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The impact of psychological climate on employees' innovative use of information systems: The moderating role of goal orientation

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ABSTRACT

The objectives of this study are to investigate climates that could facilitate innovative use of information systems (IS), and to examine how psychological climate and individual goal orientation interact to promote employees' innovative IS use. A total of 174 questionnaires were collected from enterprise resource planning (ERP) users from nine firms in China. Hierarchical regression analysis was used to test the research hypotheses. The empirical results suggest that (1) psychological climates (psychological autonomy climate and psychological innovation climate) are positively associated with IS users' innovative use, (2) avoidance orientation weakens the relationship between psychological autonomy climate and innovative use, (3) learning orientation weakens the relationship between psychological innovation climate and innovative use, and (4) learning orientation strengthens the relationship between psychological autonomy climate and innovative use. This study contributes to IS literature by identifying psychological climate as a critical antecedent of innovative use. The findings also fulfil an identified need for more empirical studies of the combined effect of individual and environmental factors on employees' innovative behaviour in the workplace, especially in the context of IS innovation.

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1. Introduction

Firms have made huge investments in information systems (IS), as they expect IS to bring great economic benefits. However, research suggests that over 60% of IS implementations result in continuous underutilisation, thereby failing to meet expected investment returns (Veiga et al. 2014). The main reason for this is that, in most cases, employees operate at low levels of feature use and lack an innovative feature use (Li et al. 2013; Wang et al. 2014). To address the issue of underutilisation, employees are expected to use the IS in novel ways to perform new tasks or existing tasks in a different way, i.e. to conduct innovative IS use (Li et al. 2013). As technology and work become increasingly inseparable in modern organisations (Orlikowski and Scott 2008), innovative IS use has critical implications for employee performance (Burton-Jones and Straub Jr, 2006; Hsieh et al. 2011). Innovative IS use enables employees to discover and re-create meaningful applications to enhance their work productivity or optimise organisational processes (Ahuja and Thatcher 2005). Innovative IS use is suggested to be important in leveraging implemented systems and ameliorating low returns on IS investments (Jasperson et al. 2005; Li et al. 2013). Toward this end, it is urgent to explore critical antecedents of employees' innovative IS use or the underlying mechanisms that drive the innovation process.

There is a strong body of research that provides insights regarding the influence of individual factors or environmental factors on innovative IS use or intention to innovate (Ahuja et al. 2005; Li et al. 2013; Huang et al. 2018; Peng et al. 2018). However, the impact of employee users' goal orientation on their innovative usage behaviour has been largely neglected in prior research. Compared with mandatory usage in the adoption and implementation stage, innovative IS use is users' proactive behaviour in the assimilation stage, which will be influenced by users' goal orientation. Extending the findings of studies in the organisational behaviour field (|Hirst et al. 2011, 2009; Huang and Luthans 2015) that individual goal orientations are associated with employee creativity, we submit that employee goal orientations retain their influence in the IS innovation context. In recent five years, a few scholars have begun focusing on environmental factors, examining how the work environment facilitates users' IS exploration

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behaviour (Maruping and Magni 2012; Liang et al. 2015), which is a construct similar to innovative IS use. However, the attention paid to the influence of facet-specific climates on innovative IS use is limited. Extending the findings of Liang et al. (2015) that innovation climate and job autonomy drive employees' system exploration behaviour, we submit that innovation climate and autonomy climate are two relevant environmental factors that can facilitate employees' innovative IS use.

Although some factors, such as individual characteristics and climate factors, work together to enable innovative IS use and IS exploration, they are often examined separately (Li et al. 2013; Liang et al. 2015; Peng et al. 2018). The research focusing on the interaction effect of individual and environmental factors on innovative IS use is scant. However, the benefits of environmental factors may depend on the individual traits of employees in the organisation (Wallace et al. 2016), such as individual goal orientation, which makes employees more or less likely to experiment and innovate in the IS usage context. The person-context interaction perspective also indicates that the effect of a given contextual characteristic on innovation is a function of the employees' personal characteristics (Shalley et al. 2016). Drawing on climate theory and individual goal orientation theory, we develop a theoretical model to explain how individual difference factors in goal orientation interact with perceptions of climate to influence users' innovative IS use.

In this study, our objectives are to investigate appropriate climates that could facilitate employees' IS use innovation, and to examine whether and how psychological climate and individual goal orientation interact to shape employees' innovative IS use. We confirm that employee learning goal orientation positively moderates the relationship between an autonomy climate and innovative IS use and negatively moderates the relationship between an innovation climate and innovative IS use. Moreover, avoidance goal orientation negatively moderates the relationship between an autonomy climate and innovative IS use. Our study contributes to the literature in three ways. First, although individual factors and climate factors have each previously shown a relationship with IS exploration in isolation (Maruping and Magni 2012; Li et al. 2013; Liang et al. 2015; Huang et al. 2018), the combination of individual goal orientation and climate factors is a valuable extension of prior work to help explain how they operate in unison to facilitate IS innovation. Second, this study contributes to adaptive structuration theory (AST) by introducing the concept of individual goal orientation to the IS field and showing that individual differences in goal orientation may lead to variations in the effectiveness of climate factors to facilitate innovative use. Third, this study contributes to IS usage literature (Li et al. 2013; Peng et al. 2018) by identifying psychological innovation and autonomy climates as critical antecedents of innovative IS use. This is important because until recently, research on innovative use has primarily focused on individual factors (Li et al. 2013; Schmitz et al. 2016), but the attention paid to climate factors, especially facet-specific climates, has been limited.

The rest of the paper is organised as follows. In the next section, we develop our theoretical framework, which integrates adaptive structuration theory (AST) theory with the person-context interaction perspective. Subsequent sections consecutively develop a research model based on this framework, describe the construct operationalisation and data collection method, present the data analysis procedure and the results of the model testing, and discuss the findings and their theoretical and practical implications. This paper concludes with a discussion about our findings and directions for future research.

2. Theoretical background

2.1. Theoretical framework

The foundation of our theoretical framework comprises of two elements: the influence of climate factors and the moderating influence of employee goal orientations (see Figure 1). According to adaptive structuration theory (AST), an organisational environment can be a major structure that influences employees' interaction with technology (Schmitz et al. 2016). Thus, we argue that organisational climate affects employees' innovative IS use in the post-implementation stage. Based on the person-context interaction perspective, the effect of a given contextual characteristic on employee innovation is a function of the employee's personal characteristics (Shalley et al. 2016), such as employee goal orientation. If certain contexts 'match' individuals' personal characteristics

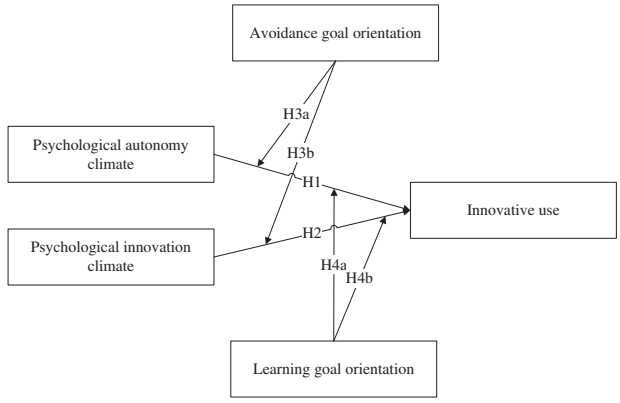

Figure 1. Theoretical model.

