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Innovation climate: A systematic review of the literature and agenda for future research

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Over the last two decades, we have witnessed growing empirical research on the concept of innovation climate at both the team and organizational levels. This article systematically reviews the literature surrounding the concept, focusing on its antecedents and outcomes, and empirical work where it has been treated as a moderator. Based on the review, we propose an agenda for future research that highlights the need to incorporate alternative theoretical perspectives to enhance our understanding of the innovation climate concept and its impact in driving team- and organizational-level outcomes. In addition to theoretical future research strands, we also highlight opportunities for empirical advancement of the field. In particular, we highlight the need to examine the negative influence of innovation climate, adopt a more dynamic approach to examine how innovation climates develops over time, and explore the influence of cultural and institutional factors on the development of innovation climate.

Practitioner Points

- Innovation is essential for organizations wishing to remain competitive and thrive in the highly competitive global marketplace.
- This study consolidates the insights from prior research linking leadership and team/demographic/workplace characteristics to both the team innovation climate and the organizational innovation climate.
- Understanding innovation climate provides practitioners with insight into the levers they may utilize to encourage innovation within the organization.
- In addition, the outcomes of innovation climate are synthesized in this paper which provides practitioners with insight into the expected benefits of focusing on developing a climate for innovation.

In the increasingly competitive global business environment, it is critical for organizations to innovate in order to differentiate their product and service offerings from competitors and deliver value to their customers. One way in which organizations and managers can foster innovation is to develop internal work climates in which innovation is supported and incentivized (Mumford, 2000). Such work climates have been labelled 'innovation climates' or 'climates for innovation' by prior studies (e.g., Anderson & West, 1998; Mathisen, Torsheim, & Einarsen, 2006). However, despite growing literature on

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innovation climates at the team and organizational levels of analysis, there has been no attempt to synthesize prior insights. A systematic review of the literature on innovation climate, therefore, is warranted in order to consolidate fragmented insights and provide scholars with a better understanding of the current state of the literature, as well as to identify knowledge gaps to guide future research.

This paper examines how innovation climate has been defined and measured in prior empirical research, reviews the literature on the antecedents and outcomes of innovation climate at the team and organizational level, and reviews work in which innovation climate has been treated as a moderator. Insights from our review allow us to determine the factors that support or constrain the development of innovation climates, understand the benefits and disadvantages that an innovation climate brings organizations and employees, and highlight the contingencies that exist between innovation climate, team and organizational factors, and organizational outcomes.

By drawing on the insights of the review, our study also makes an important contribution by developing a roadmap for future research that highlights possibilities for both theoretical and empirical development of the literature on innovation climate. We highlight how the adoption of theories such as trait activation theory, attraction–selection–attrition theory, situational strength theory, and social information processing theory can help us to explain how innovation climate develops and influences work outcomes, and the key boundary conditions of the relationships between innovation climate and the network of variables to which it is related. From an empirical viewpoint, we highlight the need for researchers to investigate the influence of team composition on innovation climates, examine the negative effects of innovation climates, adopt a dynamic approach to study innovation climates, and examine the role of cultural and institutional factors in shaping innovation climates.

Methods

Literature search

We identified peer-reviewed articles on innovation climate through searching the Web of Science database which contains all SSCI listed journals and the emerging sources journal list. We initially searched for peer-reviewed articles with the word 'innovation climate', 'climate for innovation', or 'innovation-supportive climate' in their title and keywords that had been published before between 1996 when seminal work on organizational climate was first published and the end of 2018. This initial search yielded a total of 308 articles. From this initial list, we excluded 31 articles that were not published in English-language journals. This left us with a total of 277 articles. Two authors then independently reviewed the 277 articles to identify empirical papers that had measured innovation climate at the team or organizational level. As part of the refinement process, articles were removed that focused on other types of climate at the organizational and team level including creative, justice, collaborative/competitive, psychological safety, service, learning, and voice climates. Articles were also removed that were published in journals on the emerging sources journal list that were not accessible through a recognized database (e.g., Elsevier, Sage, Wiley, Emerald, PsyArticles, EBSCO Host, ProQuest, Taylor and Francis) and studies that were non-empirical (conceptual) in nature. This left us with a total of 50 articles agreed on by the two authors.

Given during the initial review process, we identified that a number of articles on innovation climate at the team level had not explicitly used the term 'team innovation climate' or 'innovation climate' and had instead simply used the term 'team climate', we

undertook an additional search for peer-reviewed articles with the term 'team climate' in their title or keywords. After removing articles not published in English, we were left with a total of 223 articles. As in the previous search, two authors independently reviewed the articles to identify empirical papers that had measured team innovation climate. We removed articles that focused on other climates (including two articles which focused on creative climate), articles from the emerging journals list that were not accessible through a recognized database, and articles that were non-empirical in nature. We also removed duplicate articles that were found in our previous search. This left us with an additional 25 articles.

Following this, we conducted a backward and forward search of the 75 articles already identified for additional empirical articles on innovation climate that had not use the terms 'innovation climate' or 'team climate'. This led to the identification of three further articles including a meta-analysis (Hulsheger, Anderson, & Salgado, 2009) (see Figure 1: flow diagram of searched, screened, and included Studies, for a diagrammatic representation of the process of selecting papers for inclusion based on the four stages as outlined in PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Moher *et al*., 2015)). Our literature search resulted in a final database of 78 articles most

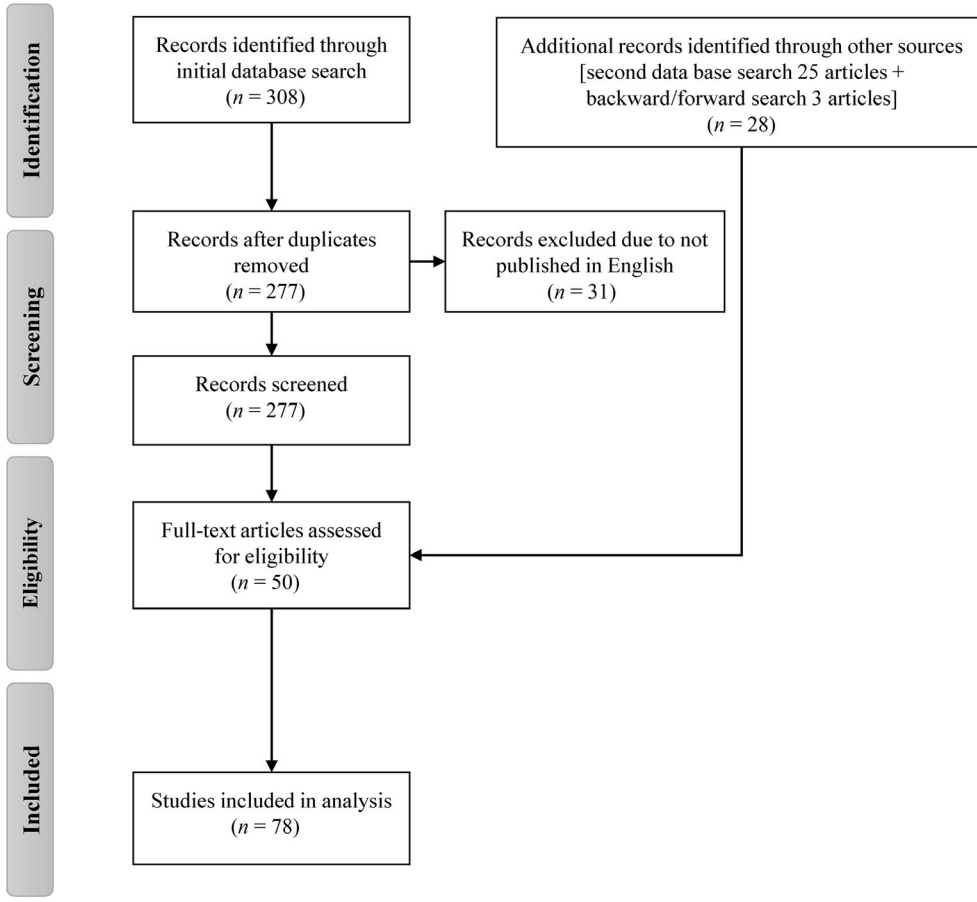

Figure 1. Flow diagram of searched, screened, and included studies

of which were published after 2000 (see Figure 2: innovation climate publication trend). We note an upward trend with regard to the number of papers published over the last five years, another indication of the ongoing importance of this area of research.

The papers that comprised our final database were coded by two of the authors using the coding parameters specified in Table 1: coding parameters. A third member of the author team independently coded a selection of papers and reviewed the rest of the coding. Categorization of the papers revealed that multi-source and multi-level research designs are becoming increasingly popular, research has been undertaken on innovation climate at both the team and organizational levels, and that research has been undertaken in a wide range of industrial sectors (manufacturing, banking, education, and health care) and countries. Table 2: summary of studies reviewed provides additional detail about each of the articles which were incorporated into the review.

This paper is organized as follows: first, we outline the way in which innovation climate has been defined and measured in prior empirical work. Second, we discuss our methodological concerns with regard to how innovation climate has been measured in prior studies. We then review work on the antecedents and outcomes of innovation climate, studies in which innovation climate has been modelled as a moderator, as well as consider the interactional effects of different dimensions of innovation climate. Finally, we conclude with an agenda for future research on the concept with a particular emphasis on highlighting opportunities for theoretical and empirical advancement.

Definition and measurement of innovation climate

Defining innovation climate

Climate research focuses on how employees' perceptions of the work environment influence their behaviours and attitudes (Schneider, 1983). Early climate researchers

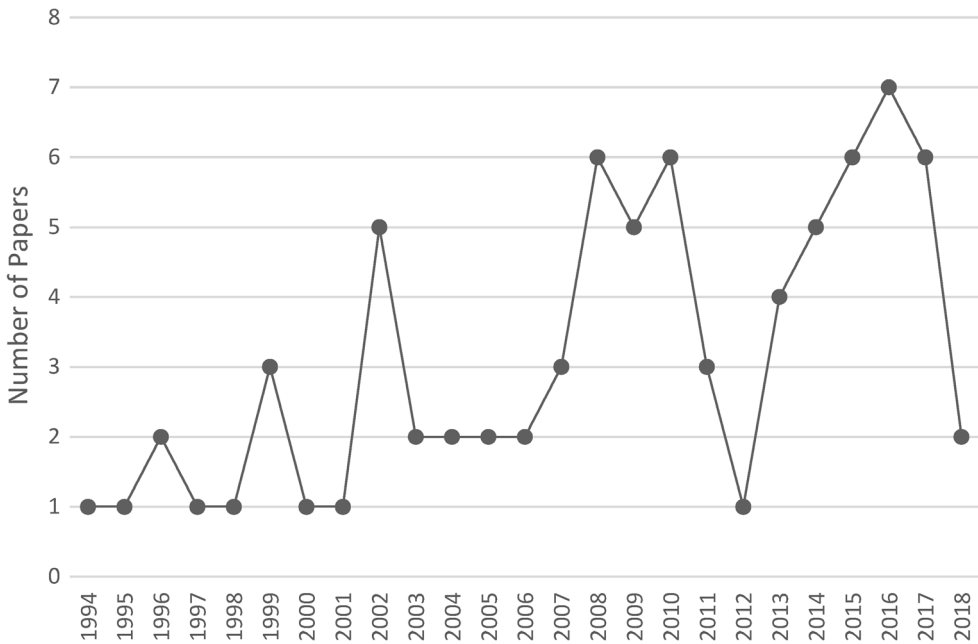

Figure 2. Innovation climate publication trend

Table 1. Coding parameters

Parameter	Details
Foci	Team or organization
Method	Qualitative or quantitative
Research design	Cross-sectional or longitudinal, multi-source or single source, multi-level or single level
Scale	The details of the scale used to measure innovation climate including whether it was an existing scale or one which the authors developed as part of the research
Study specifics	Sample size, participant details, the location, and industry in which the study was conducted
Research outcomes	Research outcomes were coded according to antecedents, outcomes, and where innovation climate acts as a moderator

typically adopted broad global conceptualizations of 'work climate' when examining its effect on employees. However, there was limited consensus as to how it should be defined and measured (Glick, 1985; James, 1982; James, Joyce, & Slocum, 1988), and the appropriateness of aggregating individuals' perceptions to the group (team) or organizational level (Glick, 1985). This led work climate researchers to focus more narrowly on specific types of work climates, including justice climate (Naumann & Bennett, 2000), safety climate (Zohar, 2000), and innovation climate (Anderson & West, 1998). This narrowing of focus has helped to address the definitional and conceptual ambiguity associated with global measures of work climates (Schneider, 1983).

The definition of innovation climate (also termed 'climate for innovation' or 'innovation-supportive climate' by different researchers (e.g., Khalili, 2016; Sarros, Cooper, & Santora, 2008)) adopted in this study is consistent with the definition most commonly utilized by researchers of innovation climate as the shared perceptions at the team (or organizational) level as to the extent to which team (or organizational) processes encourage and enable innovation (Anderson & West, 1996, 1998).

Although a number of definitions of innovation climate have been proffered by researchers, they generally tap into the same phenomenon, employees' perceptions of the extent to which the team or organizational environment is conducive to innovation and the innovative behaviour of employees. However, the definitions differ across two dimensions; namely whether the foci of innovation climate are at the team or organization level and whether innovation climate is conceptualized as an employee's individual perceptions or shared perceptions. The present article reviews empirical work that has studied the concept at both the individual-level and shared perceptions of the team or organization.

Distinguishing innovation climate from related constructs

One construct that shares some conceptual overlap with innovation climate is innovation culture (Khazanchi, Lewis, & Boyer, 2007). Innovation culture has been defined as an organization's orientation towards experimenting with new alternatives or approaches by exploring new resources, breaking through existing norms, and creating new products to improve its performance (Ireland, Kuratko, & Morris, 2006). Although both innovation climate and innovation culture explain similar organizational phenomena (e.g., innovation or innovative behaviour in the workplace), we follow the prior literature in distinguishing between the two. In prior work, climate researchers have generally

Table 2. Summary of studies reviewed

Year	Author/s	Level of focus	Innovation climate measure	Study context			Antecedents	Outcomes	As moderator
1994	Agrell & Gustafson	Team	TCI-38	124 employees in 17 teams	Sweden	Unclear		Production performance (+)	
1995	Burningham & West	Team	TCI	59 employees in 13 teams	UK	Energy industry workers		Group innovativeness(+)	
1996	West & Anderson	Team	TCI	234 employees in 35 teams	UK	Hospital managers		Overall innovation and innovation novelty (+ for SI dimension), number of innovations and team reports of innovation (+ for PS dimension)	
1997	Kivimäki *et al.*	Team	TCI-38	2265 employees	Finland	Public sector workers			
1998	Anderson & West	Team	TCI-38	155 employees in 27 teams	UK	Hospital managers			
1999	Länsisalmi & Kivimäki	Org	TCI-14	1767 employees from 108 work units	Finland	Workers from various industries	Stress (−)		
1999	Heponiemi *et al.*	Team	TCI-14 K&E	1047 employees	Finland	Elderly care workers	Organizational type – for profits/nonprofits (n.s.)		
1999	Kivimäki & Elovainio	Team	TCI-14 K&E	1494 and 771 employees (2 studies)	Finland	Social workers and health care professionals			
2000	Elovainio *et al.*	Team	TCI-38	748 employees	Finland	Health care professionals		Use of guidelines (+)	
2001	Bain *et al.*	Team	TCI-38	193 employees in 38 teams	Australia	Scientists and technologists		Individual innovation (+), number of patents (+), creative outcomes (+); useful outcomes (+); Project performance (+).	

Continued

Table 2. (*Continued*)

Year	Author/s	Level of focus	Innovation climate measure	Study context			Antecedents	Outcomes	As moderator
2002	Pirola-Merlo *et al.*	Team	TCI	313 employees in 54 teams	Australia	Research and development professionals	Transformational leadership (+)	Team performance (+)	
2002	Elovainio *et al.*	Team	TCI-14 K&E	688 employees	Finland	Health care professionals		Occupational strain (−) through procedural justice	
2002	Loo & Loewen	Team	TCI-14 K&E	288 students in 72 teams	Canada	Students			
2002	Dackert *et al.*	Team	TCI-38 and TCI-14	70 employees in 4 teams	Sweden	Office workers	Organizational change (+)		
2002	Raggazzoni *et al.*	Team	TCI-44	585 employees	Italy	Workers from various industries			
2003	West *et al.*	Team	TCI	3447 employees in 283 teams	UK	Health care professionals	Leadership which fosters clarity (+)		
2003	Bower *et al.*	Team	TCI-61	387 employees in 42 teams	UK	Health care professionals		Quality of care (+), team innovation (+)	
2004	Dackert *et al.*	Team	TCI-38	98 in 14 teams	Sweden	Manufacturing workers	Leadership styles combining employee and change orientation (+)		
2004	Mathisen *et al.*	Team	TCI-44	1487 employees in 195 teams, 1436 employees in 106 teams, 395 teams (3 studies)	Norway	Workers from various industries		Customer satisfaction (+)	
2005	Van Der Vegt *et al.*	Org	Own measure (developed by firm)	68944 employees in 248 organizational units in 25 countries	Multiple	Workers from a multinational enterprise	Demographic diversity (− in high power distance cultures, + in low power distance cultures),		
2005	Antoni	Team	TCI-16	310 employees in 20 teams	Germany	Manufacturing workers	Complex task structure (+)	Innovative behaviour (+), organizational commitment (+), job satisfaction (+), stress(−)	

Continued

Table 2. (*Continued*)

Year	Author/s	Level of focus	Innovation climate measure	Study context			Antecedents	Outcomes	As moderator
2006	Rose *et al.*	Team	TCI	72 employees	UK	Care workers	Attitudes towards professionals at work (+)	Psychological well-being (+)	
2006	Mathisen *et al.*	Team	TCI-38	1487 employees in 195 teams	Norway	Workers from various industries			
2007	King *et al.*	Org	9 items from Patterson *et al.* (2005) and Anderson and West (1998)	22696 employees in 131 organizations	UK	Health care professionals		Organizational performance (+)	Work demands to organizational performance (+)
2007	Kivimäki *et al.*	Team	TCI-14 K&E	6441 employees	Finland	Health care professionals		Intention to leave (−), turnover behaviour (−)	
2007	Proudfoot *et al.*	Team	TCI-44	7505 patients, 654 employees in 93 teams	Australia	Health care professionals		Job satisfaction (+), patient satisfaction (+)	
2008	Sarros *et al.*	Org	Scott & Bruce	1158 managers	Australia	Managers from various industries	Transformational leadership (+) through competitive, performance-oriented organizational culture		
2008	Eisenbeiss *et al.*	Team	TCI- 2 subscales (SI, CE)	188 employees in 33 teams	Multiple	Research and development professionals	Transformational leadership (+) on support for innovation dimension	Team innovation climate (+) when support for innovation and climate for excellence are both high	
2008	Panuwatwanich *et al.*	Team	TCI-12	181 employees	Australia	Design professionals	Leadership for innovation (+)	Innovation diffusion outcomes (+) through organizational culture for innovation	

Continued

Table 2. (*Continued*)

Year	Author/s	Level of focus	Innovation climate measure	Study context			Antecedents	Outcomes	As moderator
2008	Bosch *et al.*	Team	TCI-14 K&E	752 patients, 83 employees, 30 teams	Holland	Health care professionals	Organizational culture (n.s.)	Clinical patient outcomes (n.s.)	
2008	Mathisen *et al.*	Team	TCI-44	147 employees in 29 teams	Scandinavia	Entertainment workers	Team associative orientation (+), motivation (+), and ambition (+)	Team innovation (+)	
2008	Chatzi & Nikolaou	Team	TCI-44	235 employees in 52 teams	Greece	Clerical and shop floor workers			
2009	González-Romá *et al.*	Team	Own Scale 16-items	680 employees in 150 teams	Spain	Banking workers		Team performance (+) when climate strength is strong	
2009	Goh *et al.*	Team	TCI-14 K&E	249 employees in 14 practices	UK	Health care professionals/ administrators	Gender-male (+), tenure (+), occupation-GP (+)	Quality of care (n.s)	
2009	Strating & Nieboer	Team	TCI-14 K&E	270 employees	Holland				
2009	Tseng *et al.*	Team	TCI-44	203 employees in 28 teams	Taiwan	Administrators			
2010	Hsu & Fan	Org	Amabile (1996)	2136 employees	Taiwan	Research and development professionals		Creative behaviour (+), innovative behaviour (+): stronger when time pressure was lower	
2010	Moolenaar *et al.*	Org	Own scale	702 employees in 51 organizations	Holland	Teachers	Transformational leadership of principals (+) through their social network position		Innovation climate and strategic relationships interact to strengthen the relationship between supply chain partner innovativeness to innovation strategy (+)

Continued

Table 2. (*Continued*)

Year	Author/s	Level of focus	Innovation climate measure	Study context			Antecedents	Outcomes	As moderator
2010	Charbonnier-Voirin *et al.*	Team	Own scale- 6 item	120 employees in 35 teams	France	Aeronautical industry workers			Transformational leadership to adaptive performance (+)
2010	Pirola-Merlo	Team	TCI	255 employees in 33 teams	Australia	Research and development professionals		Project performance (+), project innovation (+)	
2010	Dackert	Team	TCI-38	329 employees	Sweden	Elderly care workers		Well-being (+), stress (−)	
2010	Kirsten & Du Preez	Team	TCI-44	40 employees in 2 teams	South Africa	Insurance workers	Team development (intervention)		
2011	Chang *et al.*	Org	Tsai (2005)	651 employees in 22 organizations	Taiwan	Teachers		Creative teaching behaviours (+)	
2011	Weiss *et al.*	Team	Joshi & Sharma (2004); Anderson and West (1998)- 5 items	434 employees in 94 teams	Germany	Workers from various industries		Product quality (+), project efficiency (+) only in projects where financial resource constraints	
2011	Shaw *et al.*	Team	TCI	263 employees	UK	Workers from various industries		Staff competency (+)	
2012	Aarons & Sommerfeld	Team	TCI-SI subscale only	140 employees in 30 teams	USA	Social workers	Transformational leadership (+), Leader-member exchange (+)	Attitudes towards evidence-based practice (+)	
2013	Yu *et al.*	Org	Amabile (1996); Chen & Hu (2008)	403 employees in 33 organizations	Taiwan	Financial and insurance sector workers		Innovative behaviour (+)	
2013	Turnipseed & Turnipseed	Org	Ekvall *et al.* (1983) climate for innovation questionnaire	143 employees	USA	Financial sector workers	Organizational citizenship behaviours (n.s.)		
2013	Oke at al.	Org	Prajogo and Ahmed (2006)	207 managers	Australia	Manufacturing managers			
2013	Somech & Drach-Zahavy	Team	TCI-14 K&E	996 employees in 96 teams	Israel	Health care professionals			Team creativity to innovation implementation (+)

Continued

Table 2. (*Continued*)

Year	Author/s	Level of focus	Innovation climate measure	Study context			Antecedents	Outcomes	As moderator
2014	Sung & Choi	Org	Choi (2007); Patterson *et al.* (2005)	7996 employees in 260 organizations	Korea	Workers from various industries			Learning practices to innovative performance (+)
2014	Chan *et al.*	Org	Scott and Bruce (1994) 13 items	113 employees	Hong Kong	Construction	Transformational leadership(+), development exchange leadership (−)		
2014	Cramm *et al.*	Team	TCI	90 employees in 29 teams	Holland	Health care professionals		Quality of care (+)	
2014	Ceschi *et al.*	Team	TCI- 3 subscales (SI, PS, IF)	183 employees in 50 teams	Italy	Economists or business professionals		Decision-making performance (+)	
2014	Sun *et al.*	Team	TCI-14 K&E	184 managers	China	Managers from various industries	Transformational leadership (+)	Team performance (+)	
2015	Kang *et al.*	Org	3 items from Patterson *et al.* (2005) and Scott and Bruce (1994)	105 managers and 39 CEOs	USA	Managers from various industries	Transformational leadership (+), transactional leadership (-)	Managers' innovative behaviour (+)	
2015	Hsu & Chen	Org	Amabile (1996)	781 employees in 16 organizations	Taiwan	Workers from various industries		Innovative behaviour (+) through psychological capital	
2015	Jaiswal & Dhar	Org	Scott and Bruce (1994)	372 employees in 46 teams	India	Hospitality workers	Transformational leadership (+)	Employee creativity (+), stronger when creative self-efficacy higher	
2015	Dhar	Org	Scott and Bruce (1994)	618 employees, 31 managers in 31 organizations	India	Hospitality workers			Organizational commitment to service innovative behaviour (+)
2015	Ren & Zhang	Org	Zheng, Jin, and Ma (2009)	282 employees	China	Workers from various industries		Innovative behaviour (+), weaker in presence of high hindrance stressors	

Continued

Table 2. (*Continued*)

Year	Author/s	Level of focus	Innovation climate measure	Study context			Antecedents	Outcomes	As moderator
2015	Edú-Valsania *et al.*	Team	TCI-14 K&E	562 employees	Spain	Workers from various industries	Authentic leadership (+)	Knowledge sharing behaviour (+)	
2016	Khalili	Org	Scott and Bruce (1994)	1172 employees	Iran	Workers from various industries			Transformational leadership to creativity and innovative behaviour (+)
2016	García-Buades *et al.*	Team	3-items from González-Romá *et al.* (1996)	599 customers, 344 employees, 86 teams, 60 organizations	Spain	Hospitality workers			Team engagement to service performance (+)
2016	Valls *et al.*	Team	4-items from González-Romá *et al.* (2009)	Employees in 57 branches	Spain	Financial sector workers			Education level diversity to team communication quality (+)
2016	Farnese & Livi	Team	TCI- SI subscale only	152 employees	Italy	Workers from various industries	Reflexivity (+) on support for innovation dimension	Organizational innovativeness (+)	
2016	Kinunnen *et al.*	Team	TCI-14 K&E	265 employees	Finland	Public sector workers	Authentic leadership (n.s.)	Authentic leadership (+)	
2016	Chen & Hou	Team	TCI-14 K&E	291 employees in 58 teams	Taiwan	Research and development professionals			Employee voice behaviour to creativity (+)
2016	Cheng *et al.*	Team	TCI-38	211 employees	Australia	Nursing professionals	Transformational leadership (+) via social identity		
2017	Shanker *et al.*	Org	Own scale	202 managers	Malaysia	Managers from various industries		Organizational innovation (+) through innovative work behaviour	
2017	Popa *et al.*	Org	Prajogo and Ahmed (2006) in Oke *et al.* (2013)	429 SME representatives	Spain	Manufacturing managers	Commitment-based HR (+)	Inbound and outbound open innovation (+)	

Continued

Table 2. (*Continued*)

Year	Author/s	Level of focus	Innovation climate measure	Study context			Antecedents	Outcomes	As moderator
2017	Lee *et al.*	Team	TCI-14 K&E	412 employees in 44 teams	Malaysia	Workers from various industries		Job engagement (+)	
2017	Siemon *et al.*	Team	TCI-19	196 employees	USA	Nursing professionals	Nurses in states with certification programmes (n.s.)		
2017	Pei	Team	TCI-23	218 employees in 54 teams	China	Workers from high-technology enterprises	Structuring leadership (+)	Team creativity (+)	
2017	Agreli *et al.*	Team	TCI-38	159 employees in 18 teams	Brazil	Health care professionals		Communication (+), mutual support (+)	
2018	Park & Jo	Org	Scott and Bruce (1994)- 6 items	1166 employees	Korea	Public sector workers		Innovative behaviour (+)	
2018	Magni *et al.*	Team	4 items from Van Der Vegt *et al.* (2005)	134 members of 25 artistic collectives	Italy	Artists		Improvisation (+) through proactive and risk-taking attitudes	

distinguished climates from cultures by arguing that climates provide the behavioural evidence for the culture within an organization (Schein, 2010; Schneider, Salvaggio, & Subirats, 2002), that is, are more visible than cultures and observable in the practices and policies of the organization (Ahmed, 1998).

Another construct which shares some conceptual commonality with innovation climate is creative climate. Although the concepts of creativity and innovation are often used interchangeably in the literature (Isaksen & Akkermans, 2011), creativity differs from innovation as it focuses on the individual thought processes and intellectual activity to generate new insights, ideas, or solutions to problems, whereas innovation goes beyond this by focusing on the adoption, exploitation, and successful implementation of these ideas, insights, and solutions (Amabile, Conti, Coon, Lazenby, & Herron, 1996). Based on these differences, researchers have defined creative climate in a number of ways, such as one characterized by the sharing of information, open communication, and a focus on human and professional development (Hotho & Champion, 2011), or a climate which supports the development of creative ideas through the provision of relevant rewards (Tidd & Bessant, 2009). Implicit in these definitions is the view that creative climate focuses on the properties of a group that facilitate variation in the form of developing new insights, ideas, and solutions to problems. In contrast, an innovation climate focuses on the properties of a group that not only supports the development of new insights, ideas, and solutions, but also their adoption, exploitation, and implementation. Despite this conceptual distinction, some early researchers conflated creativity and innovation climate when studying innovation in organizations (e.g., Ekvall, 1996; Ekvall, Arvonen, & Waldenström-Lindblad, 1983).

A number of other work climates linked to innovation have been studied in previous work, including climates for initiative (Baer & Frese, 2003), proactive climate (Fay, Lührmann, & Kohl, 2004), and implementation climate (Klein & Sorra, 1996). Unlike innovation climates, which have typically been conceptualized at both the team and organizational levels, these climates have been conceptualized as organizational-level climates. As such, we have witnessed less empirical work on such climates compared with innovation climates. Whereas an innovation climate refers to shared perceptions at the team or organizational level regarding the extent to which team or organizational processes encourage and enable innovation, a climate for initiative refers to employees' shared perceptions regarding the extent to which organizational processes guide and support proactive, self-driven, and persistent approaches towards work more generally (Baer & Frese, 2003). In contrast, a proactive climate has been defined as shared perceptions as to the extent to which working practices are characterized by an orientation towards (1) self-starting actions, (2) work innovation, and (3) error management (Fay *et al*., 2004). As such, it is a wider construct than climate for initiative, which only focuses on working practices oriented towards self-serving actions. Its second component, orientation towards work innovation, shares some conceptual overlap with the support for innovation dimension of innovation climate as it focuses on the extent to which organizational practices support innovation. Finally, a climate for implementation refers to employees' shared perceptions of the extent to which their use of a specific innovation is expected, supported, and rewarded within their organization (Klein & Sorra, 1996), and results from their shared experiences of their organization's implementation processes. As such, it also shares conceptual overlap with the support for innovation dimension of innovation climate.

Measuring innovation climate

Team climate inventory. The most widely used measure of team innovation climate is the team climate inventory (TCI) developed by Anderson and West (1996, 1998), which captures individuals' shared perceptions of innovation climate at the team level of analysis. From the papers within our database, we identified 49 articles that used the TCI or abbreviated (shorter) version of the TCI as a basis for measuring team-level innovation climate. This measure captures West's (1990) four sub-dimensions of innovation climate: participative safety, support for innovation, vision, and task orientation. While the original TCI comprised 61 items, a short form comprising 38 items was later developed (Anderson & West, 1998). In the latter version, participative safety was split into two sub-dimensions 'participative safety' and 'interaction frequency', which became a fifth dimension (Anderson & West, 1998). The short form of the TCI has been validated in a number of languages including Swedish (Agrell & Gustafson, 1994), Finnish (Kivimäki & Elovainio, 1999; Kivimäki *et al*., 1997), Italian (Ragazzoni, Baiardi, Zotti, Anderson, & West, 2002), Norwegian (Mathisen, Einarsen, Jørstad, & Brønnick, 2004; Mathisen *et al*., 2006), Dutch (Strating & Nieboer, 2009), Greek (Chatzi & Nikolaou, 2008), and Chinese (Tseng, Liu, & West, 2009), and across a range of industrial contexts. Prior work typically indicates that the TCI exhibits high levels of reliability and convergent validity (Mathisen & Einarsen, 2004).

As well as using the 61-item TCI (9 articles) and the 38-item short form of the TCI (11 articles), researchers have developed shorter scales for team innovation climate based on items from the TCI. For example, Kivimäki and Elovainio (1999) shortened the TCI to a 14-item version, which also demonstrated acceptable reliability and validity (15 articles) (e.g., Chen & Hou, 2016; Loo & Loewen, 2002; Somech & Drach-Zahavy, 2013). Researchers have also used a 44-item version of the TCI (6 articles) (e.g., Mathisen, Martinsen, & Einarsen, 2008; Proudfoot *et al*., 2007), a 23-item version (Pei, 2017), a 19-item version (Siemon, Shuster, & Boursaw, 2015), a 16-item version (Antoni, 2005), and a 12-item version (Panuwatwanich, Stewart, & Mohamed, 2008). A number of studies have also drawn on measures for one or more sub-dimensions of the TCI to measure team innovation climate (Aarons & Sommerfeld, 2012; Ceschi, Dorofeeva, & Sartori, 2014; Eisenbeiss, van Knippenberg, & Boerner, 2008; Farnese & Livi, 2016).

The Climate for Innovation Scale. The most frequently used measure of organizational innovation climate is the 22-item Climate for Innovation Scale developed by Scott and Bruce (1994) to capture employees' perceptions of the organizational innovation climate. Our analysis found 7 of the 20 studies which focused on innovation at the organizational level used the Climate for Innovation Scale. Based on the support for innovation scale developed by Siegel and Kaemmerer (1978), it is made up of two key dimensions, namely support for innovation and resource supply. Support for innovation comprises 16 items that capture the degree to which employees view the organization as being open to change, supportive of new ideas, and tolerant of member diversity, while resource supply comprises 6 items that capture the degree to which resources are perceived as being adequate in the organization. Although most research has utilized the 22-item scale (Dhar, 2015; Sarros *et al*., 2008), some have used shorter versions of the scale (Chan, Liu, & Fellows, 2014; Jaiswal & Dhar, 2015; Khalili, 2016) or integrated items from Scott and Bruce (1994) into their own scale (Kang, Matusik, Kim, & Phillips, 2016; Kang, Solomon, & Choi, 2015).

Other scales. Researchers have utilized a number of other scales to measure team innovation climate, either developing their own scales or drawing on scales developed by others.

Methodological concerns

Our review identified a number of methodological concerns with prior research. The first relates to a lack of consistency as to how innovation climate has been measured in prior work. Although the TCI and the Climate for Innovation Scale have been the most widely used scales to measure innovation climate at the team and organizational levels, they have not been consistently used in previous work. For example, researchers have developed their own scales of team and organizational innovation climate without providing adequate theoretical rationale and explanation of the validation process (e.g., Sung & Choi, 2014; Van Der Vegt, Van De Vliert, & Huang, 2005), or used abbreviated versions of the TCI or Climate for Innovation Scale without explaining why the full or short form of the scale was not used (Chan *et al.*, 2014; Jaiswal & Dhar, 2015; Khalili, 2016; Panuwatwanich *et al.*, 2008). In future work, we recommend researchers use validated forms of the TCI or Climate for Innovation Scale, as these measures have been developed based on sound theoretical reasoning and validated in prior research.

The second concern relates to our observation that a significant proportion of studies examining organizational innovation climate have measured it at the individual level of analysis (i.e., captured employees' perceptions of the innovation climate in their organizations) rather than aggregating such perceptions to the organizational level to produce a more objective measure of climate. Given innovation climate was originally conceptualized as a variable which captures employees' shared perceptions, future work should examine whether innovation climate meaningfully exists at the organizational level of analysis.

Our final concern relates to the potential overlap between measures of innovation climates and related constructs at both the team and organizational levels. To address such concerns, we call on researchers to conduct empirical work to demonstrate the discriminant validity between team innovation climate and related constructs such as creative climate (Ekvall, 1996; Ekvall *et al.*, 1983), climates for initiative and psychological safety (Baer & Frese, 2003), and proactive climate (Fay *et al.*, 2004), and whether they predict similar or different outcomes. In particular, we call on researchers to do more empirical work to distinguish between innovation and creative climates, in the light of recent empirical work on creative climate (e.g., Sung, Du, & Choi, 2018), which has used a subset of items from Scott and Bruce's (1994) measure of innovation climate that focus more on support for coming up with creative ideas rather than the implementation of creative ideas into practice (innovation).

Innovation climate research findings

Having outlined the way in which researchers have conceptualized innovation climate and discussed the methodological concerns with regard to the measures in use, we will now provide detail about the findings with regard to the concept of innovation climate. Figure 3: overview of innovation climate research provides a visual representation of the key themes within the research and a foundation for the following discussion about the antecedents and outcomes of innovation climate. In addition, the distinction is drawn

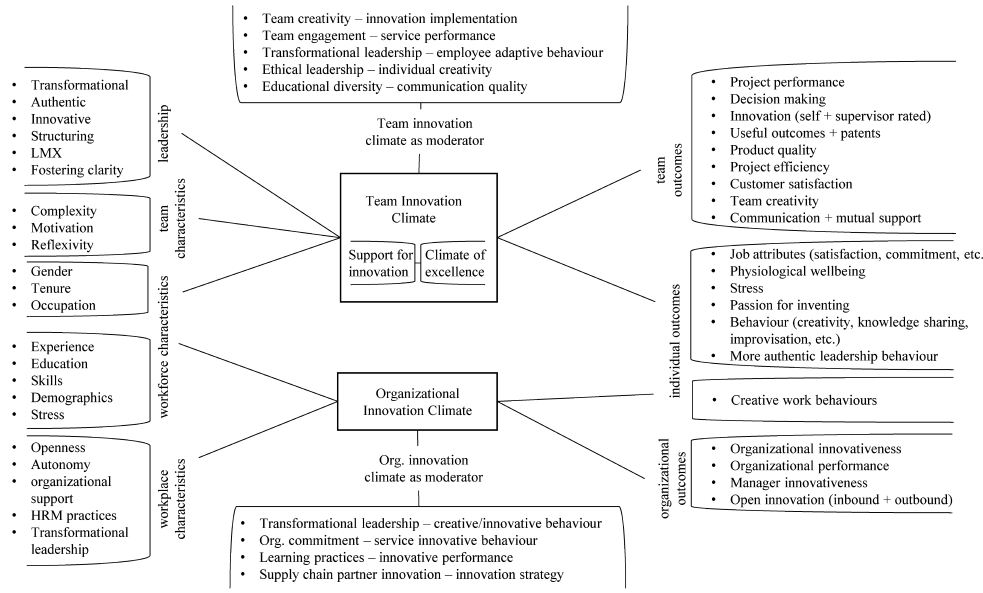

Figure 3. Overview of innovation climate research

between research related to the team-level innovation climate and the organizational-level innovation climate to establish these as distinct facets.

Antecedents of innovation climate

Leadership

Out of all leadership styles, transformational leadership has been the most widely investigated as an antecedent of innovation climate at the team level. For example, researchers have consistently found that transformational leadership (and its sub-dimensions) fosters higher levels of team innovation climate (Eisenbeiss *et al.*, 2008; Jaiswal & Dhar, 2015; Pirola-Merlo, Hartel, Mann, & Hirst, 2002; Sun, Xu, & Shang, 2014). In addition, recent work has found that the employee's social identity mediates the transformational leadership/team innovation climate relationship (Cheng, Bartram, Karimi, & Leggat, 2016). Researchers have also begun to examine the specific circumstances in which transformational leadership is related to team innovation climate. For example, Aarons and Sommerfeld (2012) found that while transformational leadership predicted higher levels of team innovation climate during implementation, leader–member exchange predicted higher levels of team innovation climate after implementation.

Researchers have also found that leadership approaches including authentic leadership (Edú-Valsania, Moriano, & Molero, 2016), leadership for innovation (Panuwatwanich *et al.*, 2008), structuring leadership (Pei, 2017), and leadership which fosters clarity (West *et al.*, 2003) enhance team innovation climate. In addition, Dackert, Loov, and Martensson (2004) found a positive relationship between a leadership style that combines employee and change orientation and team innovation climate. However, researchers have also investigated whether team innovation climate may also foster positive leadership behaviours. Drawing on time-lagged data, Kinnunen, Feldt, and Mauno

(2016) found that authentic leadership did not foster team innovation climate, but team innovation climate led to the display of greater authentic leadership from the leader.

At the organizational level, researchers have also looked at whether transformational leadership fosters an innovation climate. For example, based on the theoretical linkages between transformational leadership and innovation, Moolenaar, Daly, and Sleegers (2010) found that the transformational leadership of a school principal was positively related to their school's innovative climate and that this relationship was mediated by the principal's work-related network centrality, defined as the speed by which he/she can reach all team members in their social network. Sarros *et al*. (2008) found that two key dimensions of transformational leadership were positively related to innovation climate, namely articulating the vision and providing individual support, and that a competitive, performance-oriented organizational culture mediated the relationships between these dimensions and innovation climate. Other studies have compared the predictive validity of transformational leadership compared to other leadership styles in fostering an innovation climate at the organizational level. For example, drawing on expectancy theory, Kang *et al*. (2015) found that while the CEO's transformational leadership influenced innovation climate, transactional leadership did not. Chan *et al*. (2014) found that while the CEO's transformational leadership was positively related to innovation climate, development exchange leadership was negatively related.

Team characteristics

Researchers have begun to examine the influence of team factors other than leadership on team innovation climate. Drawing on socio-technical system theory (Emery & Thorsrud, 1982) and input–process–output theories of group effectiveness (Hackman & Oldham, 1980), Antoni (2005) found that teams with complex task structures have a stronger team innovation climate. Mathisen *et al*. (2008) found a positive relationship between mean levels of associative orientation in the team and innovation climate. They also found higher levels of team innovation climate in teams characterized by high levels of motivation and ambition. Finally, Farnese and Livi (2016) found that team reflexivity was positively related to the support for innovation dimension of team innovation climate.

Other antecedents

Researchers have investigated a number of other antecedents of organizational innovation climate. Drawing on status characteristics theory (Berger & Zelditch, 1985; Ridgeway, 1991), Van Der Vegt *et al*. (2005) found that demographic diversity within organizations in relation to organizational tenure and functional background was negatively (positively) related to organizational innovation climate in high (low) power distance cultures. Similarly, Goh, Eccles, and Steen (2009) found that gender, tenure, and occupation predicted individuals' perceptions of team innovation climate in general medical practices. Siemon *et al*. (2015) found no difference in perceptions of team innovation climate between nurses in states with professional certification programmes and those without. Heponiemi *et al*. (2012) found no differences between levels of team climate amongst nurses working in for-profit and not-for-profit organizations.

Using Organ's (1997) construct of organizational citizenship behaviour (OCB), Turnipseed and Turnipseed (2013) found no evidence of a positive relationship between OCBs and organizational innovation climate. They argued that individuals who typically engage in OCBs might not necessarily respond positively to a climate that supports

innovation. Länsisalmi and Kivimäki (1999) found that employees with high levels of stress perceived the organization to be less supportive of innovation than those with low levels of stress. In other work, researchers found that commitment-based human resources practices were positively linked to innovation climate (Popa, Soto-Acosta, & Martinez-Conesa, 2017).

Researchers have also begun to examine the influence of organizational culture and organizational change on team innovation climate. For example, Bosch, Dijkstra, Wensing, van der Weijden, and Groll (2008) found no link between organizational culture and team innovation climate. Dackert, Brenner, and Johansson (2002) found that after work teams had merged together in an organization, two dimensions of team climate (participative safety and support for innovation) were lower but vision was higher. Other work has also found that the attitudes of care staff towards professionals at work predicted their perceptions of team climate (Rose, Ahuja, & Jones, 2006).

Finally, researchers have examined whether team innovation climate can be developed (Kirsten & Du Preez, 2010). Kirsten and Du Preez (2010) found that a team development intervention fostered the development of team innovation climate.

Outcomes of innovation climate

Individual-level outcomes

Researchers have begun to examine the influence of both team and organizational innovation climate on employees' work attitudes and behaviours. They have found strong links between team innovation climate and employees' job attitudes, including job and patient satisfaction (Antoni, 2005; Proudfoot *et al*., 2007), job engagement (Lee & Idris, 2017), intention to leave (Kivimäki *et al*., 2007), organizational commitment (Antoni, 2005), and attitudes towards evidence-based practice (Aarons & Sommerfeld, 2012). They have also found a positive relationship between team innovation climate and the psychological well-being of employees (Rose *et al*., 2006), and a negative relationship between team innovation climate and different measures of occupational stress and strain (Dackert, 2010; Elovainio, Kivimäki, Eccles, & Sinervo, 2002). Elovainio *et al*. (2002) also found that procedural justice mediated the relationship between team innovation climate and occupational strain.

A strong positive relationship has also been found between team innovation climate and employee behaviours such as their creative behaviour (Jaiswal & Dhar, 2015), innovative behaviour (Antoni, 2005; Bain, Mann, & Pirola-Merlo, 2001), use of guidelines (Elovainio *et al*., 2000), and knowledge sharing behaviours (Edú-Valsania *et al*., 2016). Extending this work, Kang *et al*. (2016) found that team innovation climate fostered employee innovative behaviour through enhancing their passion for inventing, and as the proactive (risk-taking) climate increased the relationship between innovative climate and passion for inventing (employee innovation) became stronger. Magni, Palmi, and Salvemini (2018) found that team innovation climate fostered improvisation by enhancing individuals' proactive and risk-taking attitudes. Shaw, Minoudis, Hamilton, and Craissati (2011) found a positive relationship between two facets of team climate (participative safety and vision) and staff competency. However, support for innovation and task orientation and staff competency were not significantly related to staff competency. Meta-analytical work has also found a strong link between three key dimensions of team innovation climate (vision, support for innovation, and task orientation) and employees' creativity and innovative behaviour (Hulsheger *et al*., 2009). However, the link between participative safety and creativity/innovative behaviour was not significant. A strong

negative relationship has also been found between team innovation climate and employees' turnover behaviour (Kivimäki *et al.*, 2007).

Empirical work has also begun to examine the boundary conditions of the relationship between team innovation climate and creative behaviour. For example, Jaiswal and Dhar (2015) found that employees with high creative self-efficacy exhibited higher levels of creative behaviour when working under a supportive team innovation climate.

In addition, researchers have found a strong relationship between employee perceptions of the organizational innovation climate and their work behaviours such as creativity (Chang, Chuang, & Bennington, 2011; Hsu & Fan, 2010) and innovative behaviour (Hsu & Chen, 2015; Hsu & Fan, 2010; Park & Jo, 2018; Ren & Zhang, 2015; Yu, Yu, & Yu, 2013). However, although Hsu and Fan (2010) found significant relationships between employee perceptions of the organization's innovation climate and both their creativity and innovative behaviour, they also established that the relationships were stronger when time pressure was lower. Similarly, although Ren and Zhang (2015) found significant relationships between employee perceptions of the organization's innovation climate and their innovative behaviour, they also established that the relationship was weaker in the presence of high hindrance stressors.

Team level outcomes

Growing research has linked team innovation climate to team performance outcomes. For example, both Bain *et al*. (2001) and Pirola-Merlo (2010) found a strong relationship between three facets of team innovation climate (participative safety, support for innovation, and task orientation) and project performance. Similarly, adopting a longitudinal design Ceschi *et al*. (2014) found strong effects of team innovation climate on the decision-making performance of teams. Both Pirola-Merlo *et al*. (2002) and Sun *et al*. (2014) found a strong relationship between team innovation climate and the performance of research and development teams. Agrell and Gustafson (1994) found a strong link between team innovation climate and team production performance. Other work only found a strong relationship between team innovation climate and performance of teams in the banking sector when climate strength was strong (González-Romá, Fortes-Ferreira, & Peiró, 2009). Finally, Mathisen *et al*. (2004) found a strong link between team innovation climate and customer satisfaction.

The innovative outcomes of team innovation climate have also been widely studied. Pirola-Merlo (2010), for example, found a positive relationship between the team innovation climate dimensions of support for innovation and vision, and the project innovation of R&D teams. Similarly, examining the relationship between the different facets of team innovation climate and team innovation, Burningham and West (1995) found support for innovation and vision to be key predictors of external ratings of group innovativeness. In addition, they also found aim for excellence (a subscale of task orientation) to predict group innovation. West and Anderson (1996) examined the link between a number of dimensions of team innovation climate and innovation outcomes. They found a strong link between support for innovation and both overall innovation and innovation novelty, and a strong link between participation safety and both number of innovations and team reports of innovation. Mathisen *et al*. (2008) found a strong link between team innovation climate and both employee and supervisor rated measures of team innovation. Similarly, Bower, Campbell, Bojke, and Sibbald (2003) found a positive relationship between team innovation climate and self-reported team innovation. Bain *et al*. (2001) examined the relationship between team innovation climate and innovation

outcomes amongst R&D teams and found a strong relationship between innovation climate and the number of patents, number of useful outcomes, and number of creative outcomes. They also found that while teams working on research projects typically had more creative outcomes, those working on development projects had more useful outcomes. They also found that the strongest dimensions of team climate that promoted innovation outcomes were support for innovation and task orientation. Meta-analytical work has also confirmed that three key dimensions of team innovation climate (vision, support for innovation, and task orientation) more strongly influence innovation outcomes at the team rather than the individual level of analysis (Hulsheger *et al.*, 2009). As at the individual level, the link between participative safety and team innovation was not significant.

Researchers have also begun to examine other outcomes of team innovation climate. For example, Weiss, Hoegl, and Gibbert (2011), drawing on research on financial resource scarcity (Hoegl, Gibbert, & Mazursky, 2008) and the 'path of least resistance' work by Ward (1994), found that team innovation climate predicted higher levels of product quality and project efficiency, but only in projects where there were financial resource constraints. Pei (2017) found a strong relationship between team innovation climate and team creativity. Agreli, Peduzzi, and Bailey (2017) found that in teams in which team climate was stronger, they reported higher levels of communication and mutual support. Although, Bower *et al*. (2003) and Cramm, Strating, and Nieboer (2014) found a strong link between team innovation climate and quality of care provided to patients in general medical practices and chronic care, respectively, Goh *et al*. (2009) found no link between team innovation climate and quality of care provided to patients in general practice. In addition, Bosch *et al*. (2008) found no link between team innovation climate and health outcomes amongst diabetes patients in general practices.

Organizational-level outcomes

Although researchers have begun to examine the link between innovation climate and organizational outcomes, this research is limited compared with that on individual- and team-level outcomes. Researchers have begun to look at the link between organizational innovation climate and organizational innovation. For example, Shanker, Bhanugopan, Van der Heijden, and Farrell (2017) found that the organizational innovation climate fostered organizational innovation through heightening employees' innovative behaviour. Panuwatwanich *et al*. (2008) found that employees' perceptions of team innovation climate positively influenced innovation diffusion outcomes through heightening their perceptions of the organizational culture for innovation. They also found that innovation diffusion outcomes were positively related to employees' perceptions of organizational performance. Similarly, Farnese and Livi (2016) found that the support for innovation dimension of team innovation climate was positively related to organizational innovativeness. King, de Chermont, West, Dawson, and Hebl (2007) examined the relationship between organizational innovation climate and organizational performance. They found that organizational innovation climate buffered against the negative effects of work demands on organizational performance. Kang *et al*. (2015) found a positive relationship between organizational innovation climate and the innovative behaviours of managers who reported directly to the CEO. Finally, Popa *et al*. (2017) found that a positive relationship between the organizational innovation climate and both inbound and outbound open innovation.

Innovation climate as a moderator

Empirical research has begun to examine the moderating effects of innovation climate on relationships between its antecedents and outcomes at different levels of analysis. One stream of research has examined whether team innovation climate strengthens the effects of team-level characteristics on innovation outcomes at both the team and individual levels. For example, by utilizing the interactionist model of creativity (Woodman & Schoenfeldt, 1990) and the input–process–output model for team effectiveness (McGrath, 1984), Somech and Drach-Zahavy (2013) found that team creativity only enhanced innovation implementation when team innovation climate was high. Based on aspects of the job demands–resources model (JDR model) (Bakker & Demerouti, 2008; Bakker, Demerouti, & Sanz-Vergel, 2014) and person–situation interactionism (Mendoza-Denton, Ayduk, Mischel, Shoda, & Testa, 2001), García-Buades, Martínez-Tur, Ortiz-Bonnín, and Peiró (2016) found that the relationship between team engagement and service performance was stronger when team innovation climate was higher. Charbonnier-Voirin, El Akremi, and Vandenberghe (2010) established that the influence of transformational leadership on employees' adaptive performance was stronger when team innovation climate was higher. Chen and Hou (2016), based on social learning theory (Bandura, 1997), found that the indirect effect of ethical leadership on individual creativity via voice behaviour was stronger when team innovation climate was higher. Valls, Gonzalez-Roma, and Tomas (2016) established that when team innovation climate was higher, the influence of team educational diversity on team communication quality was stronger and the influence of team educational diversity on team performance through team communication quality was also higher. Underpinning this study was the categorization–elaboration model (CEM; van Knippenberg, De Dreu, & Homan, 2004), which posits that the information/decision-making perspective and social categorization perspective can jointly be used to predict effects of diversity.

Another research stream has focused on whether employees' perceptions of the organizational innovation climate influence the extent to which their perceptions and attitudes influence innovation outcomes. For example, Khalili (2016) found that the influence of employees' perceptions of transformational leadership on their creativity and innovative behaviour was stronger when they held more positive perceptions of the organizational innovation climate. Dhar (2015) found that the relationship between employees' organizational commitment and service innovative behaviour was stronger when their perceptions of the organizational innovation climate were stronger.

Finally, researchers have also examined whether organizational innovation climate amplifies the influence of organizational practices on organizational outcomes. For example, Sung and Choi (2014) found that that the positive relationship between interpersonal and organizational learning practices and innovative performance was stronger when organizational innovation climate was higher. Oke, Prajogo, and Jayaram (2013) found that that organizational innovation climate amplified the moderating effects that the possession of strategic relationships with key supply chain partners had on the relationship between supply chain partner innovativeness and innovation strategy.

Interactive effects of different dimensions of innovation climate

Researchers have also begun to examine how different dimensions of team innovation climate interact to predict innovation outcomes. Eisenbeiss *et al*. (2008) examined the interactive effects between support for innovation and climate of excellence (task orientation). They found that support for innovation only enhanced team innovation

when climate for excellence was high. Despite this initial work, there has been a lack of other work looking at the interactive effects of different dimensions of innovation climates on innovation outcomes.

Agenda for future research

Our review has highlighted a growing body of research on innovation climate within an organizational context. Although researchers have turned their attention to the outcomes of both team and organizational innovation climate, research on their antecedents is limited and scant attention has been paid to the boundary conditions between innovation climate and the antecedents and outcomes. As discussed previously, our review of the literature also highlighted key methodological concerns with prior work including the predominant use of cross-sectional research designs and inconsistencies in the ways in which innovation climate has been measured.

In addition, innovation climate research has not typically drawn on theory to explain the hypothesized relationships apart from a few researchers who utilized leadership (e.g., Bass, 1985) and team effectiveness theories (e.g., McGrath, 1984) in developing a theoretical framework. As we will discuss, researchers should draw on a wider range of theoretical perspectives to more fully explain how innovation climate develops and influences key outcomes of interest.

Opportunities for theoretical advancement

Person–situation theories. To further our understanding of the situations in which innovation climate is more likely to foster positive workplace outcomes for employees, we call on researchers to build on extant work by incorporating prominent person–situation theoretical perspectives. For example, we suggest the utilization of trait activation theory (TAT) (Tett & Guterman, 2000). According to TAT, traits are expressed as responses to trait-relevant situational cues in which behaviours can be traced back to personality traits and situations (Tett & Guterman, 2000). By focusing on this link, future research may use TAT to examine the relationship between personality traits on employee work attitudes and behaviours, and the situational cues that mediate or moderate the relationship. This theory, therefore, provides an explicit mechanism for explaining why employees may respond differently to various organizational climates, industries, countries, as well as other situational factors. Utilizing TAT, prior work has confirmed that the influence of organizational or team climate on employee behaviours is accentuated when employees exhibit certain personality traits (e.g., Byrne, Stoner, Thompson, & Hochwarter, 2005).

In addition, researchers may also consider drawing on attraction–selection–attrition (ASA) theory, to understand how employees' respond differently to innovation climates (Ployhart, Weekley, & Baughman, 2006). According to ASA theory, an individual's preferences for particular organizations are based upon an implicit estimate of the congruence between their own personal characteristics and the attributes of potential work organizations (i.e., their levels of organizational fit). Under this theory, we might expect employees who have an intrinsic need to be innovative to be attracted by organizations with a visibly strong innovation climate (e.g., Apple). Given the ongoing challenge to attract and retain talented employees, research might investigate the linkages between innovation climate, organizational identity and the attraction of innovative employees.

Regulatory focus theory. Researchers might consider drawing on regulatory focus theory (Higgins, 1998) to examine the influence of a leader's regulatory focus on innovation climates within organizations and teams. Regulatory focus theory highlights the motivational and strategic tendencies that people draw on to obtain their goals (Brockner, Higgins, & Low, 2004). It suggests that people adopt either a promotion focus, that is, focus on maximizing gains, or a prevention focus, that is, focus on minimizing losses. We might expect innovation climates to be stronger in organizations and teams where the leader has a promotion focus as such a leader stresses the need for employees to explore new opportunities and achieve new things. In contrast, we expect innovation climates to be weaker in organizations and teams where the leader has a prevention focus as such a leader focuses on minimizing losses that may occur through taking risks and experimentation with new things.

Situational strength theory. Situational strength has been defined as cues, either implicit or explicit, which external entities provide with regard to the desirability of potential behaviours (Meyer, Dalal, & Hermida, 2010). An environment where there are unambiguous cues, clear behavioural expectations, and incentivized compliance may be labelled a strong situation (Smithikrai, 2008). According to situational strength theory, climate strength is conceptualized as the degree of alignment in organizational members' perceptions of climate (Lindell & Brandt, 2000; Shin, 2012). There is growing evidence that climate strength moderates the relationship between climate and its outcomes (Schneider *et al.*, 2002). In other words, the effects of organizational climates on outcomes are augmented in strong climates and attenuated in weak climates. For example, Colquitt, Noe, and Jackson (2002) examined the moderating effect of climate strength on the relationship between justice climate and team performance, and concluded that the relationship is stronger when climate strength is high. Similarly, Shin (2012) studied the moderating effect of climate strength on the relationship between ethical climate and collective OCB. In line with these findings, we might similarly expect that the strength of the innovation climate will accentuate the influence of innovation climate on work outcomes. In other words, where there are high levels of agreement between employees as to the strength of the innovation climate, the effects of innovation climate on employees' outcomes will be stronger.

Future research might also draw on SST to examine whether a strong innovation climate may neutralize the likelihood that individuals, with certain personality traits, will be less likely to engage in innovative behaviour, through providing clarity over what behaviours are expected and reducing situational ambiguity.

Social information processing theory. One theory that helps explain how work climates influence work outcomes is social information processing theory (SIPT) (Salancik & Pfeffer, 1978). Underpinning SIPT is the assumption that individuals use the social information which they obtain from their work environment in order to adapt their behaviours to that environment. In other words, social information helps individuals ascertain appropriate ways to behave by providing them with cues to interpret the social context in which they work (Boekhorst, 2014).

Based on the SIPT, we would expect the innovation climate to act as a source of information which guides employees as to what constitutes appropriate behaviour in the team or organizational context, especially in relation to the development and

implementation of new ideas in the workplace. More specifically, we would expect an innovation climate to provide cues to employees that the development and implementation of new ideas at work are valued and prioritized by the leader of the organization more generally. SIPT theory can also be drawn on to explain how organizational practices and leadership influence work outcomes through fostering innovation climate at the organizational and team level.

Similarly, we expect that social capital – which may be developed through an organization's human resource policies and practices – may provide an interesting area for further exploration of innovation climate. For example, drawing on the work done by Soo, Tian, Teo, and Cordery (2017) on the role of intellectual capital in the development of absorptive capacity and the mediating role of absorptive capacity on innovation, researchers may explore the role of social capital in the perceptions of innovation climate at both the team and organizational levels. We suggest that the building of social capital through collaborative work environments will increase levels of trust, cooperation, and knowledge sharing with a positive impact on innovation climate within an organization.

Opportunities for Empirical Advancement

In addition to the opportunities for theoretical advancement, we also highlight prospective areas for empirical advancement. We suggest that studying these would not only contribute to a richer understanding of innovation climate from a theoretical perspective, but also provide practical insight.

Team composition and innovation climate. As highlighted in our review, comparatively limited research has examined the team-level antecedents of innovation climate. In particular, we have little understanding as to how team composition influences innovation climate at the team and organizational levels. As such, we call for more work to examine the link between different team composition and innovation climate. In line with the upper echelons theory (Hambrick & Mason, 1984), which states that the managerial background characteristics of the top management team play an important role in determining organizational outcomes, we might expect different facets of team composition such as team diversity, team fault lines, and team personality to influence organizational innovation climate. Similarly, at lower organizational levels, we may expect different facets of team composition to influence team innovation climate. For example, at both the TMT and lower organizational levels, we might expect teams composed of members with high levels of openness to experience and extraversion to have stronger innovation climates as in such teams there will be greater communication and information sharing between team members. In the light of work that suggests that team diversity exerts a positive influence on innovation outcomes (e.g., Talke, Salomo, & Kock, 2011), we might also expect a strong relationship between the functional and demographic diversity within the team and innovation climates.

Negative effects of innovation climate. While researchers have paid considerable attention to the benefits of innovation climate in enhancing innovation-related outcomes, very few have focused on their negative consequences (Janssen, Van de Vliert, & West, 2004). Although individuals and groups undertake innovative activities with the intention of deriving positive benefits from these activities (West & Farr, 1989), innovation

processes are unpredictable, controversial, and may be in competition with alternative courses of actions (Kanter, 1988). As a consequence, innovation is characterized by risky work behaviours that may lead to unintended costs for innovators despite their well-meaning intentions.

Thus, apart from focusing on the benefits of innovation climate, research is needed to identify the costs and potential negative impacts of these climates. For example, a strong innovation climate may lead employees to develop negative emotions or other attitudinal responses such as a passive attitudes, insecurity, stress, cognitive dissonance, animosity, and negative feelings about relationships with co-workers and supervisors (Janssen, 2003), especially for employees with low levels of creative self-efficacy. Moreover, in organizations with a strong innovation climate, there might be higher levels of factionalism between groups within the organization as they compete for access to resources in order to innovate. This may result in greater conflict between different parts of the organization and ultimately negatively influence organizational performance.

Incorporating a dynamic perspective to studying innovation climate. Our review identified only a limited number of empirical studies that have utilized longitudinal data to study innovation climate. Although researchers have begun to draw on longitudinal data to examine the effects of innovation climate on team-level outcomes (e.g., Ceschi *et al.*, 2014; Pirola-Merlo, 2010), this work does not fully explain why innovation climates change over time, or the causal relationship between innovation climate and other related variables. Given that organizations are not static entities, and organizational climates are likely to change over time, we advocate the use of dynamic approaches to study how innovation climate develops and influences organizational outcomes. Researchers should not only consider how innovation climate evolves within organizations as a result of organizational practices and leadership, but also investigate the influence of exogenous 'jolts' (Meyer, 1982) on innovation climate such as the introduction of disruptive technologies in particular industries or the impact of mergers and acquisitions.

The influence of cultural and institutional factors on innovation climate. Our review highlighted a lack of research examining the influence of cultural or institutional context on innovation climate. This is surprising given that research has shown that innovation rates differ considerably between societal contexts (Jones & Davis, 2000; Shane, 1995; Taylor & Wilson, 2012). We call on researchers to examine how societal culture (e.g., cultural dimensions such as collectivism and power distance) and institutional development (e.g., ease of starting a business, levels of intellectual property protection, and levels of corruption) influence the prevalence of innovative climates in organizations. For example, drawing on Hofstede's (2001) cultural dimensions framework, we might expect organizational climates that support innovation to be less prevalent in high power distance cultures, as such cultures stress the need to maintain control through organizational hierarchies and rules over encouraging individuals to experiment, and are therefore less likely to create climates which are conducive to innovative activity. Similarly, as prior empirical work has found innovation rates to be higher in cultures low in uncertainty avoidance and high in individualism (Jones & Davis, 2000; Shane, 1995; Taylor & Wilson, 2012), researchers may also examine whether innovation climates are more prevalent in such cultures.

As well as investigating the influence of cultural dimensions, researchers may also investigate whether levels of institutional development predict the existence of innovation climate. Drawing on institutional theory, which purports that organizations conform to the coercive, normative, and mimetic pressures that surround them in order to develop legitimacy (DiMaggio & Powell, 1983; Scott, 2001), researchers may examine how both formal and informal institutions impact on innovation climate across different countries and regions. We might expect there to be a greater prevalence of innovation climates in locations where there are lower levels of government bureaucracy, where there are higher levels of legal protection for businesses and where there are lower levels of corruption, as such factors are likely to support the development of an innovation climate. We might also expect there to be a greater prevalence of innovation climates in high-technology zones such as Silicon Valley, as organizations in such locations strive to develop a climate where innovation in supported in order to be seen as legitimate by competitors operating in the same industrial sector.

Researchers may also examine the influence of the industrial sector in which organizations operate on the innovation climate within organizations. We might expect innovation climate to be more prevalent in the so-called 'creative industries' such as advertising and architecture where success depends on not only the development of creative concepts but the implementation of these ideas, that is, innovation. In contrast, in industries where employees are given little discretion and required to do mundane structured tasks such as in call centres (Fleming & Sturdy, 2010; Taylor & Bain, 1999), we might expect there to be a lower prevalence of innovation climate.

The potential role of field experiments. As we have eluded, much work is required to advance our understanding of the boundary conditions of innovation climate, with a particular focus on the antecedents and outcomes. We believe that the role of experimentation in the form of potential 'what-if' scenarios would be particularly powerful in this regard. Teams and organizations are complex structures influenced not only by cultural and institutional factors as mentioned prior, but also a plethora of organizational factors including organizational form and relations of power, that also have been found to exert substantial influence on strategic decisions associated with innovation. The use of experiments can help tease out more nuanced understandings of the effects of innovation climate in the context of different organizational settings beyond the usual suspects, such as how does a climate for innovation play out in highly hierarchical organizations with strong, bureaucratic structures and relations of power.

Practical implications

Our review provides a number of practical implications. In particular, our findings suggest it is critical for organizations who wish to foster innovation at different organizational levels to support the development of innovation climates at the team and organizational levels. Our review highlights a number of ways in which this could be done. First, our review highlights the importance of leadership, especially transformational leadership, in facilitating innovation climates at both the team and organizational levels. As such organizations should consider providing training for leaders into how to support innovation through behaviours such as role-modelling innovative behaviours to their subordinates, providing individualized support to their subordinates and articulating a vision. Second, our review highlights the importance of team characteristics in facilitating

an innovation climate within teams. In particular, our review draws attention to the need for managers to encourage their team members to be reflexive, ambitious, and motivate one another. This could be done through team building exercises and planning sessions where teams set common goals and reflect on their previous experiences. Similarly, the review also highlights the need for managers who wish to develop an innovation climate within their team to design team tasks that are complex and challenging. As this may be challenging for managers who come from a technical background, organizations should consider providing training for managers around how to best structure team tasks to motivate employees to be innovative together. Finally, our review suggests that diversity is a key antecedent of innovation climate at the team and organizational level, especially in low power distance cultures. As such, we recommend organizations, especially those in low power distance cultures such as the United States, Germany, and the United Kingdom integrate diversity into hiring practices and ensure teams are as diverse as possible in skills, education, experiences, and demographics. At the same time, organizations should provide managers with training as to how best to manage diversity and deal with issues that may arise from managing a diverse workforce.

Conclusion

The present study conducted a systematic review of empirical research on innovation climate. We have examined how innovation climate has been defined and measured in previous research, and reviewed extant work on its antecedents and outcomes, and studies in which innovation climate was treated as a moderator. While we believe that our review makes an important contribution to the study of innovation climate, some limitations of the review need to be raised. First, we have limited our review papers to those that were written in English and acknowledge that this might have excluded some important studies. However, future work could extend the review to incorporate additional non-English papers. Second, we focused on studies that looked at one specific work climate within organizational contexts, the innovation climate, and did not look at other work climates that support innovation such as climates for initiative, psychological safety and implementation (e.g., Baer & Frese, 2003). In future, researchers might undertake work that examines similarities and differences in the antecedents and outcomes of different work climates.

Notwithstanding these limitations, the present research study has made an important contribution by identifying key gaps in the literature and advancing a future research agenda for theoretical and empirical advancement.

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