



Relationship between CEO's strategic human capital and dynamic capabilities: a meta-analysis

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Abstract

In this paper we study the association between Chief Executive Officers' strategic human resource capital, dynamic managerial capabilities, and firms' dynamic capabilities. This study identifies the Chief Executive Officer (CEO) variables reported in the literature, and estimates the correlation of each CEO variable with the dynamic capabilities. In addition, the moderator effect of the three types of dynamic capabilities is estimated. This paper applies a meta-analysis using structural equation modeling by means of the three-level random-effects model on 446 correlations, which account for 52,767 CEOs around the world. The findings show a positive correlation of CEO education ($\rho = .113$), CEO personality ($\rho = .162$), and leadership styles ($\rho = .306$) with dynamic capabilities. In addition, dynamic managerial capabilities totally mediate the relationship between education and dynamic capabilities and partially the relationship of CEO personality and leadership styles with dynamic capabilities.

Keywords Human capital resources · Dynamic capabilities · CEO effect · Microfoundation · Meta-analysis

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1 Introduction

CEOs have been a fascinating research population because they personify organizations (Koch et al. 2017). According to Quigley and Hambrick (2015), the proportion of the firm performance's variance explained by the CEO variables has been increasing each decade. Quigley and Graffin (2017) estimated that 22% of the firm performance is explained by variables related to CEO characteristics. Among these characteristics, CEO human capital has shown its influence on organizational variables, such as strategic actions (Wang et al. 2016), dynamic capabilities (Bendig et al. 2018; Rodenbach and Brettel 2012), and firm performance (Crook et al. 2011). Therefore, CEO human capital is another important asset for firms (Wulf and Singh 2011).

In the research on dynamic capabilities, CEO human capital has emerged as a relevant variable in the explanation of the sources of those capabilities (von den Driesch et al. 2015). Dynamic capabilities are a type of organizational capability relevant to the adaptation of the firm that allow creating, extending, or modifying the resource base intentionally (Helfat et al. 2009). Although research shows that these capacities increase firm performance (Bitencourt et al. 2020; Fainshmidt et al. 2016) and allow rising sustainable competitive advantages (Helfat and Peteraf 2009), there is a gap in knowledge on how they are developed. CEO human capital has been extensively reported as a relevant variable in the development of dynamic capabilities; nonetheless, its contribution is unclear.

Extending the model proposed by Bendig et al. (2018) to other individual characteristics of the CEOs, we assert that CEOs make use of their human capital stocks to foster proper conditions for the development of dynamic capabilities. Hence, CEOs do not create dynamic capabilities by themselves; their function is to coordinate resources and processes that enable collective actions among members of the firm. From their influential position, CEOs mobilize firm resources, enabling complementarities and the emergence of aggregated organizational phenomena as dynamic capabilities (Bendig et al. 2018; Ployhart and Hale Jr 2014). Therefore, CEOs are masters “orchestrating” a great symphony (Kor and Mesko 2013).

However, only one type of human capital is related to dynamic capabilities. In the effort to incentivize complementarities and emergent processes, CEOs exploit a special type of human capital called Strategic human capital resources (SHCR) (Ployhart et al. 2014). SHCR is a subtype of the human capital addressed to pursue competitive advantages in the market, and it enables CEOs to perform special dynamic managerial capabilities. In other terms, the stocks of knowledge, skills, abilities, and other characteristics (KSAOs) integrated into the CEO SHCR enable deploying dynamic managerial capabilities for triggering the mechanism that generates dynamic capabilities. Thus, we propose a relationship between SHCR and dynamic capabilities mediated by dynamic managerial capabilities.

Therefore, we aim to contribute to the definition of the role of the CEO SHCR in the development of dynamic capabilities. To achieve this aim, we performed a meta-analytical review using a MASEM (meta-analysis using structural equation

modeling) (Hansen et al. 2021; Wilson et al. 2016) with a three-level random-effects model (Cheung 2014; Fernández-Castilla et al. 2020). Meta-analysis is a type of quantitative literature review that seeks the integration of primary research results and the presentation of new hypotheses not included in primary research (Miller and Pollock 1994). This tool enables us to identify the research reported about the relationship between CEO SHCR and dynamic capabilities, quantify the correlation between variables, and organize the findings according to the conceptual model proposed.

Based on the findings, we hope that readers, academic, and practitioners will understand the role of the CEO SHCR in the development of dynamic capabilities. Also, we have updated human capital theory (Becker 1964), used extensively in the research, with a more comprehensive and interdisciplinary model, like human capital resources (Ployhart et al. 2014). In this paper, we identify the different CEO variables studied in the literature, estimate their association with dynamic capabilities, depict an integrative model using the variables identified, test the moderator effect of the sensing, seizing, and reconfiguration, the three types of dynamic capabilities proposed by Teece (2007). Finally, we delineate the future steps in the study of the CEO's role in the development of dynamic capabilities.

In the following sections, we describe the concept of dynamic capability, the role of CEOs in its development according to the model of Bendig et al. (2018), the concept of strategic human resource capital, its articulation with the organizational capabilities framework, and the hypothesis tested in the paper. Also, we describe the method used in the meta-analysis, the results, and the discussion.

2 Theoretical framework

2.1 Organizational capabilities: dynamic capabilities

According to the organizational capabilities framework, firms develop two types of capabilities with dissimilar functions, ordinary and dynamic capabilities (Teece 2014). On the one hand, the ordinary capabilities are “directed toward maintaining and leveraging the status quo in terms of the scale and scope of activities, businesses, product lines, customer segments, and the like” (Schilke et al. 2018, p. 393). These capabilities are related to the technical functions essential to perform daily tasks, such as those concerned with administration, operations, and governance. They transform resources in products or services; however, they cannot create new resources and change organizational processes. Therefore, they are not a source of sustainable competitive advantages (Teece 2014).

In contrast, dynamic capabilities are “capacities of an organization to create, extend or modify its resource base intentionally” (Helfat et al. 2009, p. 1). Dynamic capabilities are directed toward strategic change (Helfat and Winter 2011) because “they can change the firm’s existing resource base, the ecosystem and external environment” (Schilke et al. 2018, p. 393). Since dynamic capabilities create new resources and change organizational process, they are a source of sustainable competitive advantage. Research on dynamic capabilities has been prolific. It has

captured the attention of scholars because it offers a framework to study the competitive advantages, the “Holy Grail” of strategic management (Helfat and Peteraf 2009). Findings have shown an indirect effect on firm performance mediated by ordinary capabilities (Fainshmidt et al 2016) and have identified associated variables, such as the access to resources, the use of knowledge management, building alliances with other firms, and environmental dynamism (Bitencourt et al. 2020).

The concept of dynamic capabilities covers three types of capabilities: sensing, seizing, and reconfiguration (Teece 2007). Sensing refers to the organizational capacity to scan the organizational environment. It refers to being able to accumulate and filter information from the environment “to create a conjecture or a hypothesis about the likely evolution of technologies, customer needs, and marketplace responses” (Teece 2007, p. 1323). Seizing involves the mobilization of resources to address needs and opportunities and to capture value from doing so (Teece 2014, p. 332). It refers to developing and selecting business opportunities that fit with the organization’s environment and its strengths and weaknesses (Teece 2007). The capability of seizing is focused on exploiting opportunities and eludes threats, thereby mobilizing the firm’s resources. Finally, reconfiguration is the “ability to recombine and to reconfigure assets and organizational structures as the enterprise grows, and as markets and technologies change” (Teece 2007, p. 1335). It includes enhancing, combining, protecting, and reconfiguring the business assets. It is characterized by the actual realization of strategic renewal within the organization through the reconfiguration of resources, structures, and processes (Kump et al. 2019). From the management, the three types of dynamic capabilities are related with the main managerial tasks. Sensing is focused on the identification of opportunities, seizing on the design and refinement of business models, and reconfiguration on the realignment of structures and cultures (Teece 2018).

Nonetheless, the process of the creation of dynamic capabilities is unclear. According to Helfat and Martin (2015), they are developed over time; therefore, they are inimitable because firms have different evolution processes. In addition, they are articulated by tacit knowledge over time (Nonaka et al. 2016). Although the relevance to the firms has been extensively exposed, current research explores the creation of these capabilities (Felin et al. 2015; Kurtmollaiev 2017; Salvato and Vasolo 2018). In this paper, we highlight the active role of CEOs as a trigger in the articulation of dynamic capabilities.