(e.g. employee goal orientation), this match results in high levels of employee innovation. Thus, we further argue that employee goal orientation moderates the relationship between climate factors and innovative IS use. Our theoretical framework is grounded in the proposition that employee goal orientation moderates the extent to which innovation and autonomy climates are associated with innovative IS use.

2.2. Innovative use and its antecedents

The concept of innovative IS use has existed in the information systems literature for over two decades, under different labels. For instance, Saga and Zmud (1993) distinguished between 'standardized use' or the use of IT in a standard and recurrent manner to accomplish organisational tasks quickly and to reduce variation in outcomes, and 'emergent use' or the use of IT in novel and innovative ways beyond what the system was originally intended. The concept of emergent use is similar to that of innovative use. Indeed, other authors since then have used terms 'innovative use' (Li et al. 2013; Roberts et al. 2016; Huang et al. 2018) and 'trying to innovate using IT' (Ahuja and Thatcher 2005), and 'innovation in IT use' (Nambisan et al. 1999) to convey the similar concept.

Innovative use describes a qualitatively post-acceptance IS usage behaviours performed by an employee to support his or her work (Li et al. 2013). It differs from routine use in how the employee uses the system. Innovative IS use reflects the degree to which a person differs from others in the way he or she uses a particular information system in post-adoptive scenario. An innovation is defined as 'an idea, practice, or object that is perceived as new by an individual or other unit of adoption' (Rogers 2010). Innovative use can therefore be defined as the use of IS in novel ways to perform new tasks or existing tasks in a different way (Li et al. 2013).

Researchers have examined the antecedents of IS users' innovative and exploratory usage behaviour. Some individual factors, such as absorptive ability, intrinsic motivation, self-efficacy, perceived usefulness, personal innovativeness, and prior information technology (IT) knowledge, are critical antecedents of IT users' innovation or exploration behaviour (Hsieh and Wang 2007; Liu et al. 2011b; Ke et al. 2012; Li et al. 2013; Wang et al. 2013; Schmitz et al. 2016; Peng et al. 2018). Recently, some scholars have begun to examine the impact of environmental factors, such as organisational or team climate, on IS users' innovative and exploratory usage behaviour (Maruping and Magni 2012; Liang et al. 2015). For instance, team learning climate and empowerment climate have been found to drive users to explore new systems (Maruping & Magni 2012, 2015). Innovation climate is positively associated with system exploration and extended use (Liang et al. 2010, 2015). Autonomy climate and job autonomy are considered a positive correlate of IS exploration or solution innovation (Ahuja and Thatcher 2005; Durcikova et al. 2011; Ke et al. 2012). Although these studies have greatly improved our understanding of innovative system use, they generally treat individual and environmental factors separately. Studies in the organisational field have called for an investigation of the interaction effect of individual and environmental factors to offer a more comprehensive understanding of employee innovation (Wallace et al. 2016; Anderson et al. 2014). To answer this call, we attempt to combine individual and environmental factors into a single model to generate new knowledge on innovative IS use.

2.3. Psychological climate

Climate is considered a manifestation of organisational culture that can be conceptualised as either an organisational or psychological (individual-level) variable (Durcikova et al. 2011; Durcikova and Fadel 2016). Carless (2004) suggested that psychological climate is an individual employee's perception and evaluation of their work environment, rather than the actual environment, and is directly linked to individual behavioural response. The concept of psychological climate is receiving increasing attention from IS researchers (Barkhi and Kao 2011; Durcikova et al. 2011; Kettinger et al. 2015; Wang et al. 2017) and is consistent with our focus on individual-level innovative behaviours. Thus, this study focuses on psychological climate at the individual level.

Climate is a broad construct with several sub-dimensions, such as innovation, safety, autonomy, and service (Maruping and Magni 2012; Durcikova and Fadel 2016). Recent research calls for attention to 'facet-specific climates' (Anderson et al. 2014), such as innovation, safety, and autonomy climates. Research has identified innovation and autonomy climates as most influential for systems exploration, which is similar to system innovation (Ahuja and Thatcher 2005; Maruping and Magni 2012; Liang et al. 2015). Thus, this study focuses on psychological innovation and autonomy climates.

2.3.1. Psychological innovation climate

According to research (Bock et al. 2005; Durcikova and Fadel 2016), a psychological innovation climate refers to the extent to which an employee believes that an organisational unit (e.g. a department or team) encourages innovative behaviour and has a high tolerance for associated risk. An innovation climate can

facilitate innovative behaviours, such as system innovation, in multiple ways. First, an innovation climate conveys social cues about an organisation's expectations and instrumentalities with regard to employees' innovative behaviour (Yuan and Woodman 2010), which can direct employees to regulate their behaviour to be more innovative. Specifically, an innovation climate conveys that innovative behaviour is expected, supported, desired and rewarded by the organisation, which provides motivation for employees to devote more effort to engaging in innovative behaviours (Bock et al. 2005; Liang et al. 2015). Second, an innovation climate can foster innovative behaviour by legitimising risk-taking (Yuan and Woodman 2010). Third, an innovation climate encourages experimentations and risk-taking by offering psychological safety for taking risks without fear of negative consequences (Edmondson 1999). Last but not least, an innovation climate encourages employees to communicate and discuss novel ideas (Liang et al. 2015). Long-term exposure to novel ideas can foster employees' learning and innovative thinking (Edmondson 1999).

2.3.2. Psychological autonomy climate

A psychological autonomy climate refers to an employee's perception of self-determination with respect to work procedures, goals, and priorities (Koys and DeCotiis 1991; Durcikova et al. 2011). According to self-determination theory (SDT), employees become more innovative in an environment that supports autonomy and recognises employees' feelings, incorporates their perspectives and provides them with job-related control and choices (Ryan and Deci 2000; Wallace et al. 2016). The main benefit of a high employee autonomy climate is that it allows employees the freedom to work autonomously (Butts et al. 2009; Liu et al. 2011a), which is conductive to employee innovation. In the organisational literature, the benefits of an autonomy climate for creativity and innovation have been discussed. For example, Liu et al. (2011a) emphasised the role of work-environment autonomy in improving creativity. Wallace et al. (2016) suggested that workplace climates characterised by high employee autonomy facilitate employee innovation at work, with thriving operating as an underlying mediating mechanism.

