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Innovation climate, human capital and dynamic capacities: interrelations between innovation antecedents

Eduardo Márcio Santos Galdino da Silva
Universidade de Brasilia, Brasilia, Brazil and
Policia Federal, Brasilia, Brazil
Alessandra Ferrari Weber
Universidade de Brasilia, Brasilia, Brazil and
Empresa Brasileira de Correios e Telégrafos, Brasilia, Brazil
Marina Figueiredo Moreira
Universidade de Brasilia, Brasilia, Brazil, and
Severino Moreira da Silva
Universidade de Brasilia, Brasilia, Brazil and
Policia Federal, Brasilia, Brazil

Abstract

Purpose – The purpose of this article is to investigate the interrelationships between innovation climate and human capital in the development of dynamic capabilities related to innovation. The study presents a set of concepts about variables involved in the innovation process and their interrelationship, addressing the analysis of international scientific production related to the antecedents of the innovation climate, human capital and dynamic capabilities.

Design/methodology/approach – A review of the literature from 1998 to 2018 was carried out, using descriptive statistical methods, at first, and qualitative analysis of the results in order to visualize the current configuration of the field of study of innovation background.

Findings – The results demonstrate a significant number of studies relating human capital and dynamic capabilities and little quantitative significance in studies relating to a climate of innovation and dynamic capabilities. The research describes how the dynamic capabilities of innovation have been approached in a conceptual model based on the perspective of human capital and innovation climate.

Research limitations/implications – The study did not contemplate the analysis of the interrelationship between the resource configuration construct and the dynamic innovation capacities (part of the gap pointed out by Tuzovic, Wirtz and Heracleous (2018), constituting a perceptible limitation of the analyzes carried out in this article.

Practical implications – The influence of the innovation climate construct and its relationship with dynamic innovation capabilities deserves greater attention in research with an empirical approach, constituting a field to be explored by scientific research in organizations.

Originality/value – The research sought to investigate the gap involving the interrelations between innovation climate and human capital in the development of dynamic capabilities related to innovation, indicating the need for further empirical studies on the subject.

Keywords Antecedents of innovation, Innovation climate, Literature review, Dynamic capacity

Paper type Literature review

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1. Introduction

Innovative organizations manage to integrate, leverage and take advantage of the potential created by ideas, resources and knowledge, thus increasing the chances of success when delivering value to the market (Chesbrough, 2003; Singla, Stritch, & Feeney, 2018). For this reason, having a better control over factors which impact innovation and create competitive advantage has been rendered as a strategic asset for organizations (Chatzoglou & Chatzoudes, 2018; Barney, 1991). Among these factors, internal capacities and knowledge exchange were recognized as relevant for innovative performance (Caloghirou, Kastelli, & Tsakanikas, 2004). Companies investing in the development of internal competences and capacities have more chance to generate innovation (Souza, Tavares, Lucas, Philippe, & Leo, 2014). These organizations still need to handle the unpredictability of change and the environmental complexity, which imposes itself (Walker, Berry, & Avellaneda, 2015).

By recognizing the importance of such capacities, known as organizational resources in a resource-based view (Barney, 1991) or as antecedents of innovation (Hollebeek & Andreassen, 2018), many studies were undertaken and published in order to describe and analyse such factors and their results (Castro, Isidro-Filho, Menelau, & Fernandes, 2017; Chen, Tsou, & Huang, 2009; Homburg & Kuehnl, 2014; Hsiao, Lee, & Hsu, 2017; Ordanini & Parasuraman, 2011; Walker, 2014; Windrum, 2014). However, due to the huge amount of antecedents relating to each other in a complex manner and varying depending on the scenario (Cavalcante & Camões, 2016), researchers have highlighted the need to perform studies on the interrelations between innovation antecedents (De Vries, Bekkers, & Tummers, 2016; Demirkan, 2018; Sjödin, Parida, & Kohtamäki, 2016; Tuzovic *et al.*, 2018), especially those regarding organizational antecedents (Agolla & Van Lill, 2016; Boukis, 2013; Storey, Cankurtaran, Papastathopoulou, & Hultink, 2016). In fact, there is negligence in the investigation on the possible interdependencies and interactions between a large number of organizational capacities (Sjödin *et al.*, 2016), which creates both objective and subjective conditions to support the innovative development process (Tuzovic *et al.*, 2018).

Among the many internal resources identified by the literature, there is importance for having an internal environment suitable for innovation in which all teams and managers are attentive to the environment's demands and opportunities (García-Buades, Martínez-Tur, Ortiz-Bonnín, & Peiró, 2016). This also includes the need for individuals who have skills, experiences, knowledge and training so that they can meet the demands brought by the organization's ventures (Hsu & Wang, 2012) and use the existing internal dynamic capabilities to re-configure the organization's resources to not only adapt to an ever-changing environment but also to creatively capitalize on opportunities and mitigate threats (Han & Li, 2015; Kruyen & Van Genugten, 2017).

In this sense, based on a research gap indicating the need for studies on interrelations between innovation climate (covering the dimensions leadership and service culture), human capital and resource configurations (involving systems, structure and processes) in the development of dynamic capabilities related to innovation, as pointed out by Tuzovic *et al.* (2018), this study aims to answer the following question: How has the literature on interrelations between innovation climate and human capital in the development of dynamic capabilities been related to innovation?

To answer to this question, a literature review was conducted by means of a bibliographic research covering studies published in international journals from 1998 to 2018 in order to identify the presence of interrelations between antecedents of innovation.

This study has four sections besides the introduction, in which the first describes the theoretical basis of the background object being studied. The second section brings the description of the methodology used for selecting and analysing the articles, whereas the third presents the results of the bibliographic research and systematic literature review, thus demonstrating the patterns of interrelations found between the antecedents of innovation. Lastly, the fourth section of the study presents the final considerations.

2. Literature review

2.1 Antecedents of innovation

The companies' competitiveness is affected by their resources and their configurations (Barney, 1991), with the former being understood as antecedents of innovation, which encompass tangible and intangible assets (e.g. vision, culture, financial, human and technological resources) and are the basis for innovation in services (Hollebeek & Andreassen, 2018).

Studies point out that knowledge management, intellectual capital, organizational capabilities and organizational culture have significant direct and indirect effects on innovation (Chatzoglou & Chatzoudes, 2018), with Demirkan (2018) further highlighting the need to assess the resource integration at both internal (i.e. financial availability, human resources) and external levels (i.e. externally-formed networks and their characteristics such as size, diversity and strength).

Within an internally integrated perspective view, Tuzovic *et al.* (2018) point out the need for studies on the interrelations between innovation climate (covering the dimensions leadership and service culture), human capital and resource configurations (involving systems, structure and processes) in the development of dynamic capabilities related to innovation. For this study, among the three antecedents of innovation (i.e. climate of innovation, human capital and resource configurations), focus was also placed on innovation climate and human capital in an attempt to address part of the proposed gap from the perspective of studies already established in the theoretical field.

2.1.1 Innovation climate. The environment is related to a contextual situation at a determinate point in time and is connected with thoughts, feelings and behaviours of the members of the organization (Bock, Zmud, Kim, & Lee, 2005). Thus, it can be said that innovation climate refers to the employees' inclination to actively accept and share ideas and knowledge where there is free flow of information and tolerance to failure, which enables the search for solutions (Bock *et al.*, 2005). Within an innovation climate, the social interaction dynamics among employees favours organizational learning and enhances creative skills, which induces new practices and approaches (Lee & Chen, 2017).

In this sense, orientation to innovation, which is represented by the organization's willingness and openness to new ideas, is connected to the members who are encouraged to consider adopting innovation (Chen *et al.*, 2009). Moreover, innovation climate increases not only the link between staff engagement and the functional and relational aspects of service quality (i.e. global and specific aspects) but also the overall levels of satisfaction and loyalty (García-Buades *et al.*, 2016). In the process and product innovation, innovation culture also appears to have a positive correlation (Padilha & Gomes, 2016).

Leadership constitutes one of the most influential factors for innovation in organizational culture (Castro *et al.*, 2017) by changing the employees' attitudes, especially over time (Hansen, 2011), thus being a predictor for organizational innovation (Hughes, Lee, Tian, Newman, & Legood, 2018). Innovation climate is influenced by a leadership in this direction, which involves the subordinates in the pursuit of performance for innovation and creates an environment where the customers' needs are constantly met (Tuzovic *et al.*, 2018).