2.2 Role of CEOs in the development of dynamic capabilities

The role of CEOs in the development of dynamic capabilities has been guided by microfoundations. According to this perspective, dynamic capabilities arise from the social interaction between organizational agents (Argote and Ren 2012; Martin and Bachrach 2018; Nayak et al. 2020; Ployhart and Hale Jr 2014; Salvato and Vasolo 2018) because all social systems, including organizations, consist of people and exist because of people (Felin et al. 2015). This interaction allows the deployment of two different processes: complementarity and emergence.

Complementarity is defined as “the beneficial interplay of the elements of a system where the presence of one element increases the value of others” (Ennen and Richter 2010, p. 207). On the other hand, emergence is proposed as the explanation for aggregation (Kozlowski and Klein 2020). It is defined as a process that unfolds over time, is shaped simultaneously by contextual and individual factors, and ultimately occurs through interaction and interdependence (Felin et al. 2012; Kozlowski and Chao 2012). While complementarity refers to the interaction of resources within or across organizational levels, emergence only occurs from the individual level to the organizational or aggregated level (Ployhart et al. 2014).

According to the microfoundations approach, CEOs are triggers of the causal mechanism that generates dynamic capabilities. Nonetheless, they cannot create dynamic capabilities by themselves (Bendig et al. 2018). Their role is to foster interaction between resources, both material and human, to encourage the rise of complementarities and the emergence of organizational aggregated phenomena. Bendig et al. (2018) validated this model through the study of a personality variable of CEOs in the development of dynamic capabilities. They showed that CEOs' core self-evaluation is positively related to dynamic capabilities.

In this paper, we propose that the model of Bendig et al. (2018) offers a conceptual approach to study different individual characteristics of the CEOs. Particularly, we have extended the model to the CEO SHCR, nonetheless, it is useful to explore more individual characteristics as managerial cognition (Durán and Aguado 2022a) and the CEO social capital (Durán and Aguado 2022b). Although Bendig et al. (2018) validated their model with a variable of personality, we assert that this model can be extended to other CEO individual characteristics. CEOs have a stock of human capital resources formed by several KSAOs, which influence their managerial actions, called dynamic managerial capabilities in the literature of dynamic capabilities (Adner and Helfat 2003). To avoid the unnecessary proliferation of conceptual labels we have decided to keep the name dynamic managerial capabilities to refer the actions and decisions of the CEOs.

Nonetheless, the stock of human capital resources is inoperative by itself to develop dynamic capabilities. This stock allow to increase the possible dynamic managerial capabilities performed by the CEOs. According to the Bendig et al. (2018), it is through of dynamic managerial capabilities that CEOs mobilize firm resources, changing the conditions where employees work. Thus, CEOs create settings for interaction among employees, improving or decreasing the rise of complementarities and the emergence of complex organizational variables. According to the model proposed, dynamic managerial capabilities mediate the association between the stock of human capital resources and dynamic capabilities. Figure 1 illustrates the adaptation and extension proposed of the model of Bendig et al. (2018).

2.3 Strategic human capital resources

In this paper we use the human capital resource model proposed by Ployhart et al. (2014) in contrast to human capital theory (Becker 1964). The human capital resource model solves theoretical issues of the human capital theory by eliminating

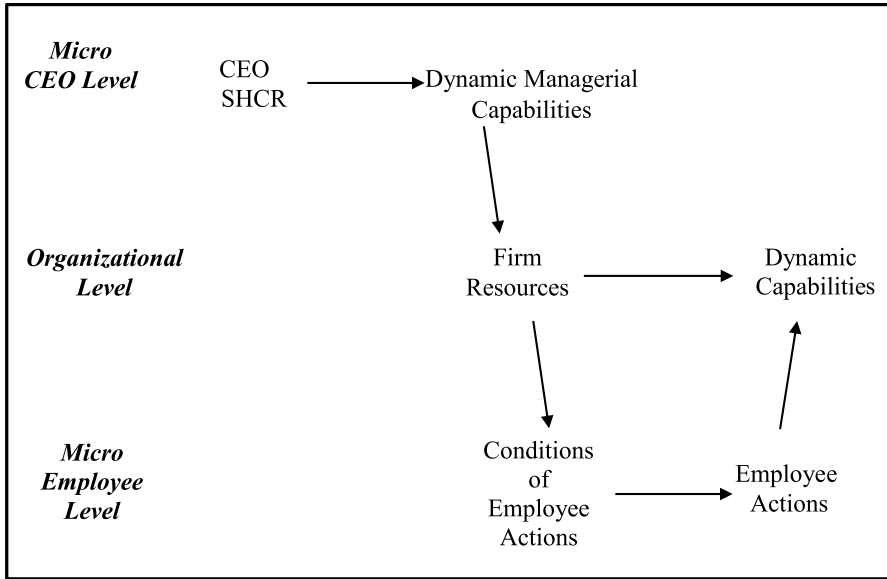


Fig. 1 Model of Bendig et al (2018). *Note.* Adapted from “On micro-foundations of dynamic capabilities: a multi-level perspective based on CEO personality and knowledge-based capital,” by D. Bendig, S. Strese, T. Flatten, M. da Costa, and M. Brettel, 2018, *Long Range Planning*, 51(6), p. 799. (<https://doi.org/10.1016/j.lrp.2017.08.002>). Copyright 2018 by the American Psychological Association

the unnecessary classification between general and specific human capital, clarifies different concepts used in the literature offering an integrative model, and encourages multidisciplinary research.

Human capital theory claims two types of human capital: general and specific. General refers to knowledge and skills broadly applicable outside the focal firm, such as experience in the industry or level of education, whereas specific refers to the skills and knowledge derived from the position in the firm (Becker 1964). Human capital theory predicts that only specific human capital is a source of sustainable competitive advantages because it is ineffective to the firm’s competency; consequently, specific human capital is valuable, rare, inimitable, and hard to transfer between firms (Barney 2001).

Nonetheless, it has been subject to criticism because both general and specific human capital could be sources of competitive advantages (Campbell et al. 2012). General human capital in the form of experience in the industry (Wang et al. 2016) or education (Eggers and Kaplan 2013) is positively related to competitive advantages. Moreover, specific human capital by itself is not a source of sustainable competitive advantages. It is relevant in daily tasks, but that is not a guarantee of its value in the development of competitive advantage. Lazear (2009) depicted that the knowledge and skills to find the bathrooms in a firm are specific human capital valuable, rare, inimitable, and hard to transfer between firms, but they are ineffective in building competitive advantages.

To address these criticisms, new models have been proposed. From microfoundations, the human capital resources model was proposed (Ployhart et al. 2014), a multidisciplinary approach which builds bridges between several academic areas. Traditionally, human capital has attracted researchers with different “conceptual glasses”, and a plurality of meanings has been present (Ployhart and Moliterno 2011). Thus, the first step in the building of bridges requires shared meanings of human capital's terms. As Nyberg and Wright (2015) highlight, the absence of common language among researchers obstructs the identification of overlapping interests, an issue evident in human capital research. The model proposed by Ployhart et al. (2014) clarifies concepts starting from the widest term in the area, the individual differences, to the most specific term, the strategic human capital resources. Each term described is a subtype of the above.

Individual differences are heterogeneous capacities across individuals (Chernyshenko et al. 2011). After this, the model places the KSAOs defined as a sub-type of the individual differences stable over time. According to Noe et al. (2017) *knowledge* is the declarative or procedural information necessary for performing a task; *skills* are the individual's level of proficiency and capabilities to perform specific tasks, which can be improved with experience; *ability* is a more enduring capability that is applicable to a range of job-related tasks; and lastly, other characteristics are personality traits and dispositional attributes that affect performance. In comparison to other individual differences, such as attitudes, satisfaction, motivation, or emotion, KSAOs are relatively stable across time, and they are not situationally induced (Murphy 2012).

Nonetheless, KSAOs are not human capital by themselves; they must be articulated in bundles addressed towards an aim to be named as human capital (Ployhart et al. 2014). Individuals have many bundles of KSAOs that enable them to accomplish different tasks (Campbell et al. 2012), but management researchers are interested just in the bundles addressed to obtain economic outcomes.