2.4. Individual goal orientation

According to achievement motivation theory, goal orientation is a motivational orientation that influences how individuals approach, interpret, and respond to achievement situations (Hirst et al. 2009; Rhee and Choi 2017). Goal orientation reflects both self-development beliefs and how these beliefs affect individuals' actions and reactions. It is a relatively stable individual trait (Nederveen Pieterse et al. 2013). There are two main goal orientations: learning goal orientation and performance goal orientation (Hirst et al. 2009). Learning goal orientation is associated with a focus on developing competence and task mastery. Learning goal orientation cultivates an intrinsic interest in the task itself, as challenging work provides a way to develop knowledge and increase competence. Individuals with high learning goal orientation are more likely to invest effort and persevere to complete complex tasks without extrinsic rewards (Hirst et al. 2009). Performance goal orientation can be divided into two categories: performance-prove orientation and performance-avoid orientation. Performance-prove orientation (hereafter prove orientation) encourages individuals to seek favourable judgements and demonstrate their competence to others, while individuals with performance-avoid orientation (hereafter avoidance orientation) focus on avoiding unfavourable competence judgements and performing worse than others (VandeWalle 1997; Rhee and Choi 2017).

Some studies have provided evidence that high learning goal orientation is more likely to lead to positive performance outcomes, such as employee innovation and creativity. For example, Janssen and Van Yperen (2004) found a positive relation between learning goal orientation and innovative behaviour. Hirst et al. (2009) found that learning goal orientation has a positive effect on creativity. Avoidance orientation is dysfunctional for numerous outcomes, because it is associated with negative motivations, such as fear of failure (Payne et al. 2007; Nederveen Pieterse et al. 2013). Employees with high avoidance orientation may focus on difficulties and task-irrelevant thoughts such as concerns about their perceived ability, instead of putting more effort into tasks (Hirst et al. 2011). This may lead to defensive behaviours such as task withdrawal or self-handicapping. Prove orientation is not so consistently related to positive or negative outcomes, and may have positive and negative effects (Payne et al. 2007). This may be because the focus on demonstrating competence to others may indicate lower motivation to engage with situations in which the likelihood of performing well is not particularly high (Elliot and Church 1997). This study focuses on the moderating effects of learning goal orientation and avoidance orientation, as we cannot determine the positive or negative effects of prove orientation.

2.5. The missing link in the literature

Although studies have investigated the factors that influence IS users' innovative behaviour, they have focused on individual-level factors, such as intrinsic motivation, absorptive ability, and self-efficacy (Li et al. 2013;

Huang et al. 2018). Yet, examining the usage behaviour of employees also requires consideration of environmental factors. The IS literature features a handful of studies exploring how climate factors (such as innovation climate and empowerment climate) influence IS users' exploration behaviour or intention to explore (Maruping and Magni 2012, 2015; Liang et al. 2015). However, this emergent body of work has not empirically examined the direct effect of climate factors on IS innovation. More empirical studies should investigate appropriate climates for enhancing employees' innovative IS use.

Another gap in the literature concerns how individual differences and organisational context interact to affect innovative IS use. Although some factors, such as individual traits, motivation, and job context, work together to enable innovative IS use, they are often examined separately. Few studies have examined the joint effect of individual traits and job context on employees' innovative use. Some scholars have called for attention to be paid to employee innovation by emphasising the interactions between individual and contextual factors (Anderson et al. 2014). Though studies in the organisational domain have investigated the influence of individual goal orientation on employee innovation and creativity (Hirst et al. 2009; Wallace et al. 2016), the impact of employees' goal orientation on their innovative IS use has not been explored. To fill these gaps in the literature, this study combines the theories of goal orientation and psychological climate, and attempts to investigate how individual differences in goal orientation and perceived psychological climate operate in conjunction to promote innovative IS use.

In this study, we develop six hypotheses to examine the effects of psychological climate on innovative IS use and the moderating effects of individual goal orientation on the relationship between psychological climate and innovative use. A questionnaire survey method is then used to examine the theoretical linkage between the constructs, as described in the following section.

3. Hypotheses

3.1. Psychological climate and innovative use

Over the past few decades, scholars have paid increasing attention to the impact of organisational climate on employee behaviour (Chen et al. 2013). In general, climate represents the social cues relating to organisational expectations for behaviour and its potential outcomes, which employees receive from their work environment (Scott and Bruce 1994). In the workplace, employees rely on these social cues to interpret events, form attitudes, and understand expectations with respect to their behaviour, then adjust their behaviour to fit the environment (Liang et al. 2015). Therefore, climate can affect employees' perceptions of organisational policies, procedures, and practises, and influence their attention and behaviour toward desired outcomes. In the IS context, employees' perceived climates can guide their IS usage behaviour.

Two types of climates are considered to affect employees' innovative IS behaviour: innovation climates and autonomy climates. First, an autonomy climate exists when employees have self-determination with respect to their work procedures, goals, and priorities (Koys and DeCotiis 1991). An autonomy climate allows employees freedom to work autonomously (Janz and Prasarnphanich 2003; Parker et al. 2006), which increases the likelihood that they will decide how best to complete their tasks (Hammami et al. 2013). Autonomy has been regarded as an important aspect of an environment that encourages employees to engage in experimental endeavours, such as IT innovation (Ahuja and Thatcher 2005), IS exploration (Ke et al. 2012), and solution innovation (Durcikova et al. 2011). For example, Ahuja and Thatcher (2005) suggested that employees embedded in contexts with more autonomy are more willing to innovate with IT. In addition, Durcikova et al. (2011) suggested that autonomous analysts are more inclined to develop solutions in innovative ways than those who must follow established procedures. Based on the reasoning of these studies, we theorise that employees in climates that foster autonomy are more apt to apply IS in innovative ways, because they have more need and freedom to innovate than employees who receive very detailed instructions. Therefore, we propose the following hypothesis:

H1. A psychological autonomy climate is positively associated with innovative IS use.

Organisational researchers have consistently shown that an innovation climate can stimulate innovation in the workplace (Chen et al. 2013). With this logic, we propose that an innovation climate is likely to influence IS users' innovative behaviour. Prior research provides strong support for this hypothesis. First, an innovation climate signals to employees that pursuing innovative and novel ways of accomplishing tasks via systems innovation is encouraged (Koys and DeCotiis 1991; Amabile et al. 1996). An innovation climate has been found to be positively related to employees' exploration with IS usage, which is innovative by nature (Maruping and Magni 2012, 2015; Liang et al. 2015). Second, an innovation climate assures employees that their experimental behaviour and risk-taking with IS innovation will be encouraged, and even if they fail there will be no negative

consequences (Edmondson 1999). With reduced fear of failure, employees are more willing to engage in IS innovation. Finally, an innovation climate encourages employees to communicate and voice novel ideas regarding IS use (Bock et al. 2005; Xue et al. 2011). Continuous exposure to diverse novel ideas can facilitate employees' learning, including their understanding of systems features and business processes, and they are consequently better prepared to innovate with IS usage (Liang et al. 2015). Therefore, we expect that IS users with a high perceived innovation climate will be more likely to apply IS in novel and innovative ways. This leads to the following hypothesis:

H2. A psychological innovation climate is positively associated with innovative IS use.

3.2. The moderating role of goal orientation

Employees' goal orientations are associated with different cognitive frameworks for how they interpret situations (VandeWalle et al. 2001), which influence their perceptions and interpretations of their environment. Some scholars have suggested that individual differences, such as employee goal orientation, affect the relationship between organisational contexts and individual behaviour (VandeWalle 2001; Wallace et al. 2016). For example, VandeWalle (2001) argued that a supportive environment does not always lead to innovative behaviour and high performance as a function of employees' goal orientation. Employees with different goal orientations may have different reactions to and interpretations of the same environment, which then influences their behaviour (VandeWalle 2001). Innovation climates and autonomy climates are positively related to employees' innovation; however, the impact of these climates may depend on employees' individual traits, which makes them more or less likely to learn and explore within a fixed climate (Wallace et al. 2016). In the IS context, as mentioned previously, employees' perceptions of innovation climate and autonomy climate are positively related to their innovative IS use. However, within the same climate, employees with different dispositions may have different understandings of the environment and thus have different reactions and IS usage behaviours. Thus, we propose that employee goal orientation moderates the relationship between psychological climates and innovative IS use.

Avoidance orientation implies a tendency to prefer endeavours with a high chance of success, and to avoid challenges that carry the risk of error and failure (Nederveen Pieterse et al. 2013). However, innovative use is a process of trial and error (Li et al. 2013). Employees with high avoidance orientation are unlikely to use IS in novel and innovative ways. Hence, high avoidance orientation is in fact a negative influence that makes the psychological climate-innovative use relationship weaker than low avoidance orientation. Based on the above analysis, this study proposes that individuals' avoidance orientation weakens the influence of psychological climate on innovative IS use. Thus, the following hypotheses are proposed:

H3a. Avoidance orientation weakens the influence of a psychological autonomy climate on innovative IS use.

H3b. Avoidance orientation weakens the influence of a psychological innovation climate on innovative IS use.

Learning goal orientation is associated with a focus on developing competence and task mastery (Hirst et al. 2011; Nederveen Pieterse et al. 2013). Learning goal orientation fosters an intrinsic interest in the task itself, as challenging work provides ways to develop skills and knowledge (VandeWalle 2001). Employees with high learning goal orientation tackle challenging tasks well, so learning goal orientation may weaken reactions resulting from failures and errors in the process of IS innovation, leading to a high level of innovative use. Within the same environmental climate, employees with high learning goal orientation are more likely to use IS in novel and innovative ways than employees with low learning goal orientation. High learning goal orientation is an active influence that strengthens the psychological climate-innovative use relationship. Thus, this study proposes that learning goal orientation strengthens the impact of psychological climate on innovative IS use. The following hypotheses are proposed:

H4a. Learning goal orientation strengthens the influence of a psychological autonomy climate on innovative IS use.

H4b. Learning goal orientation strengthens the influence of a psychological innovation climate on innovative IS use.

Figure 1 depicts the hypotheses in graphical form. In summary, we theorise that employees' innovative IS use will be positively influenced by a perceived psychological autonomy climate and innovation climate. Moreover, these relationships are expected to be stronger for employees with high learning goal orientations and weaker for employees with high avoidance orientations.

4. Research methodology

4.1. Data collection

Our hypotheses are examined with data using survey data. Because our target firms are located in China, we first translated the questionnaire from English to Chinese via back-translation. A pre-test was used to assess

the content validity of the questionnaire. We invited four experts from academia and industry to examine the questionnaire. Several measurement items were corrected or improved to ensure that the questionnaire was easy to understand.

This study uses ERP systems because they are considered typical information systems (Wang 2008). To find appropriate respondents, we contacted a large ERP software provider in Harbin, China. To achieve sufficient variance in our model constructs, we carefully selected the firms to increase the diversity of industry types, ownership types, and the amount of time since their IS implementation. We sought companies that had successfully implemented an ERP system at least 18 months prior to our data collection-well beyond the typical 8–12 month acceptance timeframe for major IS implementation initiatives (Gattiker and Goodhue 2005; Morris and Venkatesh 2010; Li et al. 2013; Rezvani et al. 2017). After the selection process, we sent invitations to the companies we selected. Nine companies agreed to participate in our study. The nine companies are in six industries, have three different ownership types, and have implemented ERP for an average of 4.9 years (see Table 1). We administered the questionnaires to 200 respondents in our target firms in late June, 2016. The respondents had at least one year of system usage experience. This should be ample time for users to achieve a reasonably high level of proficiency with a system's key applications (Veiga et al. 2014) and to further have the ability to innovate with their IS usage. To increase the number of responses, we offered incentives to each respondent. Finally, 192 questionnaires were collected, of which 174 were valid for our final analysis. The respondents differed in age, gender, education, job title, and systems experience (their demographics are presented in Table 2).

Table 2. Sample demographics.

Respondents	Category	Count	%
Education	College or lower	50	28.7
	Bachelor's	111	63.8
	Master's	13	7.5
Age	<25 years old	12	6.9
	26–35 years old	97	55.8
	36–45 years old	42	24.1
	>46 years old	23	13.2
Gender	Male	73	42.0
	Female	101	58.0
System experience	1–2 years	42	24.1
	2–5 years	69	39.7
	5–10 years	31	17.8
	>10 years	32	18.4
Job title	Top managers	15	8.6
	Middle managers	43	24.7
	IS users	116	66.7

4.2. Measures

This study generates measurements of the constructs from existing scales in the proposed model. All of the items were measured using 7-point Likert scales. The measurement scales for psychological autonomy climate were adapted from Langfred (2005) and Durcikova et al. (2011). The measurement scales for psychological innovation climate were adapted from Bock et al. (2005). For innovative use, we adapted the measures from Li et al. (2013). This study referred to VandeWalle (1997) and measured learning goal orientation and avoidance goal orientation using three items.

In addition to the constructs discussed above, to fully account for differences among the employee users, we also included four control variables that may influence innovative use, including gender, education, age, and system experience. The final measurement items are listed in Table 3.

4.3. Quality of measurement model

We began our analysis by assessing the reliability and validity of each construct using SPSS 16.0. Convergent validity refers to the degree to which the measurement scales are related to the corresponding construct, and is assessed by checking the average variance extracted (AVE) of each construct from its indicators. As shown in Table 4, all of the AVE scores were greater than 0.7, which is above the recommended value of 0.5. Then, we assessed the item loadings of each construct using SmartPLS 2.0. Hulland (1999) indicates that item loadings below 0.5 should be discarded. All of the item loadings were greater than 0.5. Hence, the results indicate

Table 1. Basic information of responding firms.

Company	Industry type	Ownership	Time since ERP implementation (years)	Number of respondents
A	Manufacturing	Joint venture	6	78
B	Retailing and wholesale	Privately-owned	8	19
C	Hospitals	State-owned	3	8
D	Hospitals	State-owned	3	9
E	Tourism and leisure	Privately-owned	6	10
F	Manufacturing	Joint venture	7	11
G	Tourism and leisure	Privately-owned	5	10
H	Hospitals	State-owned	4	11
I	Broadcast and television	State-owned	2	18

Table 3. Constructs and associated items.

Construct	Item code	Item wording	Source
Autonomy climate	AUTC1	I have a lot of freedom to decide how I perform assigned tasks.	Ahuja & Thatcher (2005); Langfred (2005)
	AUTC2	I set my own schedule for completing assigned tasks.	
	AUTC3	I make most of the decisions that affect the way my job is performed.	
Innovation climate	INNC1	My department encourages suggesting ideas for new opportunities.	Bock et al. (2005)
	INNC2	My department puts much value on taking risks even if that turns out to be a failure.	
	INNC3	My department encourages finding new methods to perform a task.	
Innovative use	INNU1	I have discovered new uses of ERP systems to enhance my work performance.	Li et al. (2013)
	INNU2	I have used the ERP systems in novel ways to support my work.	
	INNU3	I have developed new applications based on the ERP systems to support my work.	
Avoidance goal orientation	GOA1	I would avoid taking on a new task if there was a chance that I would appear rather incompetent to others.	VandeWalle (1997)
	GOA2	I am concerned about taking on a task at work if my performance would reveal that I had low ability.	
	GOA3	I prefer to avoid situations at work where I might perform poorly.	
Learning goal orientation	GOL1	I am willing to select a challenging work assignment that I can learn a lot from it.	
	GOL2	I often look for opportunities to develop new skills and knowledge.	
	GOL3	I enjoy challenging and difficult tasks at work where I'll learn new skills.	

that the measurement items have good convergent validity.

There are two main methods for assessing discriminant validity (Straub et al. 2004). The first involves comparing the square root of the AVE of each construct and its correlation with other constructs. As shown in Table 5, the diagonal values are the square roots of the AVEs for each construct, which are greater than the correlations with all other constructs, indicating good discriminant validity. The second method involves comparing the item loadings of each construct and the cross-loadings of any other construct using SmartPLS 2.0. Table 6 shows the cross-loadings of the items for all constructs, which also indicate reasonable discriminant validity.

The reliability of measurement scales is regarded as acceptable when each construct's composite reliability and Cronbach's alpha score exceed 0.7 (Chin et al. 2003). Table 4 shows that the lowest composite reliability score is 0.895 and the lowest Cronbach's alpha value is 0.825 (Gefen et al. 2000), indicating acceptable internal reliability.

5. Data analysis

5.1. The moderating effect of avoidance orientation

Hierarchical regression analysis in SPSS 16.0 was used for the hypothesis testing. Innovative use was the dependent variable. A three-step regression analysis was run: (1) the control variables were added, (2) the main effects were introduced, and (3) the moderating effect of avoidance orientation was introduced. An examination of the variance inflation factor suggested that multicollinearity was not a major concern in the analysis, as all of the variance inflation factor values were less than or very close to 1. All of the decision

Table 5. Correlation analysis of latent variables and square root of AVE.

	AUTC	INNC	INNU	GOA	GOL
AUTC	**0.861**				
INNC	0.698	**0.938**			
INNU	0.638	0.672	**0.891**		
GOA	0.178	0.159	0.197	**0.927**	
GOL	0.584	0.620	0.630	0.035	**0.899**

Table 4. Measurement quality indicators.

Latent construct	Items	Loadings	Mean	SD	Cronbachs Alpha	Composite reliability	AVE
Psychological autonomy climate (AUTC)	AUTC 1	0.832	5.296	1.138	0.825	0.895	0.741
	AUTC 2	0.887					
	AUTC 3	0.861					
Psychological innovation climate (INNC)	INNC1	0.939	5.818	1.097	0.932	0.957	0.880
	INNC2	0.947					
	INNC3	0.928					
Innovative use (INNU)	INNU1	0.891	5.496	1.049	0.870	0.920	0.793
	INNU2	0.911					
	INNU3	0.870					
Avoidance goal orientation (GOA)	GOA1	0.916	4.308	1.617	0.919	0.949	0.860
	GOA2	0.931					
	GOA3	0.936					
Learning goal orientation (GOL)	GOL1	0.916	5.745	1.027	0.882	0.927	0.809
	GOL2	0.890					
	GOL3	0.893					

Table 6. Cross loadings of latent variables.

	AUTC	INNC	INNU	GOA	GOL
AUTC 1	**0.832**	0.597	0.506	0.131	0.508
AUTC 2	**0.887**	0.571	0.606	0.130	0.572
AUTC 3	**0.861**	0.637	0.528	0.199	0.427
INNC1	0.680	**0.939**	0.666	0.152	0.566
INNC2	0.644	**0.947**	0.628	0.188	0.526
INNC3	0.638	**0.928**	0.593	0.109	0.651
INNU1	0.587	0.568	**0.894**	0.137	0.627
INNU2	0.550	0.601	**0.911**	0.140	0.542
INNU3	0.566	0.623	**0.867**	0.247	0.515
GOA1	0.139	0.067	0.170	**0.916**	0.040
GOA2	0.163	0.178	0.175	**0.931**	0.001
GOA3	0.191	0.189	0.199	**0.936**	0.054
GOL1	0.470	0.543	0.583	–0.042	**0.916**
GOL2	0.566	0.581	0.530	0.040	**0.890**
GOL3	0.545	0.553	0.584	0.098	**0.893**

variables were normally distributed. The results are displayed in Table 7.

As shown in Table 7, the *F*-value of model 2 is 25.543, and is significant at the 0.000 level, indicating that model 2 is significant. The influence of a psychological autonomy climate is significant (Beta = 0.288, $p < .05$), indicating that H1 is supported. Similarly, H2 is supported. The *F*-value of model 3 is 20.419, and is significant at the 0.000 level, indicating that model 3 is significant. H3, which stated that avoidance orientation weakens the relationship between a psychological autonomy climate and individuals' innovative IS use, was supported (Beta=–0.139, $p < .1$). However, H4, which predicted that avoidance orientation weakens the relationship between a psychological innovation climate and individuals' innovative IS use, was not supported (Beta = 0.100, n.s.).

To further probe the interaction effect, we plotted the relationship between an autonomy climate and innovative use to explore one standard deviation (s.d.) above and below the mean for employees' avoidance goal orientation, as depicted in Figure 2.

In Figure 2, the solid lines denote the relationship between a psychological autonomy climate and innovative IS use for employees with high avoidance orientation. The dotted line denotes the relationship

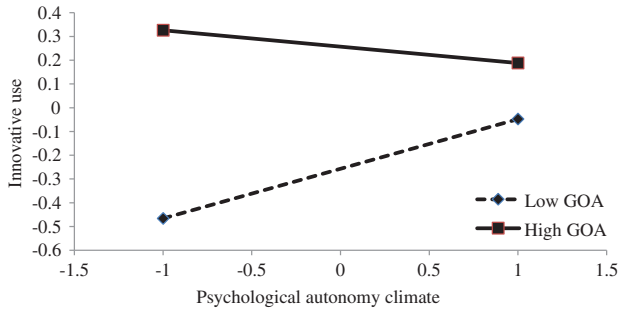

Figure 2. The interaction effect of psychological autonomy climate and avoidance goal orientation (GOA).

between an autonomy climate and innovative IS use for employees with low avoidance orientation. As depicted in Figure 2, the two lines cross each other, indicating that an interaction effect exists. In addition, the analysis results show that for employees with low avoidance orientation, the slope of the relationship between an autonomy climate and innovative use is positive, which reflects that an autonomy climate has a positive impact on innovative IS use for individuals with low avoidance orientation. In contrast, for employees with high avoidance orientation, the slope is negative, indicating that an autonomy climate has a negative impact on innovative IS use for individuals with high avoidance orientation. In short, avoidance goal orientation moderates the relationship between employees' psychological autonomy climate and innovative IS use.

5.2. The moderating effect of learning orientation

Similarly, hierarchical regression analysis was used to test the moderating effect of learning goal orientation. The results are shown in Table 8.

As shown in Table 8, the *F*-value of model 3 is 27.994, and is significant at the 0.000 level, indicating that model 3 is significant. H3, which stated that learning goal orientation strengthens the relationship between an autonomy

Table 7. The moderating effect of avoidance goal orientation.

Innovative use (INNU)	Model 1		Model 2		Model 3	
Independent variable	Beta	*T*-value	Beta	*T*-value	Beta	*T*-value
Gender	.049	.624	.006	.106	.015	.269
Education	–.027	–.328	–.047	–.795	–.038	–.650
Age	.099	1.051	.071	1.065	.072	1.065
System experience	.135	1.424	.101	1.472	.100	1.448
Psychological autonomy climate (AUTC)			.288**	3.690	.257**	3.237
Psychological innovation climate (INNC)			.456**	5.924	.483**	5.685
Avoidance goal orientation (GOA)			.071	1.259	.070	1.189
AUTC*GOA					–.139*	–1.835
INNC*GOA					.100	1.198
R^2	.049		.537		.547	
F (*p*-value)	2.027 (0.093)		25.543 (0.000)		20.419 (0.000)	

Notes: **$p < .05$; *$p < .1$.

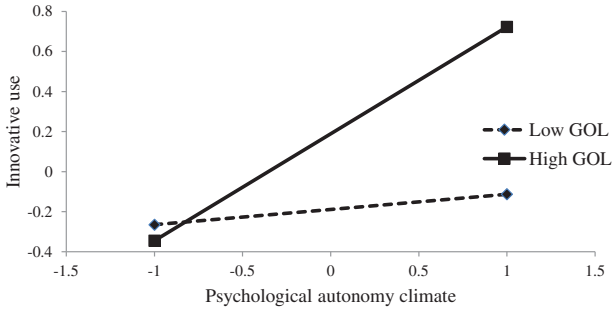

Figure 3. The interaction effect of psychological autonomy climate and learning goal orientation (GOL).

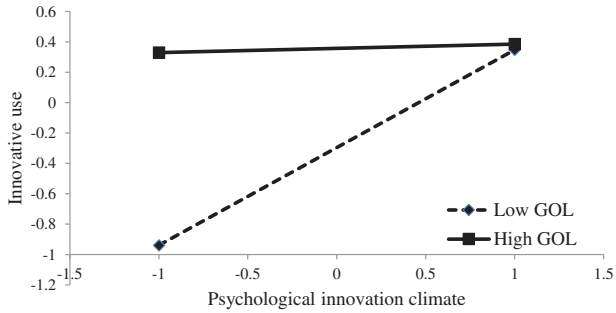

Figure 4. The interaction effect of psychological innovation climate and learning goal orientation (GOL).

climate and innovative use, was supported (Beta = 0.229, $p < .05$). H4, which predicted that learning goal orientation strengthens the relationship between an innovation climate and innovative use, was not supported (Beta=–0.338, $p < .05$). This coefficient is negative and significant, which signifies that learning goal orientation significantly weakens the relationship between innovation climate and employees' innovative IS use.

To further probe the interaction effect, we plotted the relationship between an autonomy climate and innovative IS use to explore one s.d. above and below the mean for employees' learning goal orientation, as shown in Figure 3. We also plotted the association between an innovation climate and innovative use, comparing two learning goal orientations (one s.d. above or below the mean), as depicted in Figure 4.

As shown in Figure 3, when employees' learning goal orientation is high, a psychological autonomy climate has a stronger positive impact on innovative IS use than the same conditions when employees' learning goal orientation is low. Thus, learning goal orientation significantly strengthens the relationship between autonomy climate and innovative IS use.

As shown in Figure 4, when employees' learning goal orientation is high, a psychological innovation climate has almost no effect on their innovative IS use, but when their learning goal orientation is low, this relationship becomes strongly positive. Thus, learning goal orientation significantly weakens the positive impact of an innovation climate on IS users' innovative use. Table 9 summarises these findings.

5.3. Common method bias test

As with all self-reported data, we conducted a common method bias (CMB) test in SmartPLS to examine if CMB is a concern in our study. Based on Liang et al. (2007) study, we added a common method factor whose indicators included all the principal constructs' indicators in the structural model. We calculated each indicator's variances substantively explained by the principal construct. The analysis results are shown in Table 10 (R_1^2 represents indicators' variances explained by the principle construct; R_2^2 represents indicators' variances explained by the method construct).

As shown in Table 10, the results indicate that all of the substantive factor loadings are significant, while most of the method factor loadings are insignificant. The average substantively explained variance of the indicators is 0.870, while the average method-based variance is 0.018. The ratio of substantive variance to method variance is about 50:1. Thus, we contend that the method is unlikely to be a serious concern for this study.

Table 8. The moderating effect of learning goal orientation.

Innovative use (INNU)	Model 1		Model 2		Model 3	
Independent variable	Beta	*T*-value	Beta	*T*-value	Beta	*T*-value
Gender	.049	.624	–.028	–.549	–.013	–.253
Education	–.027	–.328	–.083	–1.503	–.065	–1.195
Age	.099	1.051	.075	1.215	.049	.801
System experience	.135	1.424	.136**	2.126	.127**	2.039
Psychological autonomy climate (AUTC)			.189**	2.514	.189**	2.575
Psychological innovation climate (INNC)			.311**	4.029	.296**	3.917
Learning goal orientation (GOL)			.359**	5.103	.305**	3.943
AUTC*GOL					.229**	2.027
INNC*GOL					–.338**	–2.975
R^2	.049		.600		.624	
F(*p*-value)	2.027		33.017		27.994	
	(0.093)		(0.000)		(0.000)	

Notes: **$p < .05$; *$p < .1$.

Table 9. Summary of results.

Hypothesis	Wording	Results
H1	A psychological autonomy climate is positively associated with innovative IS use.	Supported
H2	A psychological innovation climate is positively associated with innovative IS use.	Supported
H3a	Avoidance orientation weakens the influence of a psychological autonomy climate on innovative IS use.	Supported
H3b	Avoidance orientation weakens the influence of a psychological innovation climate on innovative IS use.	Not supported
H4a	Learning goal orientation strengthens the influence of a psychological autonomy climate on innovative IS use.	Supported
H4b	Learning goal orientation strengthens the influence of a psychological innovation climate on innovative IS use.	Not supported (significant but in opposite direction)

6. Discussion and implications

6.1. Discussion of findings

While there is a rich body of literature relating to the impact of climate factors or individual factors on IS innovation (Maruping and Magni 2012; Li et al. 2013), these factors have been examined in isolation. Literature concerning the interaction effect of climate factors and individual factors on IS innovation is scant. Under this circumstance, this study examines the positive impacts of psychological innovation and autonomy climates on employees' innovative IS use, and further investigates the moderating effect of individual goal orientation on the relationship between psychological climate and innovative IS use.

The results support four of the six hypotheses and lead to insightful findings. First, as we hypothesised, this study justifies that innovation and autonomy climates positively and directly affect employees' innovative IS use. This is consistent with prior research which has verified that innovation climate and job autonomy are positively related to system exploration and extended system use (Liang et al. 2015). This is particularly in line with adaptive structuration theory (AST) which suggests that an organisational environment can be a major structure that influences employees' interaction with information technology.

More importantly, this study obtains new findings by investigating the interactions among employee goal orientation and psychological climates. These findings are generally consistent with the person-context interaction perspective which postulates that the effect of a given contextual characteristic on employee innovation is a function of the employee's personal characteristics (Shalley et al. 2016). Specifically, as we hypothesised, it is found that avoidance orientation negatively moderates the effect of psychological autonomy climate on innovative use. As shown in Figure 2, low avoidance orientation employees' perceived autonomy climate has a positive impact on their innovative IS use. High avoidance orientation employees' perceived autonomy climate has a negative impact on their innovative IS use. This indicates that when employees with high avoidance orientation are offered great autonomy, they are more unlikely to use IS in novel and innovative ways. This may be because employees with high avoidance orientation fear failure and uncertainty at work, thus greater autonomy and rights signify more uncertainty and risk, which causes more fear. This finding is consistent with the previous empirical studies, suggesting that avoidance orientation is dysfunctional for numerous outcomes, such as employee creativity (Payne et al. 2007; Gong et al. 2013; Nederveen Pieterse et al. 2013).

Contrary to our expectations, learning goal orientation significantly weakens the relationship between an innovation climate and innovative IS use. As shown in Figure 4, the impact of an innovation climate on

Table 10. Common method bias results.

Indicator	Substantive factor loading (R_1)	T_1 value	R_1^2	Method factor loading (R_2)	T_2 value	R_2^2
AUTC1	0.916**	14.237	0.839	−0.066ns	0.840	0.0044
AUTC2	0.824**	12.814	0.679	0.047ns	0.654	0.0022
AUTC3	0.698**	7.733	0.487	0.132ns	1.444	0.0174
INNC1	0.858**	12.848	0.736	0.092ns	1.352	0.0085
INNC2	0.951**	21.102	0.904	−0.081ns	1.405	0.0066
INNC3	0.937**	19.395	0.878	−0.011ns	0.201	0.0001
INNU1	0.916**	14.265	0.839	−0.024ns	0.351	0.0006
INNU2	0.977**	22.438	0.955	−0.074ns	1.547	0.0055
INNU3	0.775**	10.431	0.601	0.101ns	1.500	0.0102
GOA1	0.852**	16.410	0.726	0.028ns	0.532	0.0008
GOA2	0.775**	11.985	0.601	0.134*	2.121	0.0180
GOA3	0.925**	23.773	0.856	−0.009ns	0.169	0.0001
GOL1	0.857**	16.024	0.734	0.017ns	0.292	0.0003
GOL 2	0.919**	20.655	0.845	0.014ns	0.284	0.0002
GOL 3	0.873**	12.722	0.762	−0.033ns	0.468	0.0011

Notes: *$p < .05$; **$p < .01$.

innovative IS use is stronger when employees' learning goal orientation is low. A reasonable explanation for this may be that employees with high learning goal orientation focus on long-term development of competence, and their intrinsic interest or motivation encourage their IS use innovation in any case. Thus, their innovative IS usage behaviours are not easily influenced by environmental climate factors.

The results also indicate that the impact of a psychological autonomy climate on employees' innovative IS use is stronger when their learning goal orientation is high, as shown in Figure 3. Employees with high learning goal orientation are interested in learning and taking risks when using IS. For such employees, more autonomy and rights at work could decrease difficulties and obstacles in IS innovation and thus lead to more innovative IS use. Thus, high learning goal orientation IS users' innovative behaviours are more likely influenced by a psychological autonomy climate. This finding is consistent with the findings by Wallace et al. (2016) that if individual characteristics match a context that supports high autonomy and more freedom, this match will lead to higher levels of employee thriving and innovation.

6.2. Theoretical implications

This study has several implications. First, it contributes to the literature on IS use by identifying and examining innovation and autonomy climates as antecedents of employees' innovative IS use. Although an innovation climate has been found to potentially enhance system exploration, which is similar to IS innovation (Maruping and Magni 2012; Liang et al. 2015), our study confirms and extends prior research by showing that both innovation and autonomy climates are critical antecedents to system innovation. Because innovative IS use requires the combination of different business functions and modules, and much effort and time (Li et al. 2013; Liang et al. 2015), an autonomy climate is strongly associated with employees' freedom and authority to innovate with IS. This is consistent with Ahuja and Thatcher's (2005) finding that autonomy is positively related to employees' trying to innovate with IT. This finding also extends adaptive structuration theory (AST) by arguing that innovation and autonomy climates are positively related to employees' innovation with IS usage.

Second, this study introduces the concept of goal orientation to the IS field, showing that individual differences in goal orientation may lead to variations in the effectiveness of climate factors facilitating innovative IS use. In the prevalent IS literature, the impact of individual goal orientation on IS use is rarely examined. Although Schmitz et al. (2016) extends the adaptive structuration theory (AST) to the individual level, the impact of individual goal orientation on IS use has still been neglected. Thus, this study complements prior IS literature and adaptive structuration theory by adding the influence of individual goal orientation on innovative IS use. In doing so, this study provides a more comprehensive and precise view of IS usage and innovation.

Third, the current research is one of the first attempts to empirically demonstrate the joint effects of employee goal orientation and psychological climate on IS innovation. Unlike other studies on system exploration and innovation, either from the individual perspective or the environmental perspective (Maruping and Magni 2012; Li et al. 2013; Liang et al. 2015), we examined the interaction effect of individual goal orientation factors and environmental climate factors. Thus, this study is an extension of previous studies that only investigate individual factors (Hsieh and Wang 2007; Li et al. 2013; Schmitz et al. 2016) or environmental factors (Maruping and Magni 2012; Liang et al. 2015), by providing a more comprehensive understanding of innovative IS use from both individual and environmental perspectives. This study extends adaptive structuration theory (AST) by considering the combined effects of environmental and individual factors on innovative IS use (DeSanctis et al. 2008; Schmitz et al. 2016). This study also extends the person-context interaction perspective (Shalley et al. 2016) to IS research by revealing that the effects of innovation and autonomy climates on innovative IS use depend on employees' goal orientations.

6.3. Practical implications

Although practitioners and scholars have realised that employees' innovative IS use is important for realising the potential benefits of IS (Thatcher et al. 2011; Veiga et al. 2014), how to promote it is still unknown. This study could provide guidelines for managers to effectively harness perceived climates to promote innovative IS use according to employees' different goal orientations.

This study shows that innovation and autonomy climates are potential levers that managers can use to promote innovative IS use in the workplace. In facilitating a psychological innovation climate, team leaders should emphasise experimentation, risk-taking and mutual sharing of lessons learned in the workplace. First, in 2018, most employees use IS to accomplish their daily tasks, thus managers should consider effective policies and regulations to reward employees who find novel uses for IS to more effectively accomplish tasks. Second,

failure is a natural part of innovation. Thus, supervisors should pay attention to their leadership style (Shao et al. 2017), and influence their subordinates by exhibiting idealised influence and personal charisma (instead of using authoritative power) to foster a psychologically safe atmosphere in which their employees will not be afraid of negative consequences even if their risk-taking behaviour ends in failure (Edmondson 1999; Maruping and Magni 2012). Third, because IS innovation requires both business and technology knowledge, team leaders should encourage mutual sharing, communication, and discussion among work group members (Liang et al. 2015). For instance, formal and informal meetings should be held to discuss innovative IS usage among employees, and supervisors should implement an open-door policy to actively communicate with subordinates. Furthermore, to foster an autonomy climate, managers and executives should consider designing organisational structures or changing job designs to promote autonomy (Wang et al. 2014). Team leaders should allow IS users to decide how to use IS to achieve their goals. Team leader should also decrease monitoring of IS users' systems usage behaviour (to an acceptable extent), to strengthen employees' sense of control at work (Wang and Netemyer 2002).

Although an emphasis on innovation and autonomy climates can enhance employees' innovative IS use, our study highlights that we must consider not just the environmental climates but rather the individual characteristics in the context. It is the combination of individual goal orientation, and innovation and autonomy climates that yields the stronger association with IS innovation. First, organisational leaders should design and oversee the workplace in a way that fosters an autonomy climate (Wallace et al. 2016), thereby enabling employees with high learning goal orientation to use IS in novel and innovative ways. Second, this study's results show that employees with low learning goal orientation are more likely to be influenced by an innovation climate. Thus, supervisors should interact with such employees frequently, encourage them to experiment and take risks in their IS use and emphasise that innovative IS use will be rewarded. Finally, the results also show that, for employees with high avoidance orientation, more autonomy and rights in the workplace negatively impact their innovative IS use. Thus, managers should be cautious of recruiting employees with high avoidance orientation, and should provide more guidance and help at work for such employees. When creating an autonomy climate, organisations need to consider the negative effect of avoidance orientation on the effects of an autonomy climate on innovative IS use. Specifically, to foster innovative IS use, organisations should provide users with appropriate training to reduce their concerns, which will subsequently alter their attitudes toward innovative IS usage behaviour (Ke et al. 2012). Management could also reduce employees' anxiety about making mistakes through promoting a more open and risk-tolerant atmosphere, or sharing stories that motivate personal achievement (Ke et al. 2012). This would encourage employees to enjoy greater autonomy in IS use innovation.

7. Conclusions and future research directions

In this study, we develop an employee innovation model in the context of IS usage. Using survey data and hierarchical regression analyses, we test our hypotheses about the impacts of psychological innovation and autonomy climates on innovative IS use, and how employees' goal orientation moderates the relationship between psychological climate and innovative IS use. We confirm that an innovation climate and autonomy climate significantly influence employees' innovative IS use. More importantly, we show how individual goal orientation and psychological climate jointly influence employees' innovative IS use. The results reveal that employee learning goal orientation positively moderates the relationship between an autonomy climate and innovative IS use and negatively moderates the relationship between an innovation climate and innovative IS use. Moreover, avoidance orientation negatively moderates the relationship between an autonomy climate and innovative use.

This study has several limitations, and we have some suggestions for future study directions. First, this study uses ERP systems as the sample framework for data collection and analysis. In the era of big data, the scope of enterprise information systems (EIS) is extended from within the firm to outside the firm. Social media is a major part of customer relationship management (CRM), and mobile apps become a part of refined management and precision marketing. Future studies should extend IS innovation to newly developed technology innovation and data innovation both internal and external enterprise. Second, this study verifies the direct impact of autonomy climates and innovation climates on employees' innovation in the IS context, and some scholars have suggested that climate factors influence employee innovation through mediating variables (Luthans et al. 2008; Wallace et al. 2016). Future studies could further investigate the mediating variables between climate factors and innovative IS use. Third, Anderson et al. (2014) suggested that more attention should be paid to the linkages between facet-specific climates and innovation research, thus, future studies could explore

more facet-specific climates that could facilitate or inhibit innovative IS use. Fourth, all of our data collection was conducted in Heilongjiang province in China. Thus, the generalisability of our findings is limited. Future studies should use more large-scale empirical data in different provinces of China or different parts of the world, to ensure the generalisability of the research model. Finally, some scholars (El Sawy et al. 2010; Woodside 2013; Oyemomi et al. 2016; Pappas et al. 2016; Liu et al. 2017) have suggested that the fuzzy-set qualitative comparative analysis (FsQCA) method is effective for detecting configurations of behavioural outcomes. Thus, future studies could further explore more combinations and configurations of different climate factors and goal orientations that could lead to innovative IS use using fsQCA. Because fsQCA is suitable for estimating various possible configurations of expected outcomes, future studies could further explore the interaction effect of performance-prove orientation and climate factors on innovative IS use using the fsQCA method.

Disclosure statement

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