For Borchardt and Santos (2014), innovation is supposed to involve serious and effective efforts from the top management, including a resource allocation model which reflects the priority established for innovation. Among other things, the innovative process depends on the organizational ability to explore resources and also on the entrepreneurial and leadership capacities at both managerial and technical levels (Carvalho, Santos, & Neto, 2013).

However, there is the burden carried by the leadership factor in both private and public sectors, with the former focusing on managers and staff as sources of innovation and the latter depending on the role of policymakers and policyadvisors in the innovation process (Hartley, 2005; Pedersen, Hjelmar, & Bhatti, 2018). The adoption of innovative measures may

not be uncontroversial (Alencar, 1995). In any case, Hansen (2011) correlated the adoption of innovations to the subjective element of management, either to a greater or lesser extent, in which managers are supposed to emphasize leadership, innovation and political relations by developing a positive relationship. Leadership is a determinant variable of innovation, with the relationship between the managers' leadership behaviour and successful innovation being increasingly explicit (Domínguez-Escrig, Mallén-Broch, Lapiedra-Alcamí, & Chiva-Gómez, 2018).

Although team autonomy is one of the factors for enhancing innovation, managerial leadership boosts the achievement of innovation success by directing organizational efforts in an increasingly globalized competitive world with profound technological and social changes (Jiang & Chen, 2018).

Yet, service culture is another component of innovation climate pointed out by Tuzovic *et al.* (2018). It can be defined as an organizational climate factor focusing on the company's goals and values of service excellence, thus, being an internal characteristic, managers must develop in order to position themselves to implement these ideals throughout the organization (Richey *et al.*, 2015). Service culture is the extent to which employees at all levels perceive that the true purpose of their existence is to "serve customers" (Hoang, Igel, & Laosirihongthong, 2006).

2.1.2 Human capital. Human capital is considered to be one of the organizations' key resources and involves training, capabilities, skills, intelligence, experiences and insight of both managers and workers (Barney, 1991; Chatzoglou & Chatzoudes, 2018). Its profusion in the organizations allows them to have a faster perception of changes in the environment and facilitates the re-configuration of their actions to capture opportunities or evade threats (Han & Li, 2015). The process of human capital development is associated with education aimed at increasing knowledge and skills, which can lead to better performance of the individuals and, consequently, of the organization (Marimuthu, Arokiasamy, & Ismail, 2009).

Studies have concluded that the association between human capital and innovation capacity facilitates knowledge absorption (Subramaniam & Youndt, 2005). This emphasizes the importance of human capital for the development of innovation capacity (Leonard & Sensiper, 1998), thus being a key resource for the company's growth (Alvarez & Busenitz, 2001) as it drives the exploitation of new opportunities (Teece, Pisano, & Shuen, 1998; Eisenhardt & Martin, 2000).

Human capital has been studied in the literature as a first order construct, but at other times, it is taken as an intellectual capital dimension encompassing knowledge, skills and competencies of the individuals (Omerzel & Jurdanab, 2016). Although an agreed definition of intellectual capital cannot be found in the literature, most authors seem to agree that intellectual capital is a multidimensional concept, which can be used to describe the company's knowledge (Campbell & Abdul Rahman, 2010) regarding intellectual material, skills, experience, intellectual property and information for creation of value (Dumay, 2016). In other words, intellectual capital is the sum of all knowledge or set of intangible assets used for achieving a superior performance (Nahapiet & Ghoshal, 1998; Roos & Roos, 1997; Subramaniam & Youndt, 2005). Wang & Chang (2005) recognized that intellectual capital is a key determinant of a company's current and future competitiveness.

There is some agreement regarding the triple nature of the most common components of intellectual capital involving the dimensions human capital, relational capital and structural capital (Curado, 2008; Subramaniam & Youndt, 2005). Human capital is defined as being the knowledge, experience, vocational and professional skills recorded in the files and which are used by the teams and executives of a company (Schultz, 1961; Subramaniam & Youndt, 2005). Relational capital, on the other hand, refers to the embedded knowledge available and used during interactions with customers, suppliers, governments and other institutions (Hsu & Wang, 2012; Nahapiet & Ghoshal, 1998), whereas structural capital is defined as being the

reserves of non-human knowledge (e.g. databases, organizational charts, process instructions, strategies and intangible assets) aimed at increasing the company's value (Khani, Nor, Bahrami, Hakimpoor, & Salavati, 2011).

Taking into account the importance of the human capital dimension, the acquisition of adequate information on human resources of the organizations can contribute to the identification of existing skills and gaps, thus making the allocation of such resources more effective (Guthrie, 2001). In this study, it is noteworthy that both concepts of human capital and intellectual capital were considered for analyses of the interrelations with other antecedents, namely, innovation climate and dynamic capabilities.

2.2 Dynamic capacities

Dynamic capacity is the ability or competence a company has in order to adapt to the changing environment by reconfiguring its resources (Danneels, 2010). It is also defined as the organizational ability to integrate, build and reconfigure internal and external competencies to cope with fast-changing environments (Teece *et al.*, 1998).

At a more macroscopic level, it can be said that detecting opportunities and threats, seizing opportunities and maintaining competitiveness by reconfiguring resources are three functions of the dynamic capacities. However, at a microscopic level one can cite skills, processes, procedures, organizational structures, decision rules and disciplines (Ansari, Barati, & Sharabiani, 2016; Teece, 2007), all of which involving the combination of organizational routines and entrepreneurial leadership (Teece, 2014).

This means that dynamic capacities involve the ability to understand and apply the combination of knowledge for business activities (Soosay & Hyland, 2008) in an attempt to maintain a competitive advantage through the process of continuous creation and recreation, resulting in benefits in ever-changing markets (Ghanam & Cox, 2007; Zheng, Zhang, Wu, & Du, 2011).

For Ordanini and Parasuraman (2011), the companies' dynamic capacities to be customer-oriented and innovation-oriented have primary interactive effects on the results of service innovation. Chuang and Lin (2015) show that the dynamic capabilities of e-service generation and cooperation promote knowledge development and are factors which positively influence e-service innovation, generating competitive advantage and affecting positively the co-creation of value and the company's value. Similarly, efforts for human capital development catalyse both external absorption and internal emergence of new capacities, which shapes the organization's ability to invent, develop and introduce market innovative products (Branzei & Vertinsky, 2006). Institutions which invest in a wide range of different innovation activities increase the likelihood of innovation success with financial benefits (Piening & Salge, 2015).

2.3 Proposal for theoretical analysis

For this study, we sought to analyse the presence of interrelations between innovation climate and human capital in terms of dynamic capacities of innovation (Figure 1) in order to fill part of the proposed gap from the perspective of the studies established in the theoretical field.

3. Methodology

The present bibliographic research through a literature review aims to investigate, first quantitatively and then qualitatively, the interrelation between the three antecedents of innovation known as innovation climate, human capital and dynamic capacities based on empirical studies.

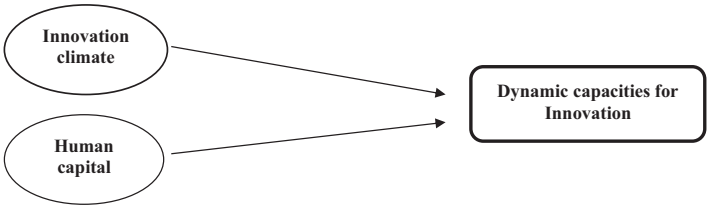
In order to the select studies to be investigated according to the methodology used by De Vries *et al.* (2016), we used a three-stage procedure in which the first stage was aimed at searching scientific articles on databases and the second one at establishing inclusion and exclusion criteria. The third stage aimed at assessing the included studies based on pre-defined criteria, as shown in Figure 2.

We searched for articles published between 1998 and 2018 (i.e. in the last 20 years) on CAPES, SCOPUS and Web of Science databases by using the following keywords and Boolean operators: "innovation climate" OR "human capital" AND "dynamic capabilit*". Our aim was to identify studies on the aforementioned antecedents without limiting to a sectorial perspective, that is, regardless of having private or public scope and of belonging to goods or service industry. The keywords could be inserted in the Abstract or title. A total of 195 articles were found, being 49 from CAPES, 49 from SCOPUS and 97 from Web of Science.

During the second stage, we established criteria to be met during the screening of the studies, thus discarding in advance those not meeting the following requisites:

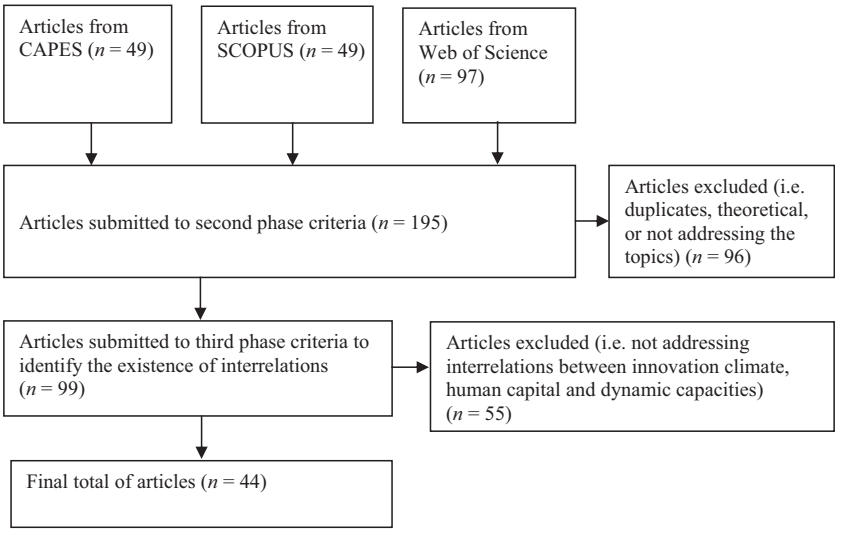
(1) Being an empirical article with strictly theoretical approach;

(2) Having been peer-reviewed for publication in scientifically rigorous journals (De Vries *et al.*, 2016);



Source(s): From the authors based on Tuzovic *et al.* (2018)

Figure 1.
Theoretical proposal for analysis of the investigated studies



Source(s): Adapted from De Vries *et al.* (2016)

Figure 2.
Three-stage procedure aimed at searching scientific articles on databases

(3) Presenting, either in the Abstract or Results sections, any mention on innovation climate, human capital or dynamic capacity;

(4) Not being repeated in the searched databases.

After this, 96 studies were discarded, and the 99 remaining ones were submitted to the third stage, in which they were read to identify the existence of interrelations between the study variables, namely, innovation climate, human capital and dynamic capacity.

In order to systematize the investigation in this stage and contribute to the analysis, we used electronic tables to compose a database with the variables extracted from the articles read, namely study reference, year of publication, methodological aspects (i.e. design, nature, type of method and research focus) and construct of the variable. In this way, it was possible to better analyse the adopted concepts, the sub-variables or dimensions in each variable, the existence or non-existence of interrelation between innovation climate and dynamic capacity, the existence or non-existence of interrelation between human capital and dynamic capacity, type of interrelation detected in the study (i.e. direct, indirect, mediation, moderate or non-existent) and study comprehensiveness. It is important to highlight that only those studies effectively investigating or testing the hypothesis of interrelation between the variables in question were considered for presentation.

After tabulating the data, we identified that 44 studies were fit for the final analysis, as shown in Table 1. The studied antecedents were shown to be convergent regarding the theoretical constructs. In order to test their association degrees in the selected, we performed both single and multivariate quantitative analyses from bibliometric data and used the following analysis techniques: chi-square tests between the variables human capital and dynamic capacities, as well as between the variables innovation climate and dynamic capacities. We also used a graphical representation technique to analyse the variable quotes.

4. Results and discussion

Based on the analysis of the selected articles, it was possible to identify that most of them had correlational (68.2%), quantitative (72.7%) and cross-sectional (72.7%) designs, with predominance of surveys (68.2%), followed by the use of secondary data (18.2%) and case studies (13.6%). Only 12 of the 44 articles (27.3%) were longitudinal. Table 2 provides a descriptive summary of the main results.

Of the 44 articles selected for study, 38 investigated the interrelations between human capital and dynamic capacities related to innovation, representing 86.4% of the total. In total, 30 studies (68.2%) reported the existence of a direct interrelation between these two antecedents. Several studies, such as that conducted by Ansari *et al.* (2016), highlighted the importance of organizations to manage their human resources by enhancing competencies and capabilities for generation of innovative performance. In addition, three studies reported on the indirect impact of the interrelation between human capital and dynamic capabilities, whereas one pointed out the existence of a mediation interrelation in which dynamic capabilities have a mediating function between human capital and innovative performance (Han & Li, 2015). Other four studies did not explain the type of interrelation between them, despite addressing human capital and dynamic capability.

With regard to innovation climate and dynamic capabilities, the articles pointed out that most studies (81.8%) did not report or analysed the interrelation between these two variables (Appendix, Table A1). Only eight out of the 44 articles (18.2%) addressed these two antecedents, with five (11.4%) indicating a direct impact, two (4.5%) showing an indirect impact and one reporting no type of interrelation (Appendix, Table A2). Therefore, we can infer that interrelations between these two variables are rarely explored in the literature on innovation. By the way, this relationship seems to occur in an ambivalent dynamics

Seq	Author(s)	Seq	Author(s)
1	Akrofi, S. (2016)	23	Kumar, N., & Yakhlef, A. (2014)
2	Allameh, S. M. (2018)	24	Lee, J. C., & Chen, C. Y. (2017)
3	Ansari, R., Barati, A., & Sharabiani, A. A. A. (2016)	25	Leitner, K. H. (2011)
4	Audretsch, D. B., Kuratko, D. F., & Link, A. N. (2016)	26	Liu, K. (2014)
5	Bendig, D., Strese, S., Flatten, T. C., da Costa, M. E. S., & Brettel, M. (2018)	27	Lowik, S., Kraaijenbrink, J., & Groen, A. (2017)
6	Biscotti, A. M., D'Amico, E., & Monge, F. (2018)	28	Majumdar, S. K. (2000)
7	Bravo-Ibarra, E. R., & Herrera, L. (2009)	29	Majumdar, S. K. (2013)
8	Brown, J. A., Gianiodis, P. T., & Santoro, M. D. (2015)	30	Mckelvie, A., & Davidsson, P. (2009)
9	Carmona-Lavado, A., Cuevas-Rodríguez, G., & Cabello-Medina, C. (2013)	31	Menguc, B., & Barker, T. (2005)
10	Chan, K. Y., Ho, M. H. R., Kennedy, J. C., Uy, M. A., Kang, B. N., Chernyshenko, O. S., & Yu, K. Y. T. (2017)	32	Nieves, J., & Haller, S. (2014)
11	Cohen, J. F., & Olsen, K. (2015)	33	Omerzel, D. G., & Jurdana, D. S. (2016)
12	Cortes, E. C., Sáez, P. Z., & Illescas, M. G. (2018)	34	Popa, S., Soto-Acosta, P., & Martinez-Conesa, I. (2017)
13	Costello, J. T., & McNaughton, R. B. (2016)	35	Remneland-Wikhamn, B., & Wikhamn, W. (2011)
14	Engelman, R. M., Fracasso, E. M., Schmidt, S., & Zen, A. C. (2017)	36	Sahaym, A., & Nam, D. (2013)
15	Ferreira, J. J., Marques, C. S., & Azevedo, C. (2011)	37	Subramaniam, M., & Youndt, M. A. (2005)
16	Ghanam, D., & Cox, P. (2007)	38	Symeonidou, N., & Nicolaou, N. (2017)
17	Han, Y., & Li, D. (2015)	39	Tamayo-Torres, I., Gutiérrez-Gutiérrez, L. J., Llorens-Montes, F. J., & Martínez-López, F. J. (2016)
18	Hsu, L. C., & Wang, C. H. (2012)	40	Tuzovic, S., Wirtz, J., & Heracleous, L. (2018)
19	Huang, Y. C., & Wu, Y. C. J. (2010)	41	Von den Driesch, T., da Costa, M. E. S., Flatten, T. C., & Brettel, M. (2015)
20	Jardon, C. M. (2018)	42	Wang, C. Y. P., Jaw, B. S., & Tsai, C. H. C. (2012)
21	Junfeng, Z., & Wei-ping, W. (2017)	43	Wu, S. H., Lin, L. Y., & Hsu, M. Y. (2007)
22	Kock, A., & Georg Gemünden, H. (2016)	44	Zouaghi, F., Sánchez, M., & Martínez, M. G. (2018)

Note(s): See Appendix for detailed references
Source(s): From the authors

Table 1. Articles selected from the literature for analysis in the present study

whenever explored as there is a series of studies indicating an indirect impact, whereas another indicates a direct impact.

According to a simultaneous article on the three antecedents of innovation, only four empirical studies (9%) addressed innovation climate, human capital and dynamic capabilities in the same work (Appendix, Table A3).

The history of scientific production of articles in this bibliographic research is shown in the graph depicted in Figure 3. One can highlight the recently increased interest in the investigation of the interrelation between the antecedents analysed by this study, especially between human capital and dynamic capabilities, as 47.7% of the articles were published in the last three years of investigation (i.e. from 2016 to 2018) during a 20-year period.

With regard to the scope of the study fields, there is a greater incidence of data collection from several companies of a single country (38.6%) and from various companies within the

Table 2.
Descriptive statistic results

Design	Amt	%	Nature of data	Amt	%	Method	Amt	%	Time frame	Amt	%
Descriptive	14	31.8	Qualitative	10	22.7	Survey	30	68.2	Longitudinal	12	27.3
Correlational	30	68.2	Quantitative	32	72.7	Case Study/PA	6	13.6	Cross-sectional	32	72.7
Explanatory-causal	0	0.00	Qualitative/Quantitative	2	4.6	Bibliographic research	0	0.00			
						Experiment	0	0.00			
						Secondary data	8	18.2			
Total	44	100.0	Total	44	100.0	Total	44	100.0	Total	44	100.0

Source(s): From the authors

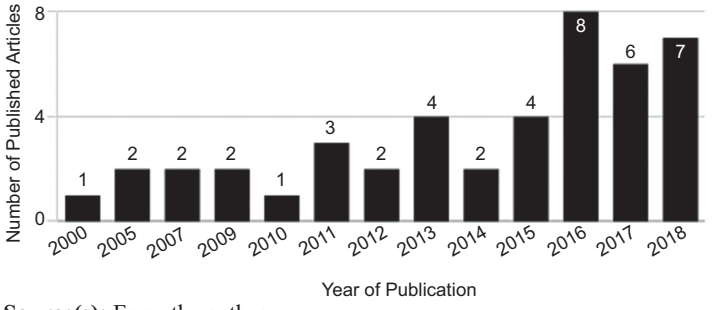
same sector (36.4%). In six articles (13.6%), data were collected from more than one country and only in five cases (11.4%) data came from a single company, which increases the likelihood of generalization of the results as several contexts of research are involved.

In Table 3, the chi-square test showed significance in the intersection of the variables human capital and dynamic capabilities, with a Pearson's value of 5.436 and 1 degree of freedom, which indicates a high probability of association between such variables (Field, 2009). In other words, these results indicate that studies on antecedents of innovation have focused on the interrelation between human capital and dynamic capabilities.

However, when we performed a chi-square test between innovation climate and dynamic capacities, there was no significance ($p > 0.05$) as Pearson's value was 0.516 with 1 degree of freedom, which indicates a low probability of finding such interrelation in the analysed articles (see Table 4).

With rare exceptions, the construct dynamic capacity had a high convergence in its concept and was mostly addressed elsewhere. In order to allow a better view of this study field, we performed a quotation analysis of the results from the Web of Science database by using the CitNetExplorer tool, as shown in Figure 4.

It is noticeable that even though this theme was addressed by Penrose in 1959, it gained momentum in 1999, with Teece being one of the most quoted authors. The consensus among large part of the authors is that the definition of this construct is the company's capacity to integrate and restructure resources in order to adapt to environmental changes (Teece *et al.*, 1998) by addressing processes of learning, identifying threats and opportunities and reconfiguring resources as dimensions of dynamic capacities (Ansari *et al.*, 2016).



Source(s): From the authors

Figure 3.
Number of published articles by year of publication

Chi-square tests – Human capital x dynamic capacities

	Value	df	Asymp. sig. (2-sided)	Exact sig. (2-sided)	Exact sig. (1-sided)
Pearson's chi-square	5.436[a]	1	0.020		
Continuity correction[b]	3.379	1	0.066		
Likelihood ratio	4.812	1	0.028		
Fisher's exact test				0.039	0.039
Linear-by-linear association	5.312	1	0.021		
Number of valid cases	44				

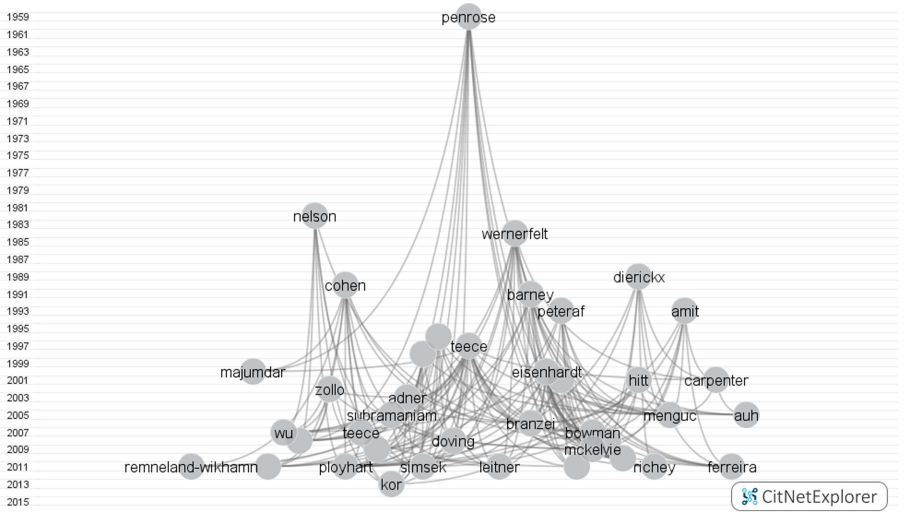
Note(s): [a]Two cells (50.0%) have expected count less than 5. The minimum expected count is 1.64
[b]Computed only for a 2 × 2 table
Source(s): From the authors using the SPSS software

Table 3.
Chi-square test of the variables human capital and dynamic capacities

Table 4.
Chi-square test of the variables innovation climate and dynamic capacities

Chi-square tests – Innovation climate x dynamic capacities					
	Value	df	Asymp. sig. (2-sided)	Exact sig. (2-sided)	Exact sig. (1-sided)
Pearson's chi-square	0.516[a]	1	0.473		
Continuity correction[b]	0.078	1	0.780		
Likelihood ratio	0.491	1	0.484		
Fisher's exact test				0.663	0.375
Linear-by-linear association	0.504	1	0.478		
Number of valid cases	44				

Note(s): [a]One cell (25.0%) has expected count less than 5. The minimum expected count is 2.18
[b]Computed only for a 2 × 2 table
Source(s): From the authors using the SPSS software



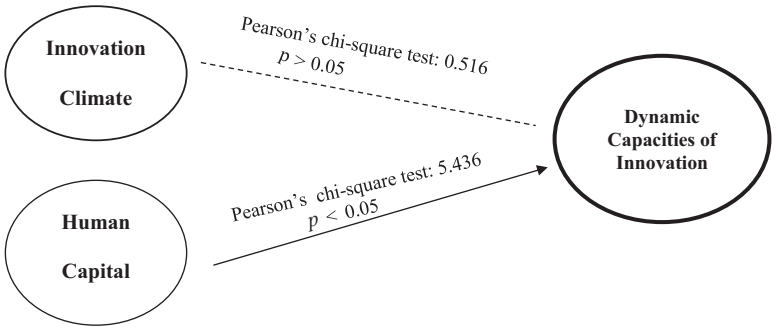
Source(s): From the authors, based on the Web of Science database by using the CitNetExplorer tool

Figure 4.
Network of quoted authors who studied the construct dynamic capacity

The analysis performed in this study indicates that the scientific community has been having more interest in the interrelations between innovation climate, human capital and dynamic capabilities (Figure 4). However, further empirical studies on the interrelation between innovation climate and dynamic capabilities should be carried out (Figure 5) due to the few results available, which constitutes an academic research gap to be investigated.

Studies have confirmed the significant interrelation between human capital and innovation-driven dynamic capacities (Han & Li, 2015; Leitner, 2011; Nieves & Haller, 2014), with the former being understood as a set of characteristics involving intellectual skills, recruitment, training, development and incentives for employees and managers (Tuzovic *et al.*, 2018).

Directed investment in human capital has facilitated the innovative capacity (Subramaniam & Youndt, 2005), especially the radical innovation, in highly innovative companies and in the short term (Leitner, 2011; McKelvie & Davidsson, 2009;



Note(s): Dashed line represents non-significant studies regarding the variables; Solid line represents significant studies regarding the variables

Source(s): From the authors based onTuzovic *et al*. (2018), with chi-square test results from the study

Figure 5.
Pearson's chi-square coefficients between antecedents of innovation

Subramaniam & Youndt, 2005). Moreover, regardless of incremental innovations, human capital can be interrelated with radical innovations (Martínez-Ros & Orfila-Sintes, 2009) as both are manifestations of the innovative phenomenon (Ferreira, Marques, & Azevedo, 2011).