When the bundles of KSAOs are used to solve a task at the unit level, they are named as human capital resources. In this model, unit level refers to collective levels of employees, e.g., groups, departments, and organizations. Ployhart et al. (2014) distinguished between human capital and human capital resources, stating that human capital resources are a subtype of human capital accessible for unit-relevant purposes. Thus, the conceptual boundary between human capital and human capital resources is established by the use that the firm gives to the bundles of KSAOs. Human capital refers to bundles of KSAOs no matter if they are used or not, and human capital resources refers to a type of human capital used by the firm to achieve an aim.

Human capital resources pursue two different unit-level aims: those relevant for the performance parity of the firm and those relevant for competitive advantage. Unit-level performance parity aims for similar firm outcomes as other firms in the market. The aim is to make the process as good as the competency, using the best practices in the market (Crook et al. 2011; Ployhart et al. 2014). On the other hand, unit-level aims relevant for competitive advantages, named as Strategic human capital resources (SHCR), are addressed to obtain strategic positions in the market. When CEOs incentivize dynamic capabilities, they are using their SHCR to

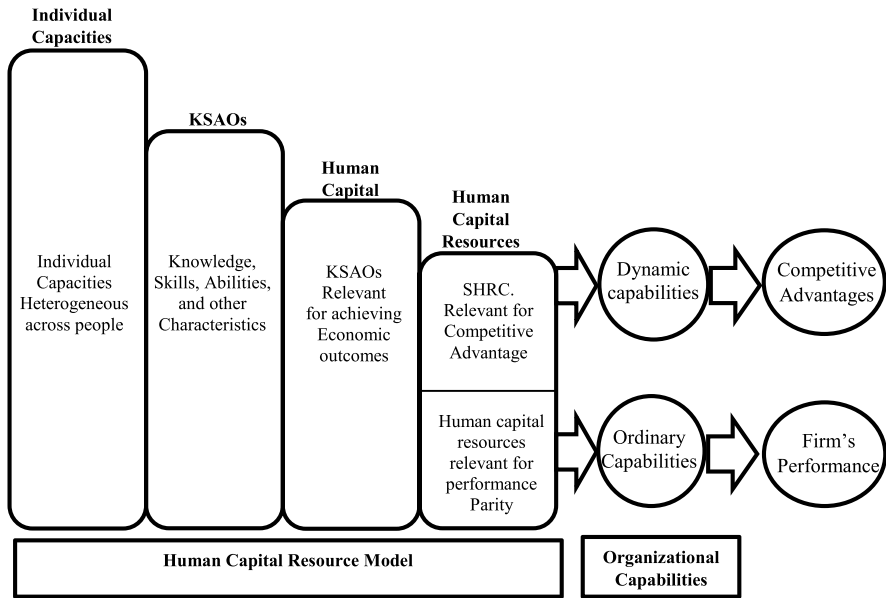


Fig. 2 Integrating Human capital Resource Model and Organizational Capabilities Framework. *Note.* This figure summary the integrative conceptual propose of the human capital resource model and organizational capabilities framework

pursue competitive advantages in the market. In contrast, when CEOs pursue performance parity, they are using human capital resources. Hence, according to Ployhart et al. (2014), KSAOs of CEOs can be directed to performance parity or competitive advantages.

To understand the role of CEOs in the development of dynamic capabilities, we propose a match between the organizational capabilities framework (Helfat et al. 2009; Teece 2007) and human capital resources model (Ployhart et al. 2014). We argue for a complementary between them. The classification of two types of unit-level aims offered by the human capital resources model, performance parity and competitive advantages, overlaps with the two types of capabilities proposed by the organizational capabilities framework, ordinary and dynamic. Human capital resources addressed to maintaining the status quo of the processes are related to the ordinary capabilities of the firm, whereas SHCR are related to the dynamic capabilities. In this paper, we use the concept of SHCR to highlight the KSAOs deployed by CEOs to incentivize dynamic capabilities. We focus on the relationship between CEOs' SHCR and dynamic capabilities; therefore, the relationship between human capital resources and ordinary capabilities falls outside of the scope of this paper. Figure 2 shows the model proposed by Ployhart et al. (2014) and the relationship with organizational capabilities.

3 Research model

According to Bendig et al. (2018), CEOs foster conditions to increase dynamic capabilities in a firm. The role of CEOs in the development of dynamic capabilities is to foster conditions for the development of those capabilities. In this task, CEOs use their SHCR available; thus, CEOs with higher SHCR will be more able to create conditions to improve the dynamic capabilities. Nonetheless, even though we propose a positive association between a CEO's SHCR and dynamic capabilities, an overall approach hinders the heterogeneity reported in the literature and the mediation of dynamic managerial capabilities. Therefore, we have organized the CEOs' SHCR variables into six different types to study their differences: CEO education, CEO tenure, CEO experience, CEO personality, and CEO leadership style. We have proposed these types of SHCRs because they are representative and extensive in the literature.

Education has been an extended variable in the human capital literature. In the classical research on human capital, CEO education is a proxy for knowledge, skills, and abilities (Hambrick and Mason 1984). Nonetheless, it is also a path to develop knowledge, skills, and abilities in CEOs (Patzelt 2010). According to Minh et al. (2021), CEOs with higher level of education are more likely to absorb new knowledge and invest in new opportunities. Education allows them to develop more complex management process (Liu et al. 2018). Findings on CEO education show a positive and significant relation with several dynamic capabilities, e.g., market disruptiveness capability, new process development capability, new product development capability (McKelvie and Davidsson 2009), and strategic renewal (Bui et al. 2020). CEO education allows increasing KSAOs enabling complex dynamic managerial capabilities to be deployed. Education expands the CEOs' stock of human capital resources to build new and more specialized KSAOs. Thus, we propose that CEOs with higher levels of education foster the complementarity of resources and the emergence of process. Thus, we propose this hypothesis:

H1: CEO education will have a positive and significant relationship with dynamic capabilities.

Also, CEO tenure is a path to increase CEOs' KSAOs. As tenure represents the CEOs' time in the chair, we expect that CEOs with long tenure have a higher accumulation of firm-specific experiences and knowledge. However, the literature shows contradictory results regarding tenure. Oh et al. (2018) have described the two contradictory research lines. On the one hand, a long tenure could offer CEOs specialized knowledge of the firm that allows for deploying complex dynamic managerial capabilities, but, on the other hand, a long tenure leads to a lack of cognitive flexibility and resistance to making necessary strategic changes. There are findings to support both of the lines. For instance, Nadkarni and Herrmann (2010) and Carpenter et al. (2001) found a negative relation between CEO tenure and R&D intensity capability, but von den Driesch et al. (2015) found a positive

relation with flexibility in the production process. Similarly, Pi et al. (2013) asserted that CEO tenure has a positive relation with cross-regional integration capacity, but Ren et al. (2020) reported an absence of association with strategic flexibility.

Therefore, the research has shown conflicting results regarding tenure. Nonetheless, we propose, according to the conceptual model depicted, that CEO tenure is a path to increase the KSAOs and then the stock of SHCR. Thus, we expect a positive relationship between CEO tenure and dynamic capabilities:

H2: CEO tenure will have a positive and significant relationship with dynamic capabilities.

Similarly, the findings regarding CEO experience are contradictory. CEO experience refers to professional background in different career roles (Liu et al. 2018). It is more extensive than the tenure category. In this case, the literature shows heterogeneity in the results. For instance, McKelvie and Davidsson (2009) showed that CEOs' industry experience is unrelated with the development of dynamic capabilities, such as market disruptiveness capability. Also, Gerstner et al. (2013) reported a nonsignificant relation between CEO experience and the number of strategic biotech initiatives. In contrast, Plambeck (2012) evidenced that prior entrepreneurial experience and previous managerial experiences are positively related with the capability to develop new processes and an absorptive capacity.

Although there are contradictory results in the literature, we propose that CEO experience increases CEOs' KSAOs and then the stock of SHCR. Therefore, we can expect a positive relationship with dynamic capabilities. We thus propose the following hypothesis:

H3: CEO experience will have a positive and significant relationship with dynamic capabilities.

