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Antecedents and intervention mechanisms: a multi-level study of R&D team's knowledge hiding behavior

Weiwei Huo, Zhenyao Cai, Jinlian Luo, Chenghao Men and Ruiqian Jia

Abstract

Purpose – The purpose of this paper is to examine why employees hide knowledge and how organizations intervene and influence the negative effects of knowledge hiding. This study builds and tests a theoretical model at both individual and team level.

Design/methodology/approach – Data were collected from universities, research institutes and enterprises' research and development (R&D) teams in China via a two-wave survey. The final sample contained 417 cases. Hierarchical linear modeling was used to test hypotheses.

Findings – The results show that territoriality plays a mediating role between psychological ownership and knowledge hiding, and that organizational result justice negatively moderated the relationship between territoriality and knowledge hiding. Procedure justice negatively moderated the relationship between territoriality and rationalized hiding, and that between territoriality and evasive hiding. Interactive justice negatively moderated the relationship between territoriality and rationalized hiding, and that between territoriality and evasive hiding. There were thus interactive effects among territoriality, perceived knowledge value and psychological ownership; the relationship between individual psychological ownership and territoriality was weaker when perceived knowledge value was lower and task interdependence was higher, and stronger with higher perceived knowledge value and lower task interdependence.

Research limitations/implications – Territorial behaviors, such as knowledge hoarding and misleading within R&D teams, are the primary challenges for organizations' positive activities, including internal sharing, teamwork and organizational goal accomplishment. Researching knowledge territoriality in the Chinese cultural context will help to distinguish territorial behaviors and to take preventive measures. In addition, this study not only enables managers to understand clearly the precipitating factors of knowledge territoriality and the relationships among them but also provides constructive strategies for reducing the negative effect of organizational intervention in knowledge territoriality.

Originality/value – This study adopts a multilevel modeling method and not only reveals the "black box" of interaction among psychological ownership, territoriality and knowledge hiding at the individual level but also probes the three-way interaction of perceived knowledge value, team task dependency and psychological ownership with territoriality at both individual and team levels, and then discusses the mediation effect of organizational justice on the relationship between territoriality and knowledge hiding. The conclusion of this study not only enriches the literature on knowledge hiding in the field of knowledge management but also helps to elucidate the function and intervention mechanism of knowledge hiding.

Keywords China, Territoriality, Intervention mechanism, Knowledge hiding, Multilevel study

Paper type Research paper

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1. Introduction

Sustainable organizational success and growth largely depend on how an organization recognizes the importance of knowledge management and intangible assets (Brown and Duguid, 2000; Witherspoon et al., 2013; Hislop, 2013; Ragab and Arisha, 2013). Knowledge sharing is the fundamental means of cultivating effective knowledge management, through which knowledge can be transferred between employees who have it and those who need it (Ipe, 2003; Wang and Noe, 2010). Over the past two decades,

"**Given that psychological ownership provides the basic beliefs for knowledge hiding behavior, understanding how psychological ownership influences individual knowledge hiding becomes salient.**"

scholars have identified several factors, such as management support (Cabrera *et al.*, 2006), organizational climate (Taylor and Wright, 2004) and individual characteristics (Constant *et al.*, 1994, 1996), which enhance the knowledge sharing process within an organization. In addition to the research on knowledge sharing, scholars indicate that knowledge hiding, which is defined as the withholding or concealing of task information, ideas and know-how (Connelly *et al.*, 2012), is a distinct construct rather than the opposite end of a continuum from knowledge sharing (Ford and Staples, 2008). For example, researchers indicate that knowledge sharing and knowledge hiding may happen simultaneously when employees share unimportant pieces of information with colleagues but hide other vital information (Ford and Staples, 2008). Therefore, the literatures of both knowledge hiding and knowledge sharing suggest that these two constructs may have strikingly different antecedents and underlying mechanisms (Connelly *et al.*, 2012; Peng, 2013).

To date, both researchers and practitioners have recognized the importance of understanding knowledge hiding process and antecedents. First, knowledge hiding is not an unusual phenomenon in the organization. A survey of 1,700 employees by The Globe and Mail demonstrated that 76 per cent hid the knowledge from their colleagues, and most agreed that "knowledge belongs to privacy, should not be shared" (The Globe and Mail, 2006). In a survey from China, Peng (2013) found that 46 per cent of respondents reported that they once conducted knowledge hiding at work. Second, knowledge hiding may impede both individual and organizational performance. By conducting a filed study and an experiment, Černe *et al.* (2014) found that knowledge hiding fostered distrust among employees and prevented employees from generating creative ideas. In addition, failing to share knowledge cost US$31.5bn a year for *Fortune 500 companies* (Babcock, 2004).