5. Final considerations

Innovation develops in contexts involving multiple variables and their relations, in addition to depending on the actions of various actors, ranging from representatives of the state to organizational investors. Knowledge, leadership, willingness, courage, commitment, engagement, initiative and management are required for transforming creativity into innovation (Bravo-Ibarra & Herrera, 2009; Hughes *et al.*, 2018; Kock & Gemünden, 2016; Popa, Soto-Acosta, & Martinez-Conesa, 2017; Tamayo-Torres, Gutiérrez-Gutiérrez, Llorens-Montes, & Martínez-López, 2016).

The present study aimed to investigate the gap pointed out by Tuzovic *et al.* (2018) regarding the interrelations between innovation climate and human capital in the development of innovation-related dynamic capacities.

It was shown that to have a sustainable innovative development process, companies must build dynamic capacities by combining their main organizational resources to enable creation, absorption, integration and reconfiguration of knowledge continuously and simultaneously. The ability to acquire and create knowledge is directly related to the presence of prior knowledge, which also involves training and qualification of human capital in combination with dynamic capacities (Teece *et al.*, 1998; Tuzovic *et al.*, 2018). Theoretically, the results suggest the importance of the interrelation between human capital and dynamic capacities for innovation, indicating that managers need to invest in the development of their human resources for a quick adaptation of the company in ever-changing environments.

The results of the analysis of the variables demonstrated the need to conduct longitudinal studies on antecedents of innovation climate and human capital when related to dynamic capacities. On the other hand, the influence of the construct innovation climate and its relation with dynamic innovation capacities deserves an empirical study as this field should be further investigated by scientific research. It should be also considered that there was a small presence (18.2%) of studies seeking to explain this interrelation, despite being weak, obtained through Pearson's chi-square test. These studies confirmed the relevance of the construct in

the configuration of innovation dynamic capacities (Bravo-Ibarra & Herrera, 2009; Kock & Gemünden, 2016; Lee & Chen, 2017; Popa *et al.*, 2017; Tamayo-Torres *et al.*, 2016).

On the other hand, to delimitate the scope of the study because of the amplitude of the theoretical field of innovation, the present study did not analyse the interrelation between the construct resource configuration and dynamic capacities of innovation (part of the gap pointed out by Tuzovic *et al.*, 2018), which was a noticeable limitation. Future studies can seek interrelations found elsewhere between resource configurations and dynamic capacities, thus contributing to close the gap partly investigated in this study. Furthermore, considering the lack of studies on the interrelation between human capital and innovation climate, it is suggested that this research gap should be further investigated.

As already explained on the method used in this study, the context of innovation in services was not delimited at first, but we sought to investigate the literature based on the gap pointed out by Tuzovic *et al.* (2018), who proposed a model of institutional support for service innovation. From that point, theoretical concepts were sought by using the Boolean operators "innovation climate" OR "human capital" AND "dynamic capabilit*", with no filter context (e.g. services, industry or government). Perhaps this choice has limited the study as there may be a generalization of the results as to the interrelations found. On the other hand, we also did not delve into how the antecedents interrelate to each other and the effects of this on the innovative capacity of the organizations, which is also a limitation of the present work.

Dynamic capacities are intangible assets which allow orchestration and synchronization of resources from inside and outside the organization, thus being necessary for achievement of innovation and adaptation to the contemporary complex environment (Junfeng & Weiping, 2017; Lowik, Kraaijenbrink, & Groen, 2017; Menguc & Barker, 2005; Symeonidou & Nicolaou, 2018). Innovation depends on dynamic capacities, which is why it is essential to identify relevant dynamic capacities to carry out the innovation process by selecting competencies according to criteria and methodological rigour.

References

Agolla, J. E., & Van Lill, J. B. (2016). An empirical investigation into innovation drivers and barriers in public sector organisations. *International Journal of Innovation Science*, 8(4), 404–422, doi: 10.1108/IJIS-06-2016-0006.

Alencar, E. (1995). Desenvolvendo a Criatividade nas Organizações: O Desafio da Inovação. *Revista de Administração de Empresas*, 35(6), 6–11, doi: 10.1590/S0034-75901995000600002.

Alvarez, S. A., & Busenitz, L. W. (2001). The entrepreneurship of resource-based theory. *Journal of Management*, 27(6), 755–775, doi: 10.1177/014920630102700609.

Ansari, R., Barati, A., & Sharabiani, A. A. A. (2016). The role of dynamic capability in intellectual capital and innovative performance. *International Journal of Innovation and Learning*, 20(1), 47, doi: 10.1504/IJIL.2016.076671.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120, doi: 10.1177/014920639101700108.

Bock, G. W., Zmud, R. W., Kim, Y. G., & Lee, J. N. (2005). Behavioral intention formation in knowledge sharing: Examining the roles of extrinsic motivators, social-psychological forces, and organizational climate. *MIS Quarterly: Management Information Systems*, 29(1), 87–111, doi: 10.2307/25148669.

Borchardt, P., & Santos, G. V. (2014). Gestão de Idéias Para inovação: Transformando a Criatividade em Soluções Práticas. *Review of Administration and Innovation - RAI*, 11(1), 203, doi: 10.5773/rai.v11i1.1185.

Boukis, A. (2013). Identifying some internal S/F factors of NSD project performance. *International Journal of Retail & Distribution Management*, 41(7), 531–544, doi: 10.1108/IJRDM-05-2013-0099.

Branzei, O., & Vertinsky, I. (2006). Strategic pathways to product innovation capabilities in SMEs. *Journal of Business Venturing*, 21(1), 75–105, doi: 10.1016/j.jbusvent.2004.10.002.

Bravo-Ibarra, E. R., & Herrera, L. (2009). Capacidad de innovación y configuración de recursos organizativos. *Intangible Capital* (Vol. 5, (3), pp. 301–320), doi: 10.3926/ic.2009.v5n3.p301-320.

Caloghirou, Y., Kastelli, I., & Tsakanikas, A. (2004). Internal capabilities and external knowledge sources: Complements or substitutes for innovative performance? *Technovation*, 24(1), 29–39, doi: 10.1016/S0166-4972(02)00051-2.

Campbell, D., & Abdul Rahman, M. R. (2010). A longitudinal examination of intellectual capital reporting in Marks & Spencer annual reports, 1978-2008. *British Accounting Review*, 42(1), 56–70, doi: 10.1016/j.bar.2009.11.001.

Carvalho, R. Q., Santos, G. V., & Neto, M. C. B. (2013). R&D+ i strategic management in a public company in the Brazilian electric sector. *Journal of Technology Management & Innovation*, 8(2), 235–256, doi: 10.4067/S0718-27242013000200019.

Castro, C. M. S., Isidro-Filho, A., Menelau, S., & Fernandes, A. S. A. (2017). Antecedentes de inovações em organizações públicas do poder executivo federal. *Cadernos Gestão Pública e Cidadania*, 22(71), 126–141, doi: 10.12660/cgpc.v22n71.63851.

Cavalcante, P., & Camões, M. (2016). Do the Brazilian innovations in public management constitute a new model?. *RAI Revista de Administração e Inovação*, 14(1), 90–96, doi: 10.1016/j.rai.2016.07.001.

Chatzoglou, P., & Chatzoudes, D. (2018). The role of innovation in building competitive advantages: An empirical investigation. *European Journal of Innovation Management*, 21(1), 44–69, doi: 10.1108/EJIM-02-2017-0015.

Chen, J. -S., Tsou, H. T., & Huang, A. Y. -H. (2009). Service delivery innovation. *Journal of Service Research*, 12(1), 36–55, doi: 10.1177/1094670509338619.

Chesbrough, H. W. (2003). The era of open innovation. *MIT Sloan Management Review*, 44(3), 35-41.

Chuang, S.-H., & Lin, H.-N. (2015). Co-creating e-service innovations: Theory, practice, and impact on firm performance. *International Journal of Information Management*, 35(3), 277-291, doi: 10.1016/j.ijinfomgt.2015.01.002.

Curado, C. (2008). Perceptions of knowledge management and intellectual capital in the banking industry. *Journal of Knowledge Management*, 12(3), 141–165, doi: 10.1017/CBO9781107415324.004.

Danneels, E. (2010). Trying to become a different type of company: Dynamic capability at Smith Corona. *Strategic Management Journal*, 32, 1–31, doi: 10.1002/smj.

De Vries, H., Bekkers, V., & Tummers, L. (2016). Innovation in the public sector: A systematic review and future research agenda. *Public Administration*, 94(1), 146–166, doi: 10.1111/padm.12209.

Demirkan, I. (2018). The impact of firm resources on innovation. *European Journal of Innovation Management*, 21(4), 672–694, doi: 10.1108/EJIM-12-2017-0196.

Domínguez-Escrig, E., Mallén-Broch, F. F., Lapiedra-Alcamí, R., & Chiva-Gómez, R. (2018). The influence of leaders' stewardship behavior on innovation success: The mediating effect of radical innovation. *Journal of Business Ethics*, 2010, 1–14, doi: 10.1007/s10551-018-3833-2.

Dumay, J. (2016). A critical reflection on the future of intellectual capital: From reporting to disclosure. *Journal of Intellectual Capital*, 17(1), 168–184, doi: 10.1108/JIC-08-2015-0072.

Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: What are they? *Strategic Management Journal*, 21(10–11), 1105–1121, doi: 10.1002/1097-0266(200010/11)21:10/11<1105::AID-SMJ133>3.0.CO;2-E.

Ferreira, J. J., Marques, C. S., & Azevedo, C. (2011). Competitiveness, resources, and capabilities: Empirical evidence from retail banking. *Service Business*, 5(4), 313–337, doi: 10.1007/s11628-011-0117-7.

Field, A. (2009). "Descobrindo a estatística usando o SPSS [recurso eletrônico]". In Field, A. (Ed.), *tradução Lorí Viali* (2nd ed.). Dados eletrônicos. Porto Alegre: Artmed.

García-Buades, E., Martínez-Tur, V., Ortiz-Bonnín, S., & Peiró, J. M. (2016). Engaged teams deliver better service performance in innovation climates. *European Journal of Work and Organizational Psychology*, 25(4), 597–612, doi: 10.1080/1359432X.2016.1171752.

Ghanam, D., & Cox, P. (2007). Dynamic capabilities: The strategy-HRM intersect? *International Journal of Learning and Intellectual Capital*, 4(1/2), 57–74.

Guthrie, J. (2001). The management, measurement and the reporting of intellectual capital. *Journal of Intellectual Capital*, 2(1), 27–41, doi: 10.1108/14691930110380473.

Han, Y., & Li, D. (2015). Effects of intellectual capital on innovative performance: The role of knowledge-based dynamic capability. *Management Decision*, 53(1), 40–56, doi: 10.1108/MD-08-2013-0411.

Hansen, M. B. (2011). Antecedents of organizational innovation: The diffusion of new public management into Danish local government. *Public Administration*, 89(2), 285–306, doi: 10.1111/j.1467-9299.2010.01855.x.

Hartley, J. (2005). Innovation in governance and public services: Past and present. *Public Money & Management*, 25(1), 27–34, doi: 10.1111/j.1467-9302.2005.00447.x.

Hoang, D.T., Igel, B., & Laosirihongthong, T. (2006). The impact of total quality management on innovation: Findings from a developing country. *International Journal of Quality and Reliability Management*, 23(9), 1092-1117, doi: 10.1108/02656710610704230.

Hollebeek, L. D., & Andreassen, T. W. (2018). The S-D logic-informed "hamburger" model of service innovation and its implications for engagement and value. *Journal of Services Marketing*, 32(1), 1–7, doi: 10.1108/JSM-11-2017-0389.

Homburg, C., & Kuehnl, C. (2014). Is the more always better? A comparative study of internal and external integration practices in new product and new service development. *Journal of Business Research*, 67(7), 1360–1367, doi: 10.1016/j.jbusres.2013.08.017.

Hsiao, C., Lee, Y. H., & Hsu, H. H. (2017). Motivated or empowering antecedents to drive service innovation? *Service Industries Journal*, 37(1), 5–30, doi: 10.1080/02642069.2017.1284203.

Hsu, L. C., & Wang, C. H. (2012). Clarifying the effect of intellectual capital on performance: The mediating role of dynamic capability. *British Journal of Management*, 23(2), 179–205, doi: 10.1111/j.1467-8551.2010.00718.x.

Hughes, D. J., Lee, A., Tian, A. W., Newman, A., & Legood, A. (2018). Leadership, creativity, and innovation: A critical review and practical recommendations. *Leadership Quarterly*, 29(5), 549–569, doi: 10.1016/j.leaqua.2018.03.001.

Jiang, Y., & Chen, C. C. (2018). Integrating knowledge activities for team innovation: Effects of transformational leadership. *Journal of Management*, 44(5), 1819–1847, doi: 10.1177/0149206316628641.

Junfeng, Z., & Wei-ping, W. (2017). Industrial marketing management leveraging internal resources and external business networks for new product success: A dynamic capabilities perspective. *Industrial Marketing Management*, 61, 170–181, doi: 10.1016/j.indmarman.2016.06.001.

Khani, N., Nor, K., Bahrami, M., Hakimpoor, H., & Salavati, S. (2011). IS/IT capability and strategic information system planning (SISP). *International Journal of Managing Information Technology*, 3, 28–37, doi: 10.5121/ijmit.2011.3303.

Kock, A., & Gemünden, H. G. (2016). Antecedents to decision-making quality and agility in innovation Portfolio management. *Journal of Product Innovation Management*, 33(6), 670–686, doi: 10.1111/jpim.12336.

Kruyen, P. M., & Van Genugten, M. (2017). Creativity in local government: Definition and determinants. *Public Administration*, 95(3), 825–841, doi: 10.1111/padm.12332.

Lee, J. C., & Chen, C. Y. (2017). Exploring the determinants of software process improvement success: A dynamic capability view. *Information Development*, 35(1), 6-20, doi: 10.1177/0266666917724194.

Leitner, K. H. (2011). The effect of intellectual capital on product innovativeness in SMEs. *International Journal of Technology Management*, 53(1), 1, doi: 10.1504/IJTM.2011.037235.

Leonard, D., & Sensiper, S. (1998). The role of tacit knowledge in group innovation. *California Management Review*, 40(3), 112–132, doi: 10.1016/j.autrev.2015.04.004.

Lowik, S., Kraaijenbrink, J., & Groen, A. (2017). Antecedents and effects of individual absorptive capacity: A micro-foundational perspective on open innovation. *Journal of Knowledge Management*, 21(6), doi: 10.1108/JKM-09-2016-0410.

Marimuthu, M., Arokiasamy, L., & Ismail, M. (2009). Human capital development and its impact on firm performance: Evidence from developmental economics. *The Journal of International Social Research*, 2(8), 265–272, doi: 10.1017/CBO9781107415324.004.

Martínez-Ros, E., & Orfila-Sintes, F. (2009). Innovation activity in the hotel industry. *Technovation*, 29(9), 632–641, doi: 10.1016/j.technovation.2009.02.004.

McKelvie, A., & Davidsson, P. (2009). From resource base to dynamic capabilities: An investigation of new firms. *British Journal of Management*, 20(SUPP. 1), doi: 10.1111/j.1467-8551.2008.00613.x.

Menguc, B., & Barker, T. (2005). Re-examining field sales unit performance. Insights from the resource-based view and dynamic capabilities perspective. *European Journal of Marketing*, 39(7–8), 885–909, doi: 10.1108/03090560510601824.

Nahapiet, J., & Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage. *Knowledge and Social Capital*, 23(2), April, 242–266, doi: 10.2307/259373.

Nieves, J., & Haller, S. (2014). Building dynamic capabilities through knowledge resources. *Tourism Management*, 40, 224–232, doi: 10.1016/j.tourman.2013.06.010.

Omerzel, D. G., & Jurdanab, D. S. (2016). The influence of intellectual capital on innovativeness and growth in tourism SMEs: Empirical evidence from Slovenia and Croatia. *Economic Research-Ekonomska Istrazivanja*, 29(1), 1075–1090, doi: 10.1080/1331677X.2016.1211946.

Ordanini, A., & Parasuraman, A. (2011). Service innovation viewed through a service-dominant logic lens: A conceptual framework and empirical analysis. *Journal of Service Research*, 14(1), 3–23, doi: 10.1177/1094670510385332.

Padilha, C.K., & Gomes, G. (2016). Innovation culture and performance in innovation of products and processes: A study in companies of textile industry. *RAI Revista de Administração e Inovação*, 13(4), 285-294, doi: 10.1016/j.rai.2016.09.004.

Pedersen, L. H., Hjelmar, U., & Bhatti, Y. (2018). What does the minister do? On the working conditions of political leaders. *Public Administration*, 96(2), 259–275, doi: 10.1111/padm.12393.

Piening, E. P., & Salge, T. O. (2015). Understanding the antecedents, contingencies, and performance implications of process innovation: A dynamic capabilities perspective. *Journal of Product Innovation Management*, 32(1), 80–97, doi: 10.1111/jpim.12225.

Popa, S., Soto-Acosta, P., & Martinez-Conesa, I. (2017). Antecedents, moderators, and outcomes of innovation climate and open innovation: An empirical study in SMEs. *Technological Forecasting and Social Change*, 118, 134–142, doi: 10.1016/j.techfore.2017.02.014.

Richey, R.G., Jr, Hilton, C.B., Harvey, M.G., Beitelspacher, L.S., Tokman, M., & Moeller, M. (2015). Aligning operant resources for global performance: An assessment of supply chain human resource management. *Journal of Management & Organization*, 17(03), 364-382, doi: 10.1017/S1833367200001528.

Roos, G., & Roos, J. (1997). Measuring your company's intellectual performance. *Long Range Planning*, 30(3), 413–423, doi: 10.1016/s0024-6301(97)90260-0.

Schultz, T. W. (1961). American economic association investment in human capital. *The American Economic Review*, 51(1), 1–17.

Singla, A., Stritch, J. M., & Feeney, M. K. (2018). Constrained or creative? Changes in financial condition and entrepreneurial orientation in public organizations. *Public Administration*, 96(4), 769–786, doi: 10.1111/padm.12540.

Sjödin, D. R., Parida, V., & Kohtamäki, M. (2016). Capability configurations for advanced service offerings in manufacturing firms: Using fuzzy set qualitative comparative analysis. *Journal of Business Research*, 69(11), 5330–5335, doi: 10.1016/j.jbusres.2016.04.133.

Soosay, C., & Hyland, P. (2008). Exploration and exploitation: The interplay between knowledge and continuous innovation. *International Journal of Technology Management*, 42(1/2), 20, doi: 10.1504/IJTM.2008.018058.

Souza, C. C. L. D., Tavares, E., Lucas, E. C., Philippe, J., & Leo, P. -Y. (2014). A relação entre inovação e desempenho internacional de atividades de serviços em firmas francesas. *Review of Administration and Innovation - RAI*, 11(1), 227–254, doi: 10.11606/rai.v11i3.100222.

Storey, C., Cankurtaran, P., Papastathopoulou, P., & Hultink, E. J. (2016). Success factors for service innovation: A meta-analysis. *Journal of Product Innovation Management*, 33(5), 527–548, doi: 10.1111/jpim.12307.

Subramaniam, M., & Youndt, M. A. (2005). The influence of intellectual capital on the types of innovative capabilities. *Academy of Management Journal*, 48(3), 450–463.

Symeonidou, N., & Nicolaou, N. (2018). Resource orchestration in start-ups: Synchronizing human capital investment, leveraging strategy, and founder start-up experience. *Strategic Entrepreneurship Journal*, 12(2), 194–218, doi: 10.1002/sej.1269.

Tamayo-Torres, I., Gutiérrez-Gutiérrez, L. J., Llorens-Montes, F. J., & Martínez-López, F. J. (2016). Organizational learning and innovation as sources of strategic fit. *Industrial Management and Data Systems*, 116(8), 1445–1467, doi: 10.1108/IMDS-12-2015-0518.

Teece, D. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28, 1319–1350, doi: 10.1002/smj.

Teece, D. J. (2014). A dynamic capabilities-based entrepreneurial theory of the multinational enterprise. *Journal of International Business Studies*, 45(1), 8–37, doi: 10.1057/jibs.2013.54.

Teece, D., Gary, P., & Shuen, A. (1998). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533.

Tuzovic, S., Wirtz, J., & Heracleous, L. (2018). How do innovators stay innovative? A longitudinal case analysis. *Journal of Services Marketing*, 32(1), 34–45, doi: 10.1108/JSM-02-2017-0052.

Walker, R. M. (2014). Internal and external antecedents of process innovation: A review and extension. *Public Management Review*, 16(1), 21–44, doi: 10.1080/14719037.2013.771698.

Walker, R. M., Berry, F.S., & Avellaneda, C. N. (2015). Limits on innovativeness in local government: Examining capacity, complexity, and dynamism in organizational task environments. *Public Administration*, 93(3), 663–683, doi: 10.1111/padm.12159.

Wang, W.Y., & Chang, C. (2005). Intellectual capital and performance in causal models. Evidence from the information technology industry in Taiwan. *Journal of Intellectual Capital*, 6(2), 222-236, doi: 10.1108/14691930510592816.

Windrum, P. (2014). Third sector organizations and the co-production of health innovations. *Management Decision*, 52(6), 1046–1056, doi: 10.1108/MD-03-2012-0166.

Zheng, S., Zhang, W., Wu, X., & Du, J. (2011). Knowledge-based dynamic capabilities and innovation in networked environments. *Journal of Knowledge Management*, 15(6), 1035–1051, doi: 10.1108/13673271111179352.

Appendix

Table A1. Studies reporting or analysing no interrelation between the variables innovation climate and dynamic capacities

Ansari, R., Barati, A., & Sharabiani, A. A. A. (2016). The role of dynamic capability in intellectual capital and innovative performance. *International Journal of Innovation and Learning*, 20(1), 47. https://doi.org/10.1504/IJIL.2016.076671

Carmona-Lavado, A., Cuevas-Rodríguez, G., & Cabello-Medina, C. (2013). Service innovativeness and innovation success in technology-based knowledge-Intensive business services: An intellectual capital approach. *Industry and Innovation*, 20(2), 133–156

Jardon, C. M. (2018). Moderating effect of intellectual capital on innovativeness in Latin American subsistence small businesses. *Knowledge Management Research and Practice*, 16(1), 134–143

Han, Y., & Li, D. (2015). Effects of intellectual capital on innovative performance: The role of knowledge-based dynamic capability. *Management Decision*, 53(1), 40–56

Ghanam, D., & Cox, P. (2007). Dynamic capabilities: The strategy-HRM intersect? *International Journal of Learning and Intellectual capital*, 4(1/2), 57–74

Kumar, N., & Yakhlef, A. (2014). How capabilities evolve in a born global firm?: A case study of an Indian knowledge-intensive service born global firm. *Journal of Entrepreneurship in Emerging Economies*, 6(3), 223–242

Wang, C. Y. P., Jaw, B. S., & Tsai, C. H. C. (2012). Building dynamic strategic capabilities: A human capital perspective. *International Journal of Human Resource Management*, 23(6), 1129–1157

Audretsch, D. B., Kuratko, D. F., & Link, A. N. (2016). Dynamic entrepreneurship and technology-based innovation. *Journal of Evolutionary economics*, 26, 603–620

Allameh, S. M. (2018). Antecedents and consequences of intellectual capital: The role of social capital, knowledge sharing and innovation. *Journal of Intellectual Capital*, 19(5), 858–874

Biscotti, A. M., D'Amico, E., & Monge, F. (2018). Do environmental management systems affect the knowledge management process? The impact on the learning evolution and the relevance of organisational context. *Journal of Knowledge Management*, 22(3), 603–620

Akrofi, S. (2016). Evaluating the effects of executive learning and development on organisational performance: Implications for developing senior manager and executive capabilities. *International Journal of Training and Development*, 20(3), 177–199

Bendig, D., Strese, S., Flatten, T. C., da Costa, M. E. S., & Brettel, M. (2018). On micro-foundations of dynamic capabilities: A multi-level perspective based on CEO personality and knowledge-based capital. Long range Planning, 51(6), 797–814

Huang, Y. C., & Wu, Y. C. J. (2010). Intellectual capital and knowledge productivity: The Taiwan biotech industry. *Management Decision*, 48(4), 580–599

Leitner, K. H. (2011). The effect of intellectual capital on product innovativeness in SMEs. *International Journal of Technology Management*, 53(1), 1. https://doi.org/10.1504/IJTM.2011.037235

Liu, K. (2014). Human capital, social collaboration, and patent renewal within US pharmaceutical firms. *Journal of Management*, 40(2), 616–636. https://doi.org/10.1177/0149206313511117

Lowik, S., Kraaijenbrink, J., & Groen, A. (2017). Antecedents and effects of individual absorptive capacity: A micro-foundational perspective on open innovation. *Journal of Knowledge Management*, 21(6). https://doi.org/10.1108/JKM-09-2016-0410

Majumdar, S. K. (2013). R&D spending and the rewards to human capital in India's IT sector. *Vikalpa*, 38(4), 37–48. https://doi.org/10.1177/0256090920130403

Majumdar, S. K. (2000). Sluggish giants, sticky cultures, and dynamic capability transformation. *Journal of Business Venturing*, 15(1), 59–78. https://doi.org/10.1016/S0883-9026(98)00010-X

Mckelvie, A., & Davidsson, P. (2009). From resource Base to dynamic Capabilities: An Investigation of new firms, 20. https://doi.org/10.1111/j.1467-8551.2008.00613.x

Menguc, B., & Barker, T. (2005). Re-examining field sales unit performance. Insights from the resource-based view and dynamic capabilities perspective. *European Journal of Marketing*, 39(7–8), 885–909. https://doi.org/10.1108/03090560510601824

Nieves, J., & Haller, S. (2014). Building dynamic capabilities through knowledge resources. *Tourism Management*, 40, 224–232. https://doi.org/10.1016/j.tourman.2013.06.010

(*continued*)

Omerzel, D. G., & Jurdana, D. S. (2016). The influence of intellectual capital on innovativeness and growth in tourism SMEs: Empirical evidence from Slovenia and Croatia. *Economic Research-Ekonomska Istraživanja*, 9664, 1–16. https://doi.org/10.1080/1331677 × .2016.1211946
Brown, J. A., Gianiodis, P. T., & Santoro, M. D. (2015). Following Doctors' Orders: Organizational change as a Response to human capital Bargaining Power. *Organization Science*, 26(5), 1284–1300
Subramaniam, M., & Youndt, M. A. (2005). The influence of intellectual capital on the types of innovative capabilities. *Academy of Management Journal*, 48(3), 450–463
Symeonidou, N., & Nicolaou, N. (2017). Resource orchestration in start-ups: Synchronizing human capital investment, leveraging strategy, and founder start-up experience. *Strategic Entrepreneurship Journal*, 12(2), 194–218. https://doi.org/10.1002/sej.1269
Von den Driesch, T., da Costa, M. E. S., Flatten, T. C., & Brettel, M. (2015). How CEO experience, personality, and network affect firms' dynamic capabilities. *European Management Journal*, 33(4), 245–256. https://doi.org/10.1016/j.emj.2015.01.003
Wu, S. H., Lin, L. Y., & Hsu, M. Y. (2007). Intellectual capital, dynamic capabilities and innovative performance of organisations. *International Journal of Technology Management*, 39(3/4), 279–296. https://doi.org/10.1504/IJTM.2007.013496
Junfeng, Z., & Wei-ping, W. (2017). Industrial Marketing management Leveraging internal resources and external business networks for new product success: A dynamic capabilities perspective. *Industrial Marketing Management*, 61, 170–181. https://doi.org/10.1016/j.indmarman.2016.06.001
Zouaghi, F., Sánchez, M., & Martínez, M. G. (2018). Did the global financial crisis impact firms' innovation performance? The role of internal and external knowledge capabilities in high and low tech industries. *Technological Forecasting & Social Change*, 132, 92–104
Engelman, R. M., Fracasso, E. M., Schmidt, S., & Zen, A. C. (2017). Intellectual capital, absorptive capacity and product innovation. *Management Decision*, 55(3), 474-490. https://doi.org/10.1108/MD-05-2016-0315
Chan, K. Y., Ho, M. H. R., Kennedy, J. C., Uy, M. A., Kang, B. N. Y., Chernyshenko, O. S., & Yu, K. Y. T. (2017). Who wants to be an intrapreneur? Relations between employees' entrepreneurial, professional, and leadership career motivations and intrapreneurial motivation in organizations. *Frontiers in Psychology*, 8(Nov), 1-11. https://doi.org/10.3389/fpsyg.2017.02041
Cohen, J. F., & Olsen, K. (2015). Knowledge management capabilities and firm performance: A test of universalistic, contingency and complementarity perspectives. *Expert Systems with Applications*, 42(3), 1178-1188. https://doi.org/10.1016/j.eswa.2014.09.002
Wang, W. Y., & Chang, C. (2005). Intellectual capital and performance in causal models. Evidence from the information technology industry in Taiwan. *Journal of Intellectual Capital*, 6(2), 222-236. https://doi.org/10.1108/14691930510592816
Costello, J. & McNaughton, R. (2016). Can dynamic capabilities be developed using workplace e-learning processes?. *Knowledge and Process Management*, 23, 73-87. https://doi.org/10.1002/kpm.1500
Ferreira, J. J., Marques, C. S., & Azevedo, C. (2011). Competitiveness, resources, and capabilities: Empirical evidence from retail banking. *Service Business*, 5(4), 313-337. https://doi.org/10.1007/s11628-011-0117-7
Claver-Cortés, E., Zaragoza-Sáez, P., & González-Illescas, M. (2018). Intellectual capital management: An approach to organizational practices in Ecuador. *Intangible Capital*, 14(2), 270-285. https://doi.org/10.3926/ic.1158

Table A1. **Source(s):** From the authors

References	Impact
Lee, J. C., & Chen, C. Y. (2017). Exploring the determinants of software process improvement success: A dynamic capability view. *Information Development*. https://doi.org/10.1177/0266666917724194	Direct
Kock, A., & Georg Gemünden, H. (2016). Antecedents to decision-making quality and Agility in Innovation Portfolio management. *Journal of Product Innovation Management*, 33(6), 670–686. https://doi.org/10.1111/jpim.12336	Direct
Popa, S., Soto-Acosta, P., & Martinez-Conesa, I. (2017). Antecedents, moderators, and outcomes of innovation climate and open innovation: An empirical study in SMEs. *Technological Forecasting and Social Change*, 118, 134–142. https://doi.org/10.1016/j.techfore.2017.02.014	Indirect
Remneland-Wikhamn, B., & Wikhamn, W. (2011). Open Innovation climate Measure: The Introduction of a Validated Scale. *Creativity and Innovation Management*, 20(4), 284–295. https://doi.org/10.1111/j.1467-8691.2011.00611.x	Direct
Sahaym, A., & Nam, D. (2013). International diversification of the emerging-market enterprises: A multi-level examination. *International Business Review*, 22(2), 421–436. https://doi.org/10.1016/j.ibusrev.2012.06.002	Direct
Tamayo-Torres, I., Gutiérrez-Gutiérrez, L. J., Llorens-Montes, F. J., & Martínez-López, F. J. (2016). Organizational learning and innovation as sources of strategic fit. *Industrial Management and Data Systems*, 116(8), 1445–1467. https://doi.org/10.1108/IMDS-12-2015-0518	Indirect
Tuzovic, S., Wirtz, J., & Heracleous, L. (2018). How do innovators stay innovative? A longitudinal case analysis. *Journal of Services Marketing*, 32(1), 34–45. https://doi.org/10.1108/JSM-02-2017-0052	Direct
Bravo-Ibarra, E. R., & Herrera, L. (2009). Capacidad de innovación y configuración de recursos organizativos. *Intangible Capital*, 5(3), 301–320	Did not report the expected relation

Source(s): From the authors

Table A2. Studies addressing the direct or indirect impact or reporting no interrelation between innovation climate and dynamic capacities

Popa, S., Soto-Acosta, P., & Martinez-Conesa, I. (2017). Antecedents, moderators, and outcomes of innovation climate and open innovation: An empirical study in SMEs. *Technological Forecasting and Social Change*, 118, 134–142. https://doi.org/10.1016/j.techfore.2017.02.014

Remneland-Wikhamn, B., & Wikhamn, W. (2011). Open Innovation climate Measure: The Introduction of a Validated Scale. *Creativity and Innovation Management*, 20(4), 284–295. https://doi.org/10.1111/j.1467-8691.2011.00611.x

Tuzovic, S., Wirtz, J., & Heracleous, L. (2018). How do innovators stay innovative? A longitudinal case analysis. *Journal of Services Marketing*, 32(1), 34–45. https://doi.org/10.1108/JSM-02-2017-0052

Bravo-Ibarra, E. R., & Herrera, L. (2009). Capacidad de innovación y configuración de recursos organizativos. *Intangible Capital*, 5(3), 301–320

Source(s): From the authors

Table A3. Studies addressing innovation climate, human capital and dynamic capabilities in the same research

Corresponding author
Eduardo Márcio Santos Galdino da Silva can be contacted at: mestradounb.silva@gmail.com