In the case of CEO personality, there is a set of individual traits studied. Personality is a relatively permanent, ingrained disposition (Finkelstein et al. 2009). It affects CEOs' processing of information about the environment. Regarding personality characteristics, there are significant relations between the Big Five traits and dynamic capabilities. Nadkarni and Herrmann (2010) showed that conscientiousness has a negative relation to a firm's strategic flexibility, and emotional stability, agreeableness, extraversion, and openness to experience have positive relationships. Although conscientiousness is used extensively as a positive performance predictor (Meyer et al. 2009), it has a negative association with dynamic capabilities. CEOs with higher conscientiousness avoid actions deviating from the business plan, try to retain control, thus decreasing the autonomy of the employees, and avoid new interpretations of information, which reduces the ability to adapt to changes (Nadkarni and Herrmann 2010). Additionally, other traits related to the entrepreneurial personality (Feher and Vernon 2021; Leutner et al. 2014) have been explored, such as risk-taking (Varma et al. 2020), need

for achievement and control locus (Qiu 2008), and core self-evaluation (Bendig et al. 2018; Fernandez-Perez et al. 2016; Pi et al. 2013). Findings have shown that CEOs with risk propensity, achievement-oriented, with an internal locus of control, and high core self-evaluation are willingness to explore the market and invest resources in new opportunities.

Although there are many personality traits explored in the literature, we can expect that overall they are associated with the dynamic capabilities. They are dispositional variables that modify the assessment of CEOs, making them more likely to perform of opportunities in the market. Thus, we propose the following hypothesis:

H4: CEO personality will be significantly associated with dynamic capabilities.

Finally, CEO leadership style is a variable evidently related to the higher position of CEOs in the organizational structures. They are responsible for fostering complementarity between resources and emergent social process that require leadership. To integrate the CEO leadership style in this meta-analysis we have used the Full-Range Leadership Model (Bass and Avolio 1994). This model proposes that the leadership styles can be organized from the most passive-ineffective to the most active-effective styles. In the passive-ineffective is the *laissez-faire* leadership, while in active-effective is the transformational leadership. According to this model, transactional leadership is in the medium between *laissez-faire* and transformational leadership.

In *laissez-faire* leadership there is absence of active leadership behavior Jensen et al. (2019). In contrast, transformational and transactional are different levels of active leadership behaviors. From the description of the transformational and transactional leadership exposed by Burns (1978), researchers have explored those leadership styles as opposite, nonetheless, from the Full-Range Leadership Model they are part of the same continuum.

Transformational leadership is based on motivating followers using ideas and high moral values (Ng and Sears 2012). CEOs with transformational leadership style influence on others elevating goals and providing followers with the confidence to perform beyond the expectations specified. In contrast, transactional leadership is based in a bureaucratic authority legitimated by the firm structure. In this leadership style, CEOs maintain control by providing rewards, emphasizing task assignments, work standards, and employee compliance (Kang et al. 2015).

Both leadership styles have shown associations with dynamic capabilities (Ng and Sears 2012; Prasad and Junni 2016). Prasad and Junni (2016) found a positive relationship between transformational and transactional leadership and organizational innovation. Similarly, Ng and Sears (2012) revealed that they are associated with a diversity of organizational practices. Therefore, although transformational leadership fosters the achievement of goals beyond expectations by engaging followers in complex tasks, and it is more suitable for stimulating new ideas, transactional leadership plays a role in the development of dynamic capabilities too. As Kesting et al. (2015) revealed, different leadership styles have relevance at dissimilar stages of firm innovation.

Based on the Full-Range Leadership Model and the evidence in the literature we propose the following hypotheses:

H5: CEOs leadership styles more active and efficient will have higher associations with dynamic capabilities than passive and inefficient styles.

Nonetheless, following the extended model of Bendig et al. (2018) proposed in this paper, SHCR influences the dynamic managerial capabilities of CEOs. Hence dynamic managerial capabilities mediate the association between SHCR and dynamic capabilities. In other terms, the pool of KSAOs called SHCR requires that CEOs perform their managerial activities to initiate the mechanism underlying dynamic capabilities. The KSAOs described before are ineffective by itself without the dynamic managerial capabilities to exploit them. From this approach, it follows that dynamic managerial capabilities are not SHCR; they are a different variable formed by the managerial actions and decisions where CEOs apply their KSAOs. Thus, we propose the following hypothesis:

H6: Dynamic managerial capabilities mediate the association between SHCR and dynamic capabilities significantly. To sum up, Fig. 3 depicted the relationship among SHRC, dynamic managerial capabilities and dynamic capabilities.

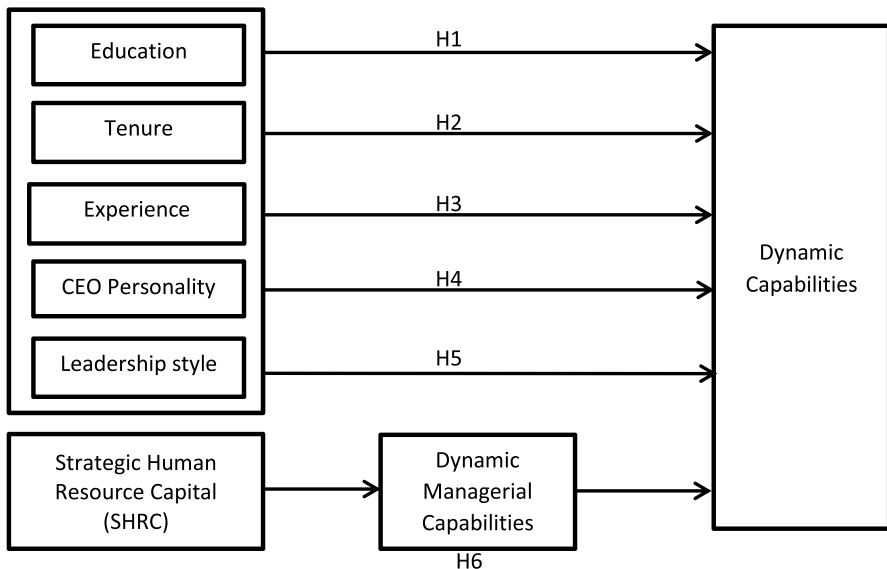


Fig. 3 Research model. *Note.* This model describes the hypotheses proposed in this paper

3.1 Moderation hypothesis

We argue that heterogeneity in the results can be explained by the type of dynamic capability. Contradictory results in the literature overlooked that there are three types of dynamic capabilities with dissimilar functions. Although the task of CEOs is to create conditions that allow the complementarities and the emergence of aggregated processes, sensing, seizing, and reconfiguration will require different SHCR to be successful. The estimation of an overall association between CEOs' SHCR, dynamic managerial capabilities, and dynamic capabilities without a differential analysis could hinder the different role of the human capital variables in each dynamic capability. We thus propose the final hypothesis:

H7: The relationship between SHCR, dynamic managerial capabilities, and dynamic capabilities will be different according to each type of dynamic capabilities, sensing, seizing, and reconfiguration.

4 Methods

4.1 Literature search

To identify studies, we used Web of Science, Scopus, ProQuest Central, and Business Source Complete (EBSCO). In this search, we obtained 503 papers after eliminating duplicates. In all the databases, we used the same keywords, filtering by title, abstract, and keywords. Additionally, we filtered by research areas focused on business and management. The search was done on December 31, 2021. In the search, we use the keywords CEO education, CEO tenure, CEO labor experience, CEO managerial skills, CEO dynamic managerial capabilities, CEO personality, and CEO leadership. Those keywords were joined with the OR conditional. We include all empirical publications, such as papers, dissertations, conferences, and working papers.

The authors read the title, abstract, and methodological section to select quantitative papers with CEO variables. In the first selection, papers were retained when they reported correlations between any of the CEO variables studied or correlations between CEO variables with dynamic capabilities. In addition, measures of top management teams or team boards were discarded. At the end of this filtering, we maintained 93 papers that reported 446 correlations. Papers that were selected are marked with an asterisk in the reference section and Fig. 4 depicted the process.

