis, 2009). In particular, in the aerospace and defense organization, there is not enough space for project leaders to deviate from the goals that have been set clearly at the beginning of the projects. However, they could improvise, be creative, and try to implement their own style in the way their team conducts daily business, as long as they stick to the predefined timeline and budget line. As an electronic engineer in Business Unit D observed: "There is some freedom but every deviation is talked through and agreed upon with the end user and then verified against the potential impact on schedule, performance and cost". This is in line with another program manager's statement:

> Customer satisfaction in the organization is the main goal of the middle management, and of course, this can take many forms, thus allowing room for maneuver (Program manager, Business Unit C).

Accordingly, a project leader in Business Unit D explained: "The aim is to satisfy all of the end-customers' needs within the contract; however, if there are possibilities to improve the end product within the scope of the contract, this may be considered". Finally, as an integrated project team leader stated:

> We are an acquisition (program execution) like organization with future planning capabilities as well. Planning is based on our "customer's" needs for modernizing and sustaining their assets and available budget that is provided by the "owner" of the assets (Integrated project team leader, Business Unit D).

Exploration in projects is also achieved in a certain way through the allocation of subject matter experts for the support of either ongoing projects or future project planning. This is called "matrix" support, when the experts can be temporally assigned to other activities, while not leaving their branch/division.

Ambidexterity at the employee level

Finally, at the employee level, it was found that there is limited focus on ambidexterity. Employees face constant challenges with regard to discipline and creativity (Andriopoulos and Lewis, 2009). Besides being asked to develop current or new products within short time frames (Eisenhardt and Brown, 1998) with limited budgets (Cao et al., 2010; Chandrasekaran, 2009), creativity in teams is not considered to be of high priority (Chandrasekaran, 2009).

More specifically, the final decision is taken based on cost efficiency and ideas used in the past and are mostly of similar or identical nature. Often, the goal is discussed with other team members, but several times, due to time constraints, there is little room to exchange ideas. According to the statement of an electronic engineer in Business Unit D: "There is little room for improvisation as in this business the rules and processes are clearly defined". The responsibilities are, by nature, related to specific goals and deadlines that do not allow much deviation, while they are also put in the framework of the statutory regulations. In some projects, due to their specific type, creativity is not required, whereas in others, leadership promotes creativity but is restricted within limits. However, flexibility is required whenever it can facilitate the progress of the project. Flexibility is promoted unless it is conflicting with particular rules. As a division director of Business Unit B explained:

> This is a mixed bag in our organization. I see some units collaborating and working in a creative manner and others working in stovepipes. Senior leadership encourages and promotes collaboration and creativity, but, frankly speaking, it could be better within our organization (Division director, Higher management, Business Unit B).

Moreover, dialogue is used extensively among employees, particularly for issues, which are complicated and touch many areas of responsibilities within the branch/section/unit. All discussions in formal forums take place under a predetermined policy. Employees discuss ideas within the Integrated Project Teams (IPT) forums, and based on those discussions, they try to reach a common suggestion to be conveyed to the senior management, which makes the final decision. This is especially important, as it is essential to connect decisions across levels to ensure that the organization has the ability to re-align its goals and adapt to changes. This is the concept where execution and strategy need to be connected. This is in line with what a program manager in Business Unit C stated: "In general, the ideas are discussed and when there is significant financial or operational impact, the decision making process invokes some of the widely used decision making tools, like decision matrix analysis, paired comparison analysis, etc.". Accordingly, an electronic engineer also explained:

> I think there is little room for creativity in my organization due to the particular type of the services that it provides. The bureaucratic structure is more helping than deterring the employees at their job. There is, however, some intra-team interaction at project level and sharing of knowledge experience. Especially between older and newer employees that are not yet knowledgeable with the process (Electronic engineer, Business Unit D).

Experts who comprise the "matrix" structure are more flexible in producing innovative ideas and in knowledge sharing. Each expert has a unique area for which he/she is responsible. Within the engineering team, everybody has the same level of voting

Table 4
A brief explanation of the data structure and analysis of the horizontal ambidexterity penetration in the organization.