Despite its importance, the process of engendering knowledge hiding within specific situation remains largely unknown (Connelly *et al.*, 2012). One dominant explanation of why employees hide knowledge from each other is offered by psychological ownership theory (Pierce *et al.*, 2001, 2003). Psychological ownership theory posits that employees are more likely to withhold and hide knowledge when they have strong feelings of psychological ownership because they see their knowledge as personal property and are motivated to hide it to defend their territory (Peng, 2013). Although this explains that psychological ownership can influence knowledge hiding via territoriality, little research has been done to explore the boundary condition of this process. Given that knowledge hiding impedes employee's and organizational performance, managers need to identity how to mitigate this impact. Building on the psychological ownership theory (Pierce *et al.*, 2001, 2003), we propose that employee's perceived knowledge value, task interdependence and organizational justice may affect the ownership-territoriality-knowledge hiding process.

First, perceived knowledge value has been an important factor of understanding knowledge sharing (Ford and Staples, 2006; Ford and Staples, 2010). Knowledge value implies that individuals can use it to obtain status, power and rewards (Gagné, 2009). Employees who own the valuable knowledge may have competitive advantage over other colleagues (Gray, 2001). Therefore, it is reasonable to expect that when employees perceive that they own the knowledge of higher value, they will be more likely to protect their knowledge as territoriality. Second, task interdependence refers to the degree of connection among employees' jobs (Kiggundu, 1983). When task interdependence is high, employees need to rely on others to

accomplish their tasks (Kiggundu, 1983; Liden *et al.*, 1997). Hence, knowledge sharing among employees creates strong incentives to work together on the interdependent tasks (Cabrera and Cabrera, 2005). Following this logic, we argue that when employees perceive high task interdependence, the positive effect of psychological ownership of valuable knowledge and territoriality will be weakened. Third, researchers have demonstrated that organizational justice engenders relational quality between employee and organization by enhancing perceived organizational support and trust in the organization (Aryee *et al.*, 2002; Tekleab *et al.*, 2005). When employees perceive high-quality relationship with their organization, they are more likely to see the organization as their particular extension and contribute more. In Peng's (2013) study, he found that organization-based psychological ownership could weaken the positive relationship between territoriality and knowledge hiding. Therefore, we propose that organizational justice may be a relational factor that affects the relationship between territoriality and knowledge hiding.

Thus, our study contributes to the psychological ownership theory and knowledge hiding literature in two ways. First, we develop a theory addressing the interplay between psychological ownership and individual knowledge hiding. Given that psychological ownership provides the basic beliefs for knowledge hiding behavior, understanding how psychological ownership influences individual knowledge hiding becomes salient. Second, we explore the contextual boundary conditions of psychological ownership's effect on individual knowledge hiding. Specifically, we theorize and test the way in which perceived knowledge value and team-level task interdependence interact to influence individual territoriality, and the way in which territoriality and team-level organizational justice interact to influence individual knowledge hiding. In practice, our search should help to explain why and when individual team members hide knowledge, and what managers and employees can do about it. Third, we conducted our research in the Chinese culture. There is a significant body of literature exploring the characteristics of knowledge sharing behaviors in the Chinese culture (Chow *et al.*, 1999, 2000). For example, researchers found that, on one hand, Chinese employees are less likely to share knowledge and experience with the colleagues who are considered as out-group members. On the other hand, Chinese employees are willing to share knowledge for the benefits of the collective group, even though their self-interest may be damaged (Chow *et al.*, 2000; Michailova and Hutchings, 2006). These findings imply that the perception of territoriality in the knowledge hiding process may be more salient in China than in other cultures because Chinese people tend to protect the interest of their own group (i.e. protect their own territoriality). In addition, organizations may intervene the knowledge hiding process if they can motivate employees to focus more on the collective interest. Therefore, in this study, we intend to provide initial evidence of how managers intervene the ownership-territoriality-knowledge hiding process in the context of Chinese culture.