With these papers selected, we invited three experts with PhDs in strategic management and academic publications in the area to identify all the dynamic capabilities reported in them. They did not read the papers, but they received a document with the reported organizational capabilities and the definition used in the paper by the authors. Experts evaluated whether the capabilities were dynamic ones. To assess this, experts received the definition of dynamic capabilities proposed by Helfat et al. (2009) in which these capabilities are defined as “capacities to create, extend or modify its resource base intentionally” (Helfat et al. 2009, p. 1). Additionally, three

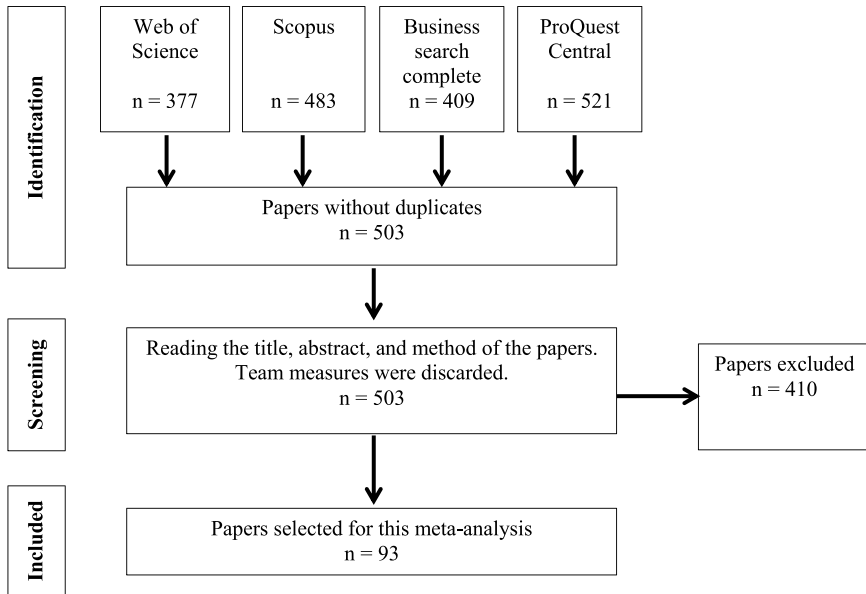


Fig. 4 Flowchart selecting papers. *Note.* This model describes the selection process of papers. The flowchart PRISMA template was used

different experts classified the capabilities identified in sensing, seizing, and reconfiguration as proposed by Teece (2007). In both groups of experts, we studied the agreement among them using Fleiss' kappa index. In the first group, Fleiss' kappa index was 0.83, and the second one was 0.89. According to Gwet (2014), a score higher than 0.80 is evidence of agreement among experts.

Experts recommended include ambidexterity and absorptive capacity in the three types of dynamic capabilities. They highlighted the conceptual debate about the overlapping of the concepts such as dynamic capabilities, ambidexterity (O'Reilly and Tushman 2008; Popadiuk et al. 2018) and absorptive capacity (Senivongse et al. 2019). Ambidexterity refers to the ability of an organization to both explore and exploit (O'Reilly and Tushman 2013) where explore match with sensing and exploit with seizing and reconfiguration. Similarly, absorptive capacity consists of the capabilities to recognize the value of new knowledge, to assimilate it, and to apply it to commercial ends. (Cohen and Levinthal 1990). Again, it involve the identification of opportunities in the environment (sensing), the assimilation of the knowledge (reconfiguration), and the application of it (seizing).

Using the papers selected, the authors built a database composed of two blocks: bibliographic information and quantitative variables. The first block included the title, journal, name of the authors, and year of publication. In the second block, we collected the sample size, correlation, and reliability of the measures expressed by Cronbach's alpha. In Table 1 we describe the variables and the measures reported in each one. Additionally, in this table we show the

dynamic capabilities classified according to sensing, seizing, and reconfiguration. In the case of ambidexterity, absorptive capability, and the overall measure of dynamic capability reported by Acheampong et al. (2017), we included them in all of the dynamic capabilities types. It was decided because these capabilities are wide categories related with the three types of dynamic capabilities.

4.2 Meta-Analytic procedures

Correlations were corrected by the Hunter and Schmidt (2004) procedure, which employs the reliability to correct the bias related to the measurement error. In those measures where we can assume perfect reliability, such as age, tenure, or years of experience, this procedure was not applied.

To test the hypothesis, we performed a meta-analytic structural equation modeling (MASEM) analysis (Jak and Cheung 2018; Wilson et al. 2016). MASEM allows estimate a structural equation model with a correlation matrix built with meta-analytical technics. It comprises two stages: the estimation of a pooled correlation matrix and the application of a structural equation model using the estimated matrix.

Since the paper selected did not offer information for all the variables studied, we estimated the pooled correlation matrix with the process described by Wilson et al. (2016). It uses a meta-regression to estimate a pooled correlation matrix via a three-level random-effects model. According to the independence principle, the meta-analyzed effects must be independent of each other, something lacking in the effects reported by the same paper. In the three-level random-effects model, it is solved by distinguishing three sources of variance: sampling variance, inter-study, and intra-study variance (Cheung 2014; Van den Noortgate et al. 2013). At the first level, this procedure calculates the sampling variance. At the second level, it calculates the inter-study variance, and on the third level, it calculates the intra-study variance (Assink and Wibbelink 2016). Thus, this model allows taking account of dependent effect sizes from the same paper (Cheung 2014; Fernández-Castilla et al. 2020).

Once the pooled correlation matrix was estimated, we used the weighted least squares (WLS) to perform a set of structural equation models. Also, we used the inverse asymptotic covariance matrix as the weight matrix (Wilson et al. 2016). To compare the model proposed among sensing, seizing, and reconfiguration, we split the sample in those three groups and run all the analyses in each one, estimating the pooled correlation matrix and the model proposed. Analyses were performed in R using metaphor (Viechtbauer 2010) and metaSEM (Cheung 2015).

5 Results

The papers allowed obtaining data regarding 52,767 CEOs around the world. Using this large complex database, we estimated the pooled correlation matrix depicted in Table 2.

Table 1 Definition and codification CEO's SHRC and dynamic capabilities

Variables analysed	Description	Measurements reported
Variable		Higher educational degree
Education	It is also a path to develop knowledge, skills, and abilities in the CEOs (Patzelt, 2010)	Years in the position of CEO
Tenure	Time of the CEOs in the chair (Carpenter et al. 2001)	International experience—Marketing or R&D experience—Functional experience (financial, production, administration or legal)—experience in the industry—experience in the development of new business—Managerial experience—Innovation experience
Experience	CEO experience refers to professional background in different career roles (Liu, et al. 2018)	Conscientiousness (Reverse)—Emotional Stability—Agreeableness—Extraversion—Openness to Experience—Core Self Evaluation—Risk Taking—Need for Achievement—Locus of Control—Innovation—Narcissism—Positive affect—Negative affect (Reverse)
CEO personality	Personality is a relatively permanent, ingrained disposition (Finkelstein et al. 2009)	Transformational and transactional leadership style
Leadership style	Style used by the CEOs. It can be transactional or transformational (Kang et al. 2015)	CEO cognitive complexity (ability to understand issues from multiple perspectives)—CEO cognitive flexibility (tendency to adapt their thinking, emotions, and behaviors to changing conditions)—CEO human capital (General and specific Human capital)—Managerial skills (Skills including acquisition of financing, personnel management, product innovation, ongoing business operation, strategic management, marketing and selling)—Customer knowledge—Explicit knowledge environment—Tacit knowledge environment—Management capabilities
Managerial capabilities	The capabilities with which managers build, integrate, and reconfigure organizational resources and competences (Adner and Helfat 2003)	

Table 1 (continued)

Variables analysed	Description	Measurements reported
Dynamic capabilities—sensing	organizational capacity to scan the organizational environment (Tece 2007)	Marketing capabilities—R&D capabilities—Idea generation capability—Sensing—Explorative capability—Scanning customers—Scanning competitors—Scanning suppliers—Scanning of resources—Scanning of technology—Socio-economical scanning—Ambidexterity (ALL)—absorptive capacity (ALL)
Dynamic capabilities—Seizing	involves the mobilization of resources to address needs and opportunities and to capture value from doing so (Tece 2014)	Production capabilities—Idea generation capability—Market disruptiveness capability—New product development capability—New process development capability—Seizing—Proactiveness—Exploitative capability—Technology innovation—Innovation of products—Technological capacity—Responsive capability—Innovative capability—Market pioneering—Market responsiveness—Ambidexterity (ALL)—absorptive capacity (ALL)
Dynamic capabilities—Reconfiguration	Ability to recombine and to reconfigure assets and organizational structures (Tece 2007)	Strategic flexibility—Diversification—Organizational capacity to adapt—Strategic renewal—Start-up absorptive capacity—Reconfiguration—International diversification—Decisions of strategic change—Diversification—Cross regional integration—Ambidexterity (ALL)—absorptive capacity (ALL)

Table 2 Correlations of the CEO's Strategic Human Capital Resources and Dynamic Capabilities

	Education	Tenure	Experience	CEO personality	Leadership styles	Managerial capabilities
Tenure	$\rho = -0.012$ [-0.11; 0.085] K = 11; J = 11					
Experience	$\rho = 0.059$ [-0.036; 0.156] K = 8; J = 14	$\rho = 0.006$ [-0.083; 0.097] K = 8; J = 16				
CEO personality	$\rho = 0.090$ [0.003; 0.176]* K = 7; J = 18	$\rho = 0.097$ [0.028; 0.165]** K = 14; J = 35	$\rho = -0.081$ [-0.221; 0.058] K = 2; J = 7			
Leadership styles	$\rho = 0.039$ [-0.072; 0.15] K = 4; J = 14	$\rho = -0.095$ [-0.195; 0.004] K = 7; J = 17	$\rho = 0.084$ [-0.07; 0.238] K = 2; J = 8	$\rho = 0.106$ [0.001; 0.212]* K = 4; J = 28		
Managerial capabilities	$\rho = 0.185$ [-0.007; 0.378] K = 2; J = 3	$\rho = 0.041$ [-0.092; 0.175] K = 4; J = 7	$\rho = -0.013$ [-0.179; 0.152] K = 3; J = 4	$\rho = 0.159$ [-0.007; 0.326] K = 2; J = 5	$\rho = 0.182$ [0.002; 0.361]* K = 1; J = 5	
Dynamic capabilities	$\rho = 0.096$ [0.01; 0.182]* K = 19; J = 34	$\rho = 0.006$ [-0.062; 0.074] K = 36; J = 53	$\rho = 0.077$ [-0.006; 0.16] K = 17; J = 51	$\rho = 0.201$ [0.127; 0.274]** K = 17; J = 82	$\rho = 0.204$ [0.076; 0.332]** K = 7; J = 13	$\rho = 0.219$ [0.092; 0.346]** K = 11; J = 21

ρ = correlation estimated; in square brackets is the 95% confidence interval. K = number of studies; J = number of correlations

* $p < .05$; ** $p < .01$; *** $p < .001$

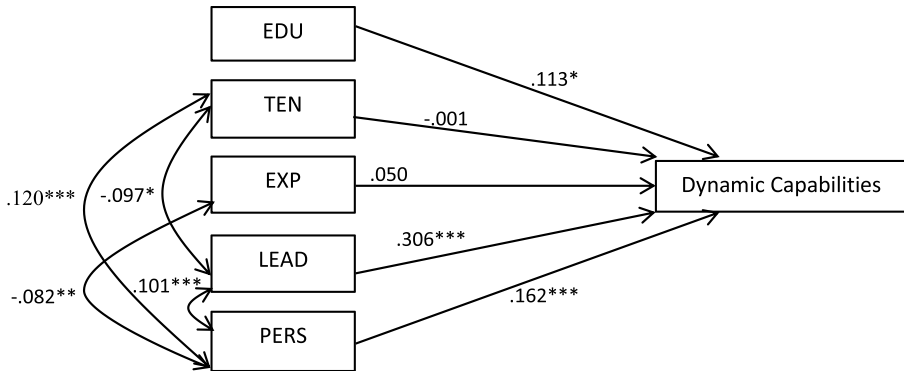


Fig. 5 Direct effects of SHRC on dynamic capabilities. *Note.* Model was tested with all the covariances among SHRC variables. Undrawn covariances are not significant. * $p < .05$; ** $p < .01$; *** $p < .001$

Correlations reveal that CEO personality is the variable with more significant associations among the SHCR variables. It is correlated with education ($\rho = 0.09$), tenure ($\rho = .097$), leadership styles ($\rho = 0.106$), and dynamic capabilities ($\rho = 0.201$). Focusing the analysis on dynamic capabilities, we observed that education ($\rho = 0.096$), CEO personality ($\rho = 0.201$), leadership ($\rho = 0.204$), and dynamic managerial capabilities ($\rho = .219$) had a positive and significant association with them. Nonetheless, this correlational analysis was insufficient to test the set of the hypotheses proposed. In Fig. 5, we observe the structural equation model with all the SHCR variables.

The analysis evidences that CEO education ($\beta = 0.113$), leadership styles ($\beta = 0.306$), and CEO personality ($\beta = 0.162$) had a direct effect on dynamic capabilities. Those variables were positive and significantly related to dynamic capabilities. According to this test, we found evidence to support H1. Nonetheless, we had no evidence of influence by tenure ($\beta = -0.001$) and experience ($\beta = 0.050$); thus, we rejected H2 and H3. In addition, we found a negative association between leadership styles and tenure ($r = -0.097$) and CEO personality and experiences ($r = -0.082$). In contrast, tenure and CEO personality had a positive relation ($r = 0.120$), like leadership styles and CEO personality ($r = 0.101$).

To complete the interpretation of the H5 we compared the leadership styles proposed by the Full Range Leadership Model. Unfortunately, we had no associations between Laissez-Faire leadership and dynamic capabilities. In the Table 3, we represent the comparison between transactional and transformational leaderships, we found a positive and significant association in transformational ($\rho = .337$) but, there was no a significant association in transactional leadership ($\rho = .208$). According to these findings we found support to H5. Also, Table 3 shows the correlation of each personality trait reported in the literature.

When we tested the mediation role of dynamic managerial capabilities, we found partial support for H6. Findings showed a total mediation for education and partial mediation for CEO personality and leadership styles. Education had an indirect influence on dynamic capabilities through dynamic managerial capabilities [Effect = 0.027,

95% C.I. (0.011, 0.052)], and the direct influence reported before disappeared. On the other hand, CEO personality had an indirect effect on dynamic capabilities [Effect=0.019, 95% C.I. (0.002, 0.041)], but it maintained a significant direct effect ($\beta=0.277$). Similarly, the leadership styles had an indirect effect through dynamic managerial capabilities [Effect=0.028, 95% C.I. (0.014, 0.049)], and it maintained a significant direct effect. In the case of tenure and experience, they had no influence on dynamic capabilities, as shown in Fig. 5 and confirmed in Fig. 6. To test the mediation among variables is mandatory that an independent variable has a significant influence on dependent variable (Hayes 2017); therefore, the mediation analysis of tenure and experience confirmed this requirement, showing that they had not influence thought dynamic managerial capabilities. Figure 6 depicts the mediation analysis.

5.1 Moderation analysis

Comparison of the types of dynamic capabilities showed that the mediation of dynamic managerial capabilities disappeared in sensing, but it was maintained in seizing and reconfiguration. In sensing, dynamic managerial capabilities did not have a significant effect on dynamic capabilities, neglecting the possibility of any mediation effect. Nonetheless, leadership style had an influence on dynamic managerial capabilities ($\beta=0.160$). However, CEO personality and CEO leadership had a direct effect on dynamic capabilities ($\beta=0.175$ and $\beta=0.532$, respectively). Figure 7 represents the model for sensing.

Table 3 Estimated correlations for CEO personality and leadership variables

CEO's SHCR variables	# Studies	# Effects	ρ [95%]	Inter-studies variance	Intra-studies variance
CEO personality	6	44	.190 [.096; .281]***	.034***	.008
Agreeableness	5	8	.213 [.065; .352]*	.012	.008
Conscientiousness	6	9	.046 [-.185; .096]	0	.017
Extraversion	6	9	.232 [.004; .436]	0	.055
Openness to experience	6	9	.336 [.169; .485]**	.017*	.020
Emotional stability	6	9	.225 [.084; .357]**	.025**	.0023
Core self evaluation	3	7	.176 [.052; .253]*	0	.006
Locus of control	2	8	.271 [.220; .321]***	0	<.0001
Need for achievement	1	6	.446 [.314; .562]***	.020***	0
Risk taking	2	5	.226 [.079; .363]*	0	.003
Innovation	1	6	.229 [.151; .305]***	.003	0
Narcissism	1	2	.356 [.029; .614]*	0	0
<i>Leadership</i>	7	13	.348 [.148; .520]**	.031	.064**
Transactional	3	3	.208 [-.520; .761]	.048	.048
Transformational	5	8	.337 [.077; .554]*	.002	.063**

* $p < .05$; ** $p < .01$; *** $p < .001$

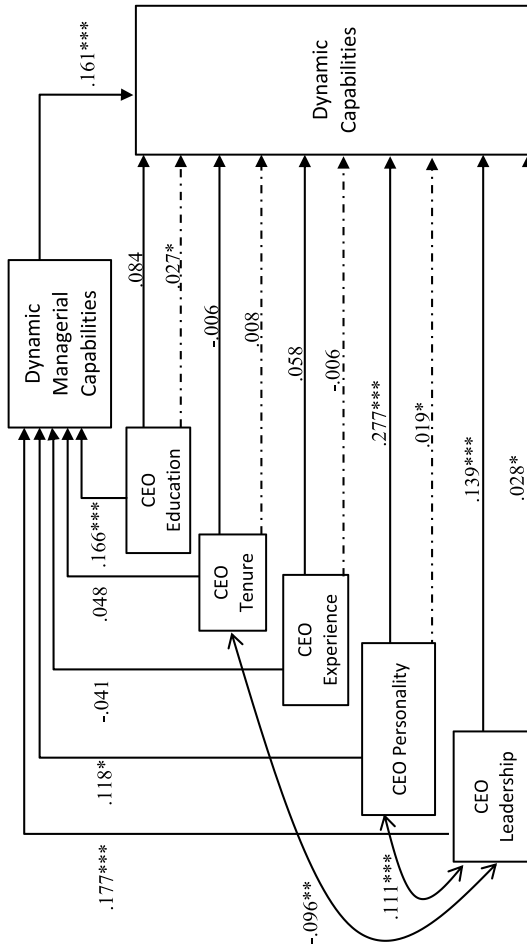


Fig. 6 Mediation analysis of the managerial capabilities. *Note.* Model was tested with all the covariances among SHRC variables. Undrawn covariances are not significant. Dot line shows indirect effects and continuous line represents direct effect. * $p < .05$; ** $p < .01$; *** $p < .001$

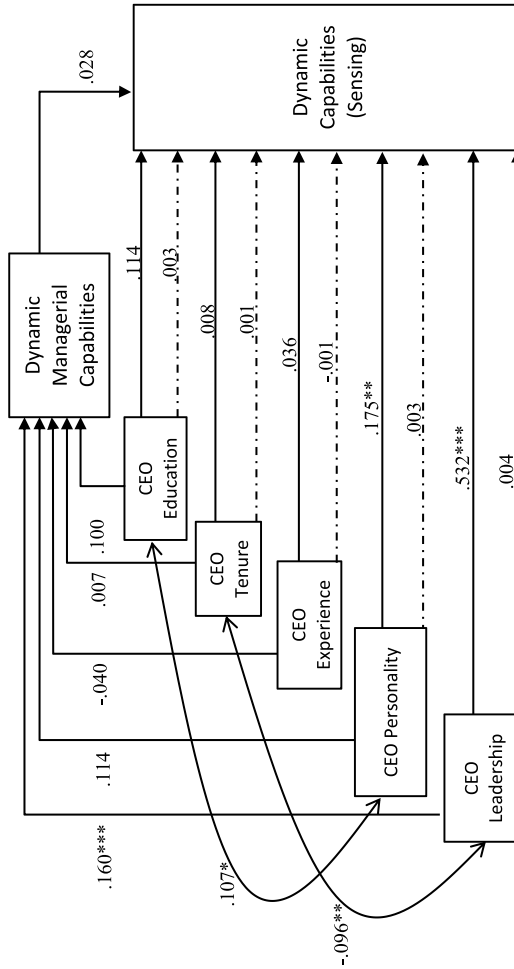


Fig. 7 Managerial sensing. Note: * $p < .05$; ** $p < .01$; *** $p < .001$

In the case of seizing, we found evidence of total mediation for education and partial mediation for leadership styles. The direct effect of education on dynamic capabilities disappeared but it had an indirect effect through dynamic managerial capabilities [Effect=0.018, 95% C.I. (0.002, 0.044)]. In the case of leadership styles, it had a direct ($\beta=0.511$) and indirect influence [Effect=0.029, 95% C.I. (0.009, 0.054)] on dynamic capabilities. Figure 8 depicts the model for seizing.

Lastly, in a reconfiguration we found total mediation for education, partial mediation for leadership styles and a lack of mediation for CEO personality. First, education had an indirect effect through dynamic managerial capabilities [Effect=0.027, 95% C.I. (0.003, 0.065)] and an absence of direct effect. Second, leadership styles had a direct ($\beta=0.149$) and indirect influence [Effect=0.018, 95% C.I. (0.002, 0.060)] on dynamic capabilities. And third, CEO personality had a direct effect ($\beta=0.162$), but it did not have an indirect influence. Figure 9 depicts the findings.

6 Discussion

The active role of CEOs' SHCR in the development of dynamic capabilities is supported in this paper. Findings support the association of education, CEO personality, and leadership styles with dynamic capabilities. Also, we have shown evidence of the mediation of dynamic managerial capabilities in two types of dynamic capabilities: seizing and reconfiguration. Dynamic managerial capabilities completely mediate the influence of education and partially mediate the influence of CEO personality and leadership styles (Fig. 9).

According to the model proposed in this paper, education, tenure, and experience are paths for increasing the KSAOs of CEOs (Patzelt 2010), and consequently, we expected their positive association with dynamic capabilities. Nonetheless, tenure and experience have shown conflicting results in the literature (Oh et al. 2018). Based on the findings, we have evidenced the association of education, and we have disproven the association of tenure and experience, solving the conflicting results reported.

From the model proposed, the findings illustrate that education, tenure, and experience develop different types of KSAOs. On the one hand, through tenure and experience, CEOs obtain knowledge, skills, and standardized abilities that have been useful to face challenges in the past. However, these increases do not encourage the generation of new processes in the firm because they are related to maintaining the status quo in activities (Schilke et al. 2018). Therefore, CEO tenure and experience could be related to the development of ordinal capabilities. Conversely, education enables obtaining KSAOs to propose creative approaches to firm processes. It is relevant to take into account that in the core of the definition of dynamic capabilities is the creation and modification of organizational resources (Helfat et al. 2009), which implies great effort on the CEOs' part to "think outside of the box".

Also, findings show the relevance of CEO personality. The analysis of this variable can be traced along two different paths: studying each personality trait to understand its influence or using models reported in the literature to integrate the

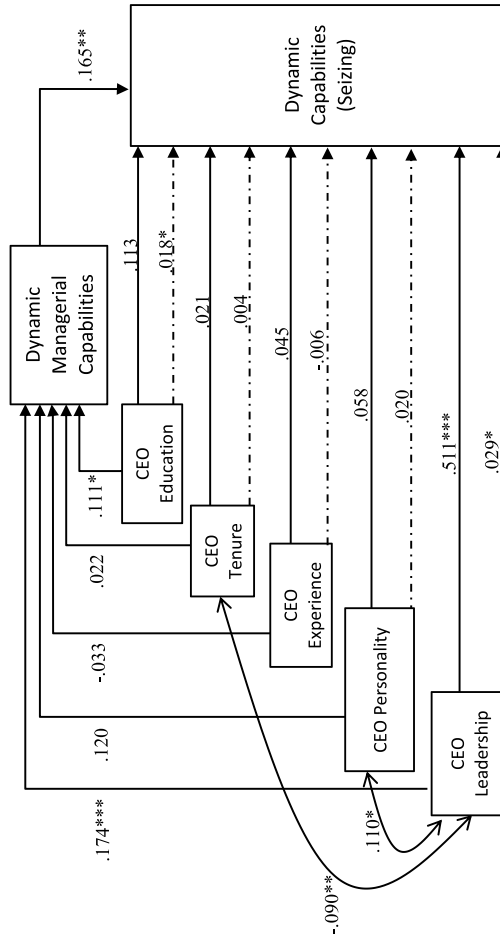


Fig. 8 Managerial seizing. Note. * $p < .05$; ** $p < .01$; *** $p < .001$

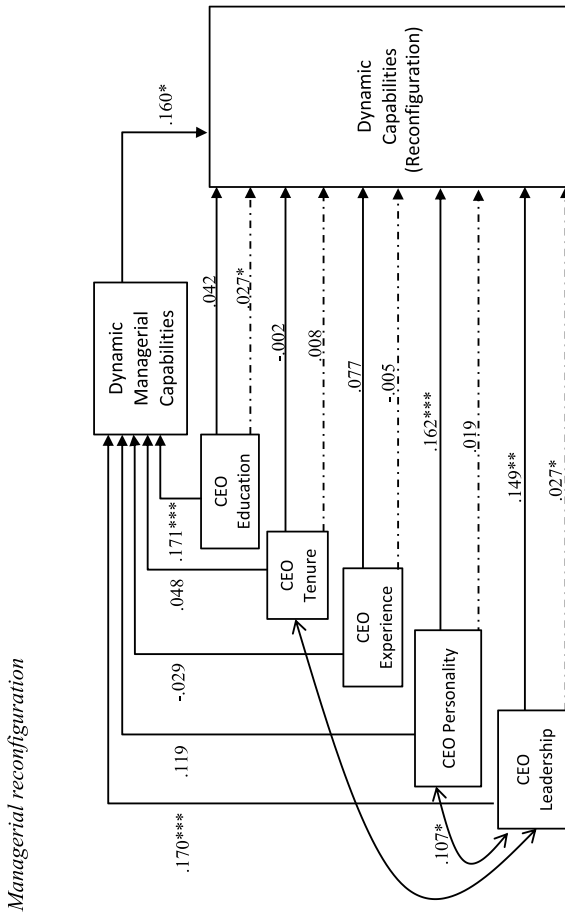


Fig. 9 Managerial reconfiguration. Note. * $p < .05$; ** $p < .01$; *** $p < .001$

traits. Following the first path, it is relevant to take account the number of studies supporting each trait because some of them have few studies reported. On the one hand, agreeableness, openness to experience, emotional stability, and core self-evaluation show evidence of an association with dynamic capabilities and a relevant number of studies to support them. In contrast, need for achievement, locus of control, risk-taking, innovation, and narcissism have fewer studies and their evidences are fragile.

Following the second path in analyzing CEO personality, we propose that models reported in the literature as the Big-Five or the entrepreneurial personality allow generating profiles of CEOs with higher theoretical and practical value. The analysis of the results from the Big-Five model shows that CEOs with a profile of high agreeableness, openness to experience, and emotional stability are willing to develop dynamic capabilities. The profile depicted using the Big-Five highlights that the classical traits associated with CEOs, extroversion and conscientiousness, are irrelevant to the development of dynamic capabilities. CEOs need different personal characteristics to develop dynamic capabilities that facilitate social interaction, allowing to explore opportunities and control their emotional experiences.

On the other hand, entrepreneurial personality has shown more predictive value in management than wider models like the Big-Five because it defines specific behaviors related to entrepreneurial success (Leutner et al. 2014). Traits related to entrepreneurial personality are self-efficacy, autonomy, innovativeness, achievement motivation, internal locus of control, optimism, stress tolerance, and risk-taking (Leutner et al. 2014). We found those traits in the analysis, and we consider that a possible description of an entrepreneurial personality profile is relevant to the research. However, it is not possible to build this profile with the current state of the literature because there are few studies reported.

Lastly, leadership styles show an association with dynamic capabilities but not with any type of style, specially the transformational style. Although Prasad and Junni (2016) reported the influence of transactional leadership, we have found significant influence only in the transformational leadership style. From the approach of the development of dynamic capabilities, being a CEO is thus being a transformational leader; therefore, CEOs should encourage, inspire, and motivate others (Ng and Sears 2012). Nonetheless, there is no evidence of other new leadership styles (e.g., authentic leadership), and research should explore the effects of these new "leaderships".

Another remarkable result of this paper is the mediation of dynamic managerial capabilities due to the fact that SHCR requires CEO action to be effective. By definition, SHCR are individual characteristics without an effect on dynamic capabilities by themselves. However, we find different mediation results for the variables that need different interpretations.

Regarding the first type, it is only through dynamic managerial capabilities that education influences dynamic capabilities; therefore, CEOs can activate education or not. Consequently, an increase in education must be joined with the development of managerial skills to mobilize resources. Regarding the second type, CEO personality and leadership styles partially require dynamic managerial capabilities. Only

a part of the influence of these variables follows the path of dynamic managerial capabilities; nonetheless, there is another path to connect them with dynamic capabilities that the model proposed does not include. The bundle of CEO personality and leadership styles can be useful to depict this new path. An overall approach to the findings of this bundle highlights the role of CEOs as social figures that encourage employees, offer social support, listen to their ideas, and show control over their emotions. This new path illustrates the social nature of the role of CEOs beyond their operative role because CEOs must be inspiring social agents. Based on this, we suggest a different mediator called CEO social capabilities. This construct is a parallel mediator to the dynamic managerial capabilities that highlight the social role of CEOs in the firm.

Finally, moderation according to the types of dynamic capabilities shows that the mediation model emerges in seizing and reconfiguration but disappears in sensing. As the three types of dynamic capabilities pursue different aims, the relationships studied in this paper change. Based on the results, CEOs' SHCR variables are relevant to the mobilization of resources to exploit opportunities and to the recombination of assets, but they are less relevant to the assessment of the environment to identify opportunities and traits. Nonetheless, the relevance of the CEO personality and leadership style is robust in the three types of dynamic capabilities, offering strong support for this bundle in the development of dynamic managerial capabilities.

Therefore, we offer several research lines for future studies. First, we propose that CEOs are relevant agents for the firm beyond their operative tasks; the social role highlighted by the new construct of managerial social capabilities requires a strong research effort. Second, we propose the study of CEO personality through personality trait models. The elaboration of a profile using the entrepreneurial personality and a comparison with Big-Five will allow to deepen the understanding of personality in the development of dynamic capabilities. We suggest that this research line could be more productive than the study of individual traits. Third, we propose that other leadership styles should be studied in the future. Although the relevance of transformational leadership in the development of dynamic capabilities is evident, studying different styles could offer additional information regarding the role of the CEO as leader in the firm. As additional future research, we propose the study of organizational and environmental moderators. Among the organizational ones, the structure of the firm, the size, and the firm tenure could be explored. On the other hand, research could explore the economic sector or environmental dynamism. Also, we propose to study additional CEO variables, such as age or type of education.

As we have stated in this paper, individual characteristics of the CEOs are inoperative by themselves, they require the role of dynamic managerial capabilities to be effective in the development of dynamic capabilities. Nonetheless, although we have focused on the dynamic capabilities, the study of the ordinary capabilities it is interesting for the literature also. Future researches can study the association of human capital resources relevant for performance parity (Ployhart et al. 2014), and the ordinary capabilities. It would allow to compare the influence of human capital variables in the development of the two types of organizational capabilities.

Finally, this paper is not without limitations. We can no offer information about all the processes described by Bendig et al. (2018), especially at the micro employee

level. We cannot integrate information about this part of the process. Also, findings are limited by the cross-sectional design used in the papers, which is most commonly applied.

7 Conclusions

CEOs' relevance to a firm is highlighted in this paper. Effectively, they use their SHCR to develop dynamic capabilities. Therefore, the education of CEOs, their personality, and their leadership styles are relevant to foster dynamic capabilities in firms. On the other hand, we discard the influence of tenure and experience, two areas largely used in the human resource management practices. These variables, with a tradition in the selection process, offer no value when the aim is to develop dynamic capabilities. Additionally, this paper emphasizes that CEOs are relevant to the firm beyond their operative tasks. CEOs must be leaders of their firms. When firms develop dynamic capabilities, the managerial social capabilities in addition to the dynamic managerial capabilities are relevant.

Author contributions All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by all the authors. The first draft of the manuscript was written by William Fernando Durán and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Data availability statements Authors declare that all data supporting the findings of this study are available in supplementary information files. Any additional clarification please sent an e-mail to duran.w@javeriana.edu.co.

Declarations

Conflict of interest The authors have no relevant financial or non-financial interests to disclose.

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