Level	Patterns	Quotes	Broad categories	First-order concepts	Second-order themes	Aggregate dimensions
Senior management level	Exploitation	Multiple times the organization goes with the less financial-wise solution based on different aspects, i.e. political driven. Realistically, cost effectiveness is only a small piece in the decision making process and mostly not the driving factor.	Cost is not always the priority	Cost savings are not always the priority	Limited focus on exploitation	Limited focus on ambidexterity at the senior management level
		Cost savings is the prime goal but not from areas where big savings can be achieved. New projects authorization seems to be the secondary priority. In a lot of cases we spend excess amount of money without examining more efficient ways to do business.	Cost savings not always from the appropriate areas			
	Exploration	I do encourage crosstalk and idea sharing, however, the type of our organization is rather oriented on focusing on goals, respecting deadlines and following well-established and documented processes.	Little room for creativity	- Little room for creativity at the organizational level - Less efficient in innovative ideas	Limited focus on exploration	
		On organizational level, most efficiency is observed in areas of communication with all the stakeholders, internal coordination, cost efficiency. Less efficiency is observed in areas of speedy accomplishment of goals and innovation.	Less efficient in innovative ideas			
Middle management level	Exploitation	The goals are suggested by the middle management and are finally agreed after exhaustive discussion with the whole chain of command. There is some kind of scorecard approach that links the project goals with the overall unit goals.	Goals set at the beginning of the project	Clearly set goals at the beginning of the project	Focus on exploitation	Focus on ambidexterity at the middle management level
		There is some freedom but every deviation is talked through and agreed upon with the end user and then verified against the potential impact on schedule, performance and cost.	Clearly set goals and procedures			
	Exploration	The project in its nature allows for freedom. Deadlines can be moved if justified appropriately, old requirements are introduced again as the needs have changed.	Freedom and room for improvisation	Room for improvisation in projects to achieve customer satisfaction	Focus on exploration	
		The short-term goals are primarily the coordination with the “customers” on daily or weekly basis, to achieve their exact requirements. In long term, some freedom is allowed, as long as the “customers” operational requirements will eventually be achieved.	Customer satisfaction is important – some freedom is allowed			
Employee level	Exploitation	Due to the fact that the requirements and the course of action are explicitly defined, everything is followed with absolute dedication.	Specific course of action without much deviation	Responsibilities related to specific goals and deadlines, without much deviation	Focus on exploitation	Limited focus on ambidexterity at the employee level
		We do not really discuss the way forward unless there is a difficult situation, which needs to be resolved quickly	Rules and processes clearly defined			

(*continued on next page*)

Table 4 (*continued*)

Level	Patterns	Quotes	Broad categories	First-order concepts	Second-order themes	Aggregate dimensions
		and efficiently. Once an agreement has been reached we move to the next authority, normally the branch chief.				
	Exploration	Creativity and individual employee responsibilities are promoted, however with a focus on the overall goals and deadlines.	Some form of creativity within limits	Creativity is restricted within limits	Limited focus on exploration	
		The ideas are generally discussed with the team members and this is the way the final decision is made. The leadership promotes creativity and individual responsibility, but in a way that does not allow deviation from the deadlines and the short-term goals.	Leadership promotes creativity but is restricted within limits			

opportunity for finalizing the recommendations for decisions. If there is no consensus at the lowest level, then the issue has to be elevated to the next higher level. Responsibilities are formally recorded in the Job Descriptions while creativity is recognized during task execution. Once creativity is recognized from any individual then that person becomes the owner of that idea, and the idea is utilized in other areas.

Table 4 below provides a brief explanation of the data structure and analysis conducted on the horizontal ambidexterity penetration in the organization.

Finally, Fig. 2 below summarizes the data acquired from the interview participants of all the three levels above and provides a visual representation of the data structure and findings, which shows a low horizontal ambidexterity penetration in the aerospace and defense organization.

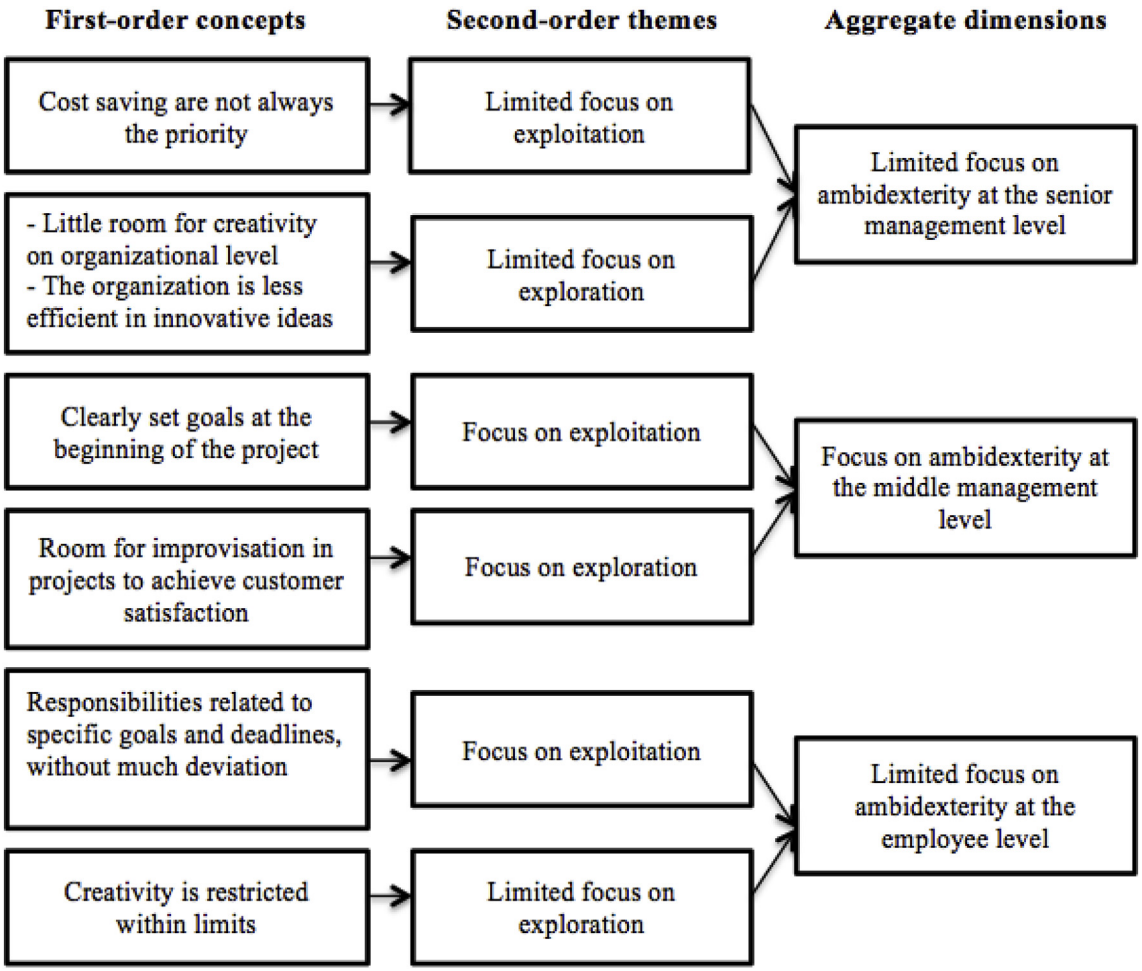

Fig. 2. Low horizontal ambidexterity penetration in the aerospace and defense organization.

This figure demonstrates how ambidexterity penetrates at the horizontal level in the aerospace and defense organization. It shows that there is low horizontal ambidexterity penetration in the organization. In the first column, first-order concepts are presented, which are based on the statements of the majority of the participants. Then, these concepts are classified into second-order concepts at each level (senior, middle and employee level). Finally, it is concluded that, according to our classification of ambidexterity penetration (see Table 1), there is only limited focus on ambidexterity management at the senior and employee levels, indicating low ambidexterity penetration at these two organizational levels, and consequently, low overall horizontal ambidexterity penetration across the organization.

Vertical ambidexterity penetration

In the aerospace and defense organization under study, exploration-exploitation tensions are managed on different levels, as they constitute a shared responsibility of all corporate members (Beckman, 2006). More importantly, even though there is a clear hierarchy in the business units, with the top group making the decisions, there is a well-established process for the involvement of all

stakeholders in order to facilitate a well-informed decision-making. There are two levels of decision power. The highest decision tier in some units of the organization is the Board of Directors (BoD), which meets 2–3 times per year; in coordination with the senior management, it is responsible for the decision-making, the strategic goals and the financial processes, wherein it employs the top-bottom decision-making process. As an electronic engineer in Business Unit D observed: "The decisions are made by the senior management at strategic and sometimes at tactical/operational level. The program/project leaders have the freedom to make decisions on the procedural matters. In certain cases the senior management requests proposals and assessments from the middle management but this is more exception than the rule. The strategic level decisions are made by the senior management, while middle management offers them advice in procedural and technical matters. The goals are set either by the higher management or in certain cases are provided to the senior management by the Board of Directors or the Higher Echelon parent Organization/Headquarters".

However, there is a tendency to over-expand the stakeholder pool in most issues in order to dissipate the responsibilities. In that respect, all issues and goals are, in practice, managed and released at the lowest level of the hierarchy (middle level management in coordination with employees) pursuant to the delegation released by the highest level (senior level management and BoD). However, for certain very important issues and especially ones that are related to financial processes and strategic goals, the highest level of approval is always required. Most of the time, there is a routing sheet being passed from the requester to the general manager, with input from all involved departments. The final decision is made based on all the inputs.

As a project leader in Business Unit D explained in detail: "The team leader makes the project-specific decisions. The program manager makes the program level decisions. The core team is dedicated to the specific project and employees of other branches of the organization matrix/expert support when necessary. All matrix team members communicate their own positions during meetings, emails, phone calls to the team leader and when necessary to the program manager. The more effective means of coordination are the face-to-face team meetings (every 2 days of ad-hoc) and the daily emails. The driver of the decisions is primarily the achievement of the project level and (then) program level goals and objectives, with emphasis on the schedule, cost and performance. Whenever needed or desired, employees of other branches of the organization or other external organizations provide expert support (legal or financial)".

Communication and resolution of tensions

Nonetheless, everyday communication creates tensions within teams, as well as between employees and management (Andriopoulos and Lewis, 2009). Within teams, different views and goals that need to be reached, as well as lack of specialized knowledge (different academic and professional backgrounds), may lead to problems of misunderstanding. On the senior management side, micromanagement, unjust or unequal treatment towards employees, unclear guidance, and lack of technical knowledge lead to difficulties in understanding the issues and coming up with proper solutions. Also, when senior management bypasses the middle management and provides assignments directly to employees, a potential challenging problem arises. As a program manager in Business Unit C explained: "Between employees, I would say the problem in communication arises in the different interpretation/understanding of what needs to be done to accomplish certain tasks. Between employees and senior management there is sometimes lack of information flow mainly on the future projects and goals of the organization".

As tensions are always emerging, there is a certain approach to ease tensions through regular face-to-face meetings, where, through constructive discussion, employees attempt to find a solution that satisfies the views and requirements of both sides as early as possible. As a project leader in Business Unit E noted: "There are always tensions emerging. My personal approach is based on the gradual resolution of tensions, after having established my intensions and the limits of my tolerance. In principle, the higher an issue is being resolved, the worse it is for everyone". Similarly, an electronic/communication engineer noticed:

> Tensions are not very common, but whenever they arise they are the result of a common effort to comply with the tight implementation schedule. In my opinion, the easiest way to cope with such situation is to prioritize the issues according to severity, importance and impact, and attack separately (Electronic/communication engineer, Business Unit D).

In the following section, we discuss the penetration of organizational ambidexterity in the organization at each of the levels and across multiple organizational levels and propose a more comprehensive framework.

Discussion

This research extends our previous understanding of exploration-exploitation tensions across multiple organizational levels. Earlier empirical studies have shown that ambidexterity plays a positive role in a firm's performance, within the constraints provided by the organizational context (Gibson and Birkinshaw, 2004; Raisch and Birkinshaw, 2008). Research has also revealed that the ambidexterity dilemma exists in different units and at multiple levels. For instance, the unit responsible for exploration, such as the R &D department, is not only seeking for new opportunities but is also building on existing resources of the rest of the organization (Hill and Birkinshaw, 2014). Similarly, the unit that is responsible for exploitation, such as the manufacturing department, is not only spending most of the time on formulating cost-efficient procedures but is also looking out for process improvements (Birkinshaw and Gupta, 2013).

The same logic applies to multiple organizational levels. Exploration – exploitation tensions are reiterated through various levels of hierarchy in organizations, starting from the highest level of management and down to the employee level. There also exists some blend of exploration and exploitation at each level (Andriopoulos and Lewis, 2009; Birkinshaw and Gupta, 2013). In that respect, our study analyzes the ambidexterity penetration through multiple organizational levels in the aerospace and defense organization, from

the top management down to the employee level. We also analyze in depth the exploration – exploitation tensions at each of these levels.

More specifically, by examining the horizontal ambidexterity penetration in the organization, the findings of this study indicate that there are different degrees of effectiveness in how ambidexterity practices penetrate horizontally at each of the levels. Limited management of exploration – exploitation activities is observed at the senior management level. Neither cost efficiency (limited focus on exploitation) nor innovation (limited focus on exploration) constitutes the top priority of senior management. High performance seems to be achieved in a less cost-efficient way. In addition, at the middle management level, ambidexterity practices penetrate quite well, as project leaders prefer not to deviate from goals (exploitation), while promoting innovation and improvisation in projects (exploration). Finally, at the lower employee level, a limited focus on ambidexterity is observed. Even though individuals deliver projects in short time frames and within limited budget (exploitation), creativity does not appear to be of a high priority (limited focus on exploration).

Moreover, what seems important in the organization is the vertical ambidexterity penetration across the levels. Alignment of strategic-level decisions with project-level activities, proper communication and resolution of tensions contribute to the promotion of ambidexterity between the top and middle management levels. Informal communication, however, is preferred over the formal one, which facilitates the promotion of ambidexterity between the two higher levels. Accordingly, communication and resolution of tensions are also important between project leaders and employees. Dialogue is extensively used to resolve complicated issues and procedures, while also contributing to the promotion of ambidexterity between the two lower levels. Overall, strategic-level decisions are aligned with project-level activities (even though difficulties in communication are also present), and this alignment results in high vertical ambidexterity penetration across the levels.

Finally, Raisch and Hotz (2010) indicate in their work that in dynamic environments, organizations are mostly oriented towards exploration. In stable environments, however, organizations prefer an exploitative or a more balanced orientation (Kauppila, 2010; Lavie et al., 2010). Accordingly, in standardized, centralized, and hierarchical organizations, exploitation is preferred over exploration for increased efficiency and enhanced performance (Davis et al., 2009; Raisch and Hotz, 2010). The public information of the organization under study reveals its complex structure, as the organization has a centralized and hierarchical composition, with multiple organizational levels, and many business units that operate in different countries. The public information available about this organization also shows that it operates in a low dynamism environment, due to environmental predictability, low uncertainty, and lack of competition being it a government organization. Thus, a low level of organizational ambidexterity penetration is observed, while taking into account the low environmental dynamism and the complex organizational structure of the organization.

In sum, even though the organization under study presents high vertical ambidexterity penetration, it also shows low horizontal and low organizational ambidexterity penetration. For the above reasons, it is concluded that the particular organization presents a low overall ambidexterity penetration (horizontal, vertical, and organizational) across multiple organizational levels (Andriopoulos and Lewis, 2009; Bledow et al., 2009; Chandrasekaran et al., 2012; Papachroni et al., 2016). In Table 5 below, we present the extent of ambidexterity penetration in the organization.

Finally, with respect to how the three different levels relate to each other, Table 5 in combination with our findings shows some inconsistencies among the levels. The first inconsistency is observed between the horizontal and the organizational ambidexterity penetration. More specifically, in our research we came across a low level of organizational ambidexterity penetration. This means that the complex organizational structure and the low environmental dynamism should have forced organizational actors to focus mostly on the exploitative activities and less on the explorative ones at each of the horizontal levels. However, the data revealed the existence of different degrees of ambidexterity management at each of these levels. This finding does not fit with the organizational ambidexterity penetration that should have been orthogonal to the horizontal ambidexterity penetration with the main focus on exploitation (i.e. focus on exploitation – limited focus on exploration at each of the three horizontal levels).

Another inconsistency is found between the vertical and the horizontal ambidexterity penetration. More specifically, in this study, it is observed that high level of vertical ambidexterity penetration does not promote an effective horizontal ambidexterity penetration, as at each of the horizontal levels we find different degrees of ambidexterity management. Even though employees manage the explorative and exploitative activities effectively, this is not the case for the senior and middle management levels. This finding is

Table 5
Extent of ambidexterity penetration in the organization.

Ambidexterity penetration			
Levels of analysis		Extent of penetration	
		High/Low	Overall
Horizontal level	Senior management level	Low	Low
	Middle management level	High	
	Employee level	Low	
Vertical level	Top-middle	High	High
	Middle-employee	High	
Organizational level	Organizational structure	Low	Low
	Environmental dynamism	Low	
Overall			Low

contradictory to the high level of vertical ambidexterity penetration found in our study that should have facilitated an effective exploitative orientation in the organization from the higher to the lower horizontal levels and vise versa.

A possible explanation for the above inconsistencies between the horizontal – organizational and horizontal – vertical levels, and the existence of different degrees of ambidexterity penetration at each of the horizontal levels lies in the fact that at the senior management level individuals perceive the relationship between innovation – efficiency differently (Hirst et al., 2018), a fact that creates different sub – tensions at the lower organizational levels (Papachroni et al., 2016). For example, some employees state that in their organization, the main driver is cost, followed by schedule and performance; other employees state that cost effectiveness is only a small piece in the decision making process and mostly not the driving factor, while some others state that cost, schedule and performance are negotiated with the contractors and depending on the particular situation any of the three elements may be the priority and receive precedence (see Appendix C). In addition, some organizational actors manage ambidexterity ineffectively, a fact that affects the ambidexterity penetration of their level. For example, in projects, different views and goals that need to be reached, as well as lack of specialized knowledge lead to problems of misunderstanding. Accordingly, on the senior management side, micro-management, unjust or unequal treatment towards employees, unclear guidance, and lack of technical knowledge lead to difficulties in understanding the issues and coming up with proper solutions. A similar issue was observed by Burgess et al. (2015) in their study, in which they noticed that some individuals seem to be more able and more inclined to facilitate ambidexterity than others (Kobarg et al., 2017; Lavie et al., 2010).

Contributions to theory and practice

Our study addresses an essential question in strategic management about how ambidexterity can penetrate across multiple organizational levels. Our aim was to uncover how exploration-exploitation exchanges take place across multiple levels in the aerospace and defense organization under study, as ambidexterity is an important element for the long-term prosperity of organizations. Our findings offer a number of contributions for ambidexterity literature.

First, we extend Andriopoulos and Lewis's (2009) work by proposing additional levels of ambidexterity penetration. In that respect, we proposed not only ambidexterity penetration at each level but across levels as well. Therefore, according to our findings, exploration-exploitation tensions can penetrate within the organization under study at the same level (horizontal ambidexterity), across levels (vertical ambidexterity), and through the entire organization (organizational ambidexterity).

Second, our study extends Boumgarden et al. (2012) by offering a classification of ambidexterity penetration in the organization under study. Based on our findings, we suggest that organizations with the attributes of the organization under investigation, can be classified into categories according to which they may achieve high ambidexterity penetration, if they achieve the proper balance of exploration-exploitation across organizational levels. Otherwise, if they miss some or all of the elements that have been previously specified, they are considered to present low ambidexterity penetration across levels. In that respect, according to our findings, a low overall ambidexterity penetration was observed in the organization under examination.

Third, our study extends upon previous understandings about how ambidexterity can be managed within an organization at multiple levels. We analyzed how exploration-exploitation tensions are managed at three horizontal levels, across levels, and within the context of the entire organization, while we also provide a perceptual classification of these tensions and examine the extent of ambidexterity penetration in the aerospace and defense organization under investigation.

Our study also offers practical insights for managers dealing with competing strategic tensions in complex firms. First, we demonstrate the importance of managing such tensions across multiple levels inside the firm, and not only focusing attention and resources on a small sub-set of primary strategic initiatives or critical business units, operations or products. This leads us to the second insight, which refers to the importance of investing in systems and structures that enable the horizontal, vertical and organizational communication between employees, regardless of their geographic location or organizational level. Such communication systems and structures are an important step for ambidexterity penetration to take shape. Finally, our third practical insight refers to the importance of investing in talent development and human relation processes that enable organizational actors to spend time in multiple locations in their firm beyond their focal business unit or function, and also enable them to explore alternative career paths. Such processes can help facilitate ambidexterity penetration, particularly in complex organizational settings.

Future research directions and limitations

Future research could examine more closely the relation of ambidexterity between the levels. Scholars should clarify whether we can really compare the different levels in terms of their ambidexterity or whether the observations are manifestations of the same ambidexterity occurring on different levels in different degrees of detail, an issue that demands a different approach to ambidexterity management on behalf of the individuals. With respect to the methodological approach to ambidexterity penetration, future studies should use a more specialized approach to ambidexterity management, such as cluster analysis or qualitative comparative analysis (QCA). These approaches should include a statistical analysis of ambidexterity penetration in several ambidextrous organizations grouped in clusters. Finally, the study of our case could well provide guidance for constructing similar case studies for other firms in this sector and in other industries that face similar environmental pressures.

We recognize that our study has a number of limitations. First, the degree of ambidexterity penetration observed at the senior level may be due to the fact that the number of participants at that level was only three. Even though this number may have affected our understanding of ambidexterity penetration at that level, yet the individuals from lower levels were aware of the processes taking place at the top level of their business unit and thus provided all the necessary information about ambidexterity management at that level. Second, the number of replies at each of the levels was smaller than projected. Some of the initial responses had to be rejected, whereas some of the questions had to be modified and reiterated with follow-up questions to improve categorization. Third, except for units B and D, where we obtained more than ten interviews, we managed to obtain only one to four interviews from the rest of the units. Even though this element may have affected the reliability of our conclusions, yet the description of processes by individuals at their level was similar across the business units, a fact that may have eliminated any shortcomings of the small number of participants of these units.

Finally, while the qualitative analysis of organizational ambidexterity at multiple organizational levels within the aerospace and defense organization provides the benefits of richness critical to understanding the mechanisms that deliver ambidexterity in this organization, it must be stressed though that a great deal of relevant information in the aerospace and defense organization is classified and thus not available to general public. For this reason, other factors related to the processes of ambidexterity management that the organizational actors may not have wanted to disclose, may have influenced the organizational dynamics and the outcomes of this study.

Conclusion

In conclusion, it must be recognized that applying ambidexterity in organizations is a challenging accomplishment, where top management teams should facilitate the contradictory yet complementary issues of exploration and exploitation. At the same time, they must be able to cooperate with middle management groups and communicate the ambidextrous strategy throughout their organization down to the lower level of employees. With this study, therefore, we contribute to understanding of ambidexterity by focusing on the context of the aerospace and defense organization. This helps us show how in complex settings, ambidexterity is practiced across multiple organizational levels. To capture this concept we introduce the term *ambidexterity penetration*.

Appendix A. Interview protocol

You are kindly invited to respond with honesty to the following set of questions that investigate the applicability of Ambidexterity in leadership methods and strategic management at government organizations that operate in the highly challenging fields of high-tech electronics, defense and aerospace.

Ambidexterity, as is denoted by its name, relates to the ability of engaging simultaneously and efficiently into two different often contradicting but equally demanding tasks: current operations that are the primary purpose and obligation of your organization towards its superior authority, while at the same time allocating resources (in terms of personnel, time and money) for planning for the future development of your organization that will allow it to adapt to the changing environment.

Note, that both your personal data as well as the data of your organization will be kept confidential, will not be published or referenced in any way, as are not important for the processing of the provided information. Your participation will be classified as: senior executive/project leader/employee – middle or higher level, and your organization as: aerospace and defense organization (business unit A, B, C etc.)

Please, keep your answers concise but do not hesitate to expand if you consider necessary. For several questions where choices or examples are provided to help and provide context, please do not hesitate to answer with options that are not provided.

Thank You.

Part A: Interviewee introduction

1. What is the Level of Management in your Organization that best applies to your position/job description:
   i. Higher Management: Leader/Commander (general manager), Director of Unit (division director)
   ii. Senior level management (executives): Program manager
   iii. Middle level management (project leader or IPT leader)
   iv. Employee (engineer, logistics expert, IT expert, contracts expert etc.)
2. Years in the organization and in the specific position
3. Your key management responsibilities (in short, not required to be specific)
4. The key challenges that have to be managed at the same time/simultaneously (in short)

Part B: Ambidextrous tensions on different levels

5. Describe, in short, the most difficult/challenging problems to be resolved in the everyday communication
   o Between employees

o Between employees and senior management. Are there any specific tensions that immerge between other employees and management? If yes, how do you cope with them?

6. What is the decision-making process like and how are the final decisions achieved? Who drives them?
7. How are the goals set and who is responsible to set them? Are you using any scorecard approach to link the project goals with the overall unit goals?
8. How often do you have formal and informal meetings at your level of management? Would you prefer communicating with management formally or informally?
9. Do you think that the senior management of your organization allocates most of the resources in current or future projects?
10. What are in general the main short-term and long-term goals of your middle management (projects leaders) in relation to the recipients of your services ("customers")? Are they trying to achieve exactly what they require or are they allowed to have some form of *freedom or improvisation*?
11. Do your employees generally discuss their ideas with other team members? How do they make a final decision? Does the leadership of the individual units promote creativity and individual employee responsibilities or should the employees stick to specific goals and deadlines?

Thank you for your time.

Appendix B. Summary of key findings (illustrative quotes) of ambidexterity penetration at multiple levels in the aerospace and defense organization

Horizontal ambidexterity penetration			
Levels of analysis	Business Unit	Job specification	Quotes
Top management level	Business Unit E	Project leader	In my current post there is a clear hierarchy, thus the command group is making the decisions. There is a well-established process for the involvement of all stakeholders in order to facilitate a well-informed decision-making. There is however, a tendency to over-expand the stakeholder pool in most issues in order to dissipate the responsibilities (with a lot of stakeholders, the blaming game is more difficult).
Middle management level	Business Unit B	Project leader	Middle management and even employees are allowed to have some ''decision making freedom,'' according to the limits set by the hierarchy and the relevant Directives.
Employee level	Business Unit D	Employee	- There is little room for improvisation as in this business the rules and processes are clearly defined - I think there is little room for creativity in my organization due to the particular type of the services that it provides. The bureaucratic structure is more helping than deterring the employees at their job. - There is, however, some intra-team interaction at project level and sharing of knowledge experience. Especially between older and newer employees than are not yet knowledgeable with the processes.
Vertical ambidexterity penetration			
Top-middle	Business Unit C	Program manager	Between employees and senior management there is sometimes lack of information flow on mainly on the future projects and goals of the Organization. This is compensated by the so called town hall meetings where all the employers are invited and receive informative briefings.
	Business Unit F	Employee	Unclear guidance and unclear assigned responsibilities lead to less than ideal handling of programs. Mostly, a straightforward discussion solves the miscommunication and misunderstanding.

Middle-employee	Business Unit A (headquarters)	Employee	- Tensions immerge between employees and management concerning issues like recognition of efforts and respective rewards. Additionally, it is extremely important from the management side to be able to clearly describe the needs and requirements. If I were in the position to cope with these problems I would acknowledge the work that everyone has dedicated, I would keep the personnel motivated and enthusiastic. sbnd At my level of management we have on a daily basis, one formal meeting. In my opinion, it will be in the best interest of our organization to have both formal and informal meetings.
	Business Unit B	Project leader	Formal and informal meetings at my level of management may take place on a daily basis. Both are necessary for the promotion of the assigned tasks, depending on the occasion.
	Business Unit C	Program manager	Between employees, I would say the problem in communication arises in the different interpretation/understanding of what needs to be done to accomplish certain tasks.
	Business Unit D	Employee	Formal meetings are held at project level twice a week and at senior management level weekly. Informal communication is welcome but formal is also necessary so that the tasking is clearly defined.
	Business Unit E	Project leader	- Informal communication is the best as long as everyone realizes they are on the same boat. Unfortunately, this is rarely the case, thus formal communication is the remaining alternative. All discussion in formal forums takes place under predetermined policy. The place where free exchange of ideas takes place is the coffee break and the launch brake. - There are always tensions immerging. My personal approach is based on the gradual resolution of tensions, after having established my intensions and the limits of my tolerance. In principle, the higher an issue is being resolved, the worse it is for everyone.
	Business Unit F	Employee	- Discussion within the team and the immediate supervisor. The outcome is later presented to higher management for approval. Rarely, but not impossible, our suggestion is not accepted and we need to go back and refine it. - We have established a weekly Staff Meeting, where each individual present his progress with his assigned program. Normally though, since our offices are located very close to each other, we have an everyday interaction with the Branch Chief.
Organizational ambidexterity penetration			
Organizational structure	Business Unit A (headquarters)	Employee	- Performance and cost efficiency are both considered in any decision. In most of the cases the performance is limited in order to accomplish cost efficiency - The planning is indicated by the organization and approved by the parent organization, which also acts as the supervising authority. - Most efficient: speedy decision taking, cost efficiency, adopting policies, standardization - Less efficient: innovative ideas, performance, productivity, flexibility
	Business Unit E	Project leader	All measures of effectiveness are dictated by parent organization, by setting the standards (the limits) of business. The organization is most efficient in achieving required objectives, less efficient in creating innovative ideas.
Environmental dynamism	Business Unit E	Project leader	Low dynamism environment (predictability, low uncertainty)

The above Table shows some of the illustrative quotes of participants about ambidexterity penetration at multiple levels in the aerospace and defense organization. It is divided into three parts based on (a) horizontal penetration on the three levels (senior, middle and employee), (b) vertical penetration between top-middle and middle-employee levels, and (c) organizational penetration in the organization, while taking into consideration organizational structure and environmental dynamism of the aerospace and defense industry. For example, both project leaders and employees refer to their main focus on exploitative activities in their business unit, where they use a well-established process for the involvement of all stakeholders in order to facilitate a well-informed decision-making. Accordingly, middle level managers and employees describe the difficulties and tensions in their communication with senior executives and other employees, and how they overcome any communication problems. Finally, participants discuss how performance and cost efficiency are considered in any decision and they all state that they operate in a low dynamism industrial environment.

Appendix C. Detailed explaination of data analysis at the senior management level

Appendix C: Detailed explaination of data analysis at the senior management level					
Patterns	Quotes	Broad categories	First-order concepts	Second-order themes	Aggregate dimensions
Exploitation	Cost efficiency is considered as there is always a cap in the budget. The key strategy is to achieve the best product with the available funding. However, the projects are strongly performance oriented and there is no-profit involved in the decision-making. Cost, schedule and performance are negotiated with the contractors. Depending on the particular situation any of the three elements may be the priority and receive procedence. For example, during periods that multiple inter-related projects are in progress, the schedule is the key element that receives precedence even at a higher cost.	1. cost is not always the priority 2. schedule receives precedence over cost	1. cost savings are not always the priority	Limited focus on exploitation	Limited focus on ambidexterity at the senior management level
	We have 3 pillars for each project: cost, schedule and performance/technical compliance. We have a very comprehensive and rigorous process to balance among these 3 pillars.	cost is not always the priority			
	Cost savings is the prime goal but not from areas where big savings can be achieved. New projects authorization seems to be the secondary priority. In a lot of cases we spend excess amount of money without examininig more efficient ways to do business.	cost savings not always from the appropriate areas			
	Cost efficiency is always considered, but in specific cases, performance might be imperative disregarding minimum requirements.	cost is not always the priority			
	Best possible result with minimum cost is the goal.	cost is important			
	Try to achieve performance but not at any cost because of limitations	cost is important			
	The organization is trying to achieve the best performance with the minimum cost. In order to achieve this, it is using a prudent allocation of human resources and a strict planning.	cost is important			
	The most important is the cost efficiency, but sometimes especially in security matters, the task is more important at any cost	cost is not always the priority			
	The organization strives to achieve the best possible result with the minimum cost.	cost is important			
	The organization considers cost efficiency as a major driver for its long term decisions. The balancing of cost, schedule and performance/technical comliance is achieved primarity by activities to adapt firstly the schedule and secondly (if needed) the performance elements to achieve the cost element.	1. cost is not always the priority 2. schedule receives precedence over cost			
	Main driver is cost, followed by schedule and performance.	cost is important			
	Multiple times the organization goes with the less financial-wise solution based on different aspects, i.e. political driven. Realistically, cost effectiveness is only a small piece in the decision making process and mostly not the driving factor.	cost is not always the priority			
	Due to financial hindrances, it is highlighted that our primary goal is to achieve minimum costs.	cost is important			
	Performance and cost efficiency are both considered in any decision. In most of the cases, performance is limited in order to accomplish cost efficiency.	cost is important			
	I would say that although cost efficiency is a major discipline, sometimes in order to cope with urgent operational requirements this discipline is not followed. The speedy accomplishement of goals sometimes is less efficient due to external to the organization reasons. The organization is most efficient in the discipline of focusing on the customer and in this sense it is a recognized center of excellence in the provision of certain services.	cost is not always the priority			
	In most cases, and given the current fiscal limitations, the organization adopts a cost efficient approach. Nonetheless, when adoption or incorporation of new technologies is deemed absolutely necessary, there is increased flexibility to achieve the goal by overcoming these fiscal limitations, which in turn may have a negative impact on other projects of lower importance.	cost is not always the priority			
	In our organization we follow the year budget and we strive for the best performance with the least cost. We balance cost by addressing our request to many vendors and examine each proposal, then we can use the best-balanced cost.	cost is important			
	As a fairly unique multi-national organization, our organization has the additional task of ensuring that our conributing nations receive industrial returns for their participating national industries. This aspect, plus performance, are the overriding factors.	cost is not always the priority			
	There is always a trade-off between minimum cost and performance.	cost is important			
	The organization is less efficient in cost efficiency. Numerous times a decision was driven by the operational necessity, which in turn was independent of a price tag.	cost is not always the priority			
	The organization is mostly efficient in speed and efficiency in turning user requirements into contractual actions that lead to the delivery of technical enhancements to our customers' aircraft. However, executing a variety of complex financial and contractual processes that are designed to insure that national industries receive their fair share of industrial returns. These processes require an incredible amount of human resources to execute and are extremely inefficient.	cost is not always the priority			
	Overall cost efficiency is the main driver "best result for the money available". However, occasionaly some requirements driving the performance are so important that the realization of them detracts others to stay in the available budget.	cost is not always the priority			

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