2. Background and hypotheses

2.1 Knowledge hiding and psychological ownership

Knowledge sharing is defined as an important factor in increasing organizational performance, but organizations do not hold employees' knowledge assets and cannot force employees to transfer their knowledge to other members (Kelloway and Barling,

"**When employees believe that their knowledge is valuable and they need to cooperate with others to complete the task, the positive effect of psychological ownership and territoriality can be weakened.**"

"**"Organizational justice weakens the relationship between territoriality and knowledge hiding."**"

2000). To solve this problem, researchers have been working on the influencing factors of knowledge sharing, such as organizational culture and salary incentives (MacNeil, 2003; Wang and Noe, 2010). Enterprises have also done much to try to improve the level of knowledge sharing, but the effect is not significant (Babcock, 2004). Duffy *et al.* (2002) found that the fear of losing advantage and psychological ownership perception may lead to refusal to share knowledge, but the negative relationships between these two factors and the level of knowledge sharing are not significant. Duffy *et al.* (2002) suggested that researchers should begin to focus on the dark side of knowledge management and try to take a "knowledge sharing failure" perspective to resolve knowledge management dilemmas.

Although in terms of external behavior, knowledge hiding is somewhat similar to knowledge hoarding behavior, counterproductive work behavior and failure to share knowledge, it is a unique concept and has distinctive characteristics (Černe *et al.*, 2014). First, knowledge hiding is characterized by intention, an intentional attempt to conceal knowledge that has been requested by another person, while knowledge hoarding behavior and failure to share knowledge may result from lack of time, appropriate channels and unforeseen circumstances, which are objective. Second, knowledge hiding may not result from an intention to hurt others' feelings. For example, employees may keep secrets from their colleagues for reasons of responsibility, and employees refrain from pointing out their colleagues' mistakes to avoid conflict. In contrast, counterproductive work behavior has harmful effects on the organization or its members, such as breeding contempt for others' opinions. Connelly *et al.*'s (2012) recent empirical study showed that knowledge hiding is not the opposite of knowledge sharing: both have good discriminate validity, and knowledge hiding is different from knowledge hoarding, which is a counterproductive work behavior.

Individual psychological ownership refers to a perception of ownership over a particular object (tangible or intangible) (Pierce and Rodgers, 2004). "Control" and "self-efficacy" gained through controlling, influencing and changing objective things are the main sources of psychological ownership. Psychological ownership may lead to a negative desire to monopolize and dominate. Individuals with higher ownership perception refuse to share objects of psychological ownership, thus maintaining control of them. In management practices, knowledge can provide employees with sustainable competitive advantages, so knowledge control becomes a major condition that can affect an individual's bargaining power in the organization (Bacharach and Lawler, 1980).

When individuals input a lot of energy or take on more risks to acquire a specific object, they experience stronger feelings of ownership. Researchers indicate that individuals often overestimate their own potential value relative to the controlled object and take action to maintain their control of it (Kelloway and Barling, 2000). In this case, employees may feel that losing control of knowledge would threaten their power and status, and regard their knowledge as their own territory, even though sharing knowledge with colleagues will earn the latter's respect and inner satisfaction. For research and development (R&D) teams especially, knowledge is the core competitiveness of an individual, and one must invest a lot of energy to study or to create new knowledge, so it is easy to feel that one's knowledge is one's personal psychological property. According to this logic, to avoid losing control of knowledge and to improve self-efficacy, knowledge owners tend to hide their knowledge and to boost their prestige in the organization by controlling that knowledge.

2.2 The mediating effect of territoriality in organizations

Territoriality in organizations is defined as the behavioral expression of individual members based on their perceived ownership of physical or social objects, which they then protect as their own (Brown et al., 2005). The characteristics of territoriality are as follows:

1. "social characteristics" show that territoriality not only is based on the individual's or group's expression of affiliation to objects (i.e. "I like") but also shows the different relationships with other people or objects through these behaviors (i.e. "It's mine, not yours");

2. "physical and non-physical" means that the objects of territoriality incorporate both physical objects, such as a tangible workplace, and non-physical objects, such as relationships and knowledge; and

3. "exclusivity" demonstrates that territoriality often refuses others' control of territorial resources (Brown and Robinson, 2007).

The three characteristics above indicate the strong relationship between psychological ownership and territoriality. According to psychological ownership theory, if individuals experience strong psychological ownership of the knowledge (i.e. non-physical object), the knowledge tends to be the extension of themselves (Peng, 2013; Pierce et al., 2001; Pierce et al., 2003). The greater the efforts expended to acquire knowledge, the greater the likelihood the individual will have a strong perception of psychological ownership of that knowledge (i.e. "This knowledge is mine, not yours") and then seek to protect and keep it (i.e. refuses others' control) as his or her own.

Therefore, when individuals experience strong feelings of ownership for knowledge, they will present strong territoriality over that knowledge, which subsequently leads them to protect their knowledge territory (i.e. by hiding knowledge). The more intense the feelings of individual psychological ownership, the greater the possibility that the individual will view an object as his or her own territory and take defensive action (Webster et al., 2008; Brown and Robinson, 2007). Thus, the present study proposes that territoriality is a more proximal variable than psychological ownership for knowledge hiding:

> *H1.* The relationship between individual psychological ownership and knowledge hiding will be mediated by territoriality.

2.3 The moderating effect of perceived knowledge value at the individual level

Perceived knowledge value is the individual's view of the importance of his or her knowledge, a typical knowledge characteristic that has a significant impact on knowledge sharing (Augier et al., 2001; Leidner, 1999). In this study, we argue that perceived knowledge value will strengthen the impact of knowledge-based psychological ownership on territoriality. The exploratory research of Dyson-Hudson and Smith (1978) consider the internal mechanism of human territoriality from the cost-benefit perspective. They indicate that if the cost of exclusive use and defense of territoriality are outweighed by the benefits gained from the resource control, territoriality will be expected to occur.

In the case of knowledge-based psychological ownership, the exclusive benefits obtained from an individual's territory refer to the expected future value of knowledge, and the cost is the interpersonal risk stemming from the exclusive right to use or hide knowledge behaviors in the field of knowledge management. When individuals realize the importance of their knowledge, they will expect greater exclusive benefits from possessing the same kind of knowledge in the future. Meanwhile, because gaining access to important knowledge requires time and effort, employees who do so are more likely to experience higher levels of psychological ownership. Knowledge owners are more reluctant to give up valuable knowledge, even when they realize that protection of knowledge may bring about unpredictable interpersonal risk (Ford and Staples, 2006). When individuals are aware of possessing high-value knowledge assets, once they have a higher perception of

psychological ownership of this kind of knowledge, they will have higher future expectations of territoriality earnings, triggering more intense territoriality orientation. In contrast, when individuals consider the value of their knowledge to be low, they will weigh the benefits and costs of territoriality and will not show strong territoriality, even when they perceive some degree of ownership. In sum, the impact of individual psychological ownership on the territoriality of knowledge is influenced by perceived knowledge value; the higher the perceived knowledge value, the more significant the influence of psychological ownership on territoriality:

> *H2.* The relationship between individual psychological ownership and territoriality is significantly and positively moderated by perceived knowledge value.

2.4 The cross-level intervention of task dependence

Task dependence refers to the degree to which organizational members engage in interaction and cooperation to complete their respective tasks, reflecting their interconnection at work (Zhang *et al.*, 2014). When there is a high correlation between different tasks within the team, communication and cooperation among members play a very important role in completing those tasks. Thus, to complete their objectives, organizational members must share their resources, like knowledge and information. In this context, even if team members perceive themselves as owners of information and knowledge of high value, to achieve their objectives, they are willing to consider a certain amount of information exchange, and therefore do not show a high level of territoriality.

The task dependency among team members determines the frequency and quality of human interaction, which can weaken the level of territoriality caused by the interaction of perceived knowledge-based psychological ownership and knowledge value. On one hand, when employees perceive high level of task dependency, they need more information and knowledge from others to fulfill their job responsibility. In this case, the cost of exclusive use and defense of their own knowledge as territoriality will outweigh its benefits. Therefore, we assert that when task dependency is high, employees will be less likely to protect their own valuable knowledge as territoriality. On the other hand, in teams where employees perceive task dependency is low, employees can accomplish their tasks without frequent collaboration. When members of such a team perceive themselves to be the owners of information and knowledge of high value, they tend to view that knowledge as a "product within their territory" and refuse to share or exchange it with colleagues in order to maintain their own advantages:

> *H3.* The influence of perceived knowledge value on the relationship between psychological ownership and territoriality will depend on the task dependency within a team. When the task dependency is high and individual perceived value of knowledge is low, the positive influence of psychological ownership on territoriality is at its weakest. However, when the task dependency is low and individual perceived value of knowledge is high, territoriality behavior is at its strongest, triggered by psychological ownership.

2.5 The cross-level intervention of organizational justice

In an interview-based study, Connelly *et al.* (2012) discovered that knowledge hiding is not merely a simple refusal to transfer knowledge. It may be multidimensional and comprise three related factors: rationalized hiding, evasive hiding and playing dumb (Connelly *et al.*, 2012). Playing dumb describes behaviors whereby the hider pretends to be ignorant of the relevant knowledge (Connelly *et al.*, 2012). For example, an individual claims to be unfamiliar with a topic, and to not have the information requested. Evasive hiding involves instances where the hider provides incorrect information or a misleading promise of a complete answer in the future, even though he or she has no intention of actually providing this (Connelly *et al.*, 2012). Rationalized hiding does not necessarily involve deception. In this case, the hider is offering a justification for failing to provide requested knowledge by

either suggesting that he or she is unable to do so or by blaming another party. In this study, we followed Connelly et al.'s (2012) research and considered knowledge hiding as a multi-dimensional construct.

We proposed that organizational justice can be the interventional factor affecting the relationship between territoriality and knowledge hiding. More specifically, we proposed that organizational justice can weaken the impact of territoriality on three dimensions. Organizational justice refers to the degree to which an organization is fair and equitable, perceived by individuals or groups within the organization, and usually consists of three internal dimensions: result justice, procedural justice and interactive justice (Farh et al., 1997). Result justice is the perception of the distribution of resources within the organization, procedural justice focuses on the fairness of the allocation process and interactive justice is primarily focused on the subjective feelings of fairness in interpersonal exchanges.

Employees who perceive strong organizational justice will come to believe that they are significant, worthy and treated fairly by the organization, and subsequently form high-quality organization–employee relationships. In this case, they are more likely to see the organization as their particular extension, leading them to contribute more to it (Olkkonen and Lipponen, 2006; Walumbwa et al., 2009). Researchers have found that employees who perceive higher organizational justice will form stronger organizational commitment and are more likely to engage in citizenship behaviors (Ang et al., 2003; Moorman, 1991; Paré and Tremblay, 2007). Therefore, we argue that organizational justice can foster the citizenship motives of the employees by contributing to the organization and sharing knowledge with colleagues. Hence, organizational justice will reduce the impact of perceived territoriality on knowledge hiding behaviors. Besides, organizational justice also contributes to the positive organizational climate, engendering knowledge sharing motives among employees (Bock et al., 2005; Gagné, 2009). In contrast, when individuals perceive an unfair organizational atmosphere, they fear getting an unfair return after sharing their knowledge (Burgess, 2005) and losing control of that knowledge. In this case, employees may perceive higher cost of stemming from the exclusive right to use the knowledge, which leads employees to become self-focused. Researchers suggested that self-focused motivation emanates from worrying about and being preoccupied with marking and defending territory, affecting their ability to connect with and focus on the goals of the organization (Brown et al., 2005). In other words, when individuals believe that they will not be treated fairly, the exclusivity of territoriality will lead to a strong desire for monopolization, and they will be motivated not to share the knowledge.

However, we believe that employees will not explicitly refuse the asking of knowledge by others. Instead, they will try to hide the knowledge because of the impression management motives[1]. Impression management in organizations is defined as the behaviors that employees use to shape how they are seen by others (Rosenfeld et al., 1995; Bolino, 1999). Impression management is not merely a unidirectional process whereby individual employees displays an impression in front of the organization but an interactive process in which the organization interprets the observed tactic and in turn responds with a counter tactic motivated by their own interests. If individual employees who share knowledge with the organization perceive strong organizational justice, such as they are believed to be significant, worthy and treated fairly by the organization, subsequently high-quality organization–employee relationships will be formed. Researchers indicate that when there is a discrepancy between the way employees hope to be seen and how they are currently seen, employees are more likely to manage their impressions (Leary and Kowalski, 1990; Bolino et al., 2016). When other colleagues ask for knowledge sharing, failing to share knowledge may hurt the reciprocal relationships among employees and will be viewed as a distrusted person. Therefore, we assert that the potential damage of personal image will motivate the employees to engage in impression management behaviors of knowledge sharing and hide the useful knowledge. For example, under the request, the knowledge by

others, employees may claim to be unfamiliar with the topic (i.e. playing dumb), provide incorrect information (i.e. evasive hiding) or suggest that he or she is unable to do so (i.e. rationalized hiding).

Hence, we argue that perceived higher organizational justice will foster the positive climate and citizenship motives, which weakens the impact of territoriality on knowledge hiding. In contrast, employees will be motivated not to share the knowledge when they perceived lower organizational justice. In this case, the impact of territoriality on knowledge hiding will be strengthened due to the impression management motives:

H4. The relationship between individual territoriality and knowledge hiding will be moderated by organizational result justice (*H4a* for rationalized hiding, *H4b* for evasive hiding and *H4*c for playing dumb) such that the positive relationship will be weaker when organizational result justice is high.

H5. The relationship between individual territoriality and knowledge hiding will be moderated by organizational procedural justice (*H5a* for rationalized hiding, *H5b* for evasive hiding and *H5c* for playing dumb) such that the positive relationship will be weaker when organizational procedural justice is high.

H6. The relationship between individual territoriality and knowledge hiding will be moderated by organizational interactive justice (*H6a* for rationalized hiding, *H6b* for evasive hiding and *H6c* for playing dumb) such that the positive relationship will be weaker when organizational interactive justice is high (Figure 1).

3. Research design

3.1 Sample and data collection

Connelly *et al.*s (2012) research has shown that because knowledge hiding is an intentional attempt by an individual to withhold or conceal knowledge that has been requested by another person, it is better measured by self-reported responses from the individual concerned (Connelly *et al.*, 2012). Because the variables psychological ownership, territoriality, and perceived organizational justice are all at the level of psychological perception, the self-reported measurement method will be more accurate. Because self-reported data are collected via a research design using a single questionnaire, common method variance may cause systematic measurement error and bias estimates. To avoid common source variance, we adopted pairing of staff data sampling and multiple

Figure 1 Hypothesis model
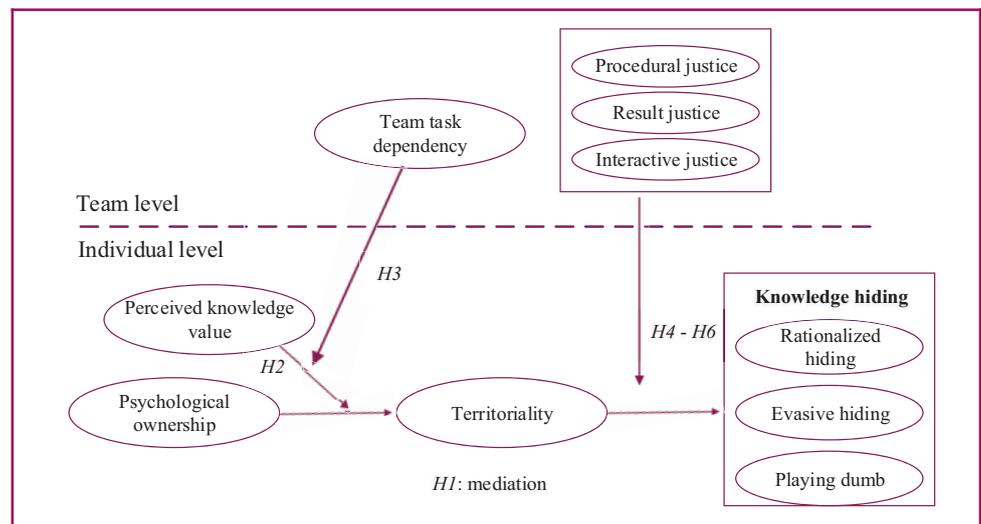
point sampling. In the first stage, employees provided demographic information and completed questionnaires on psychological ownership, territoriality and perceived knowledge value, while their team leaders completed questionnaires about task independence. After three months, employees completed questionnaires on knowledge hiding and organizational justice. Due to multilevel research's need to guarantee the validity of questionnaires within the organization, we removed the questionnaires with incomplete responses from the sample and also excluded the teams with low within-group response rates. After these screening procedures, the final sample comprised data from 417 individuals (42 leaders and 375 members). These participants were mainly sourced from universities, research institutes and enterprises' R&D teams in China. The demographic variables conformed to sampling requirements.

3.2 Measures

All measures originally developed in English were translated into Chinese following the translation-back-translation procedure to ensure accuracy. Unless otherwise noted, all items were assessed on a five-point Likert-type scale on which 1 = "strongly disagree" and 5 = "strongly agree".

- *Psychological ownership*: Psychological ownership was measured with Van Dyne and Pierce's (2004) seven psychological ownership items in one dimension.

- *Territoriality*: We measured territoriality using the four items scale developed and validated by Avey *et al.* (2009). The Cronbach's alpha was 0.79.

- *Organizational Justice*: We measured organizational justice by adopting Colquitt's (2001) scale.

- *Perceived knowledge value*: We measured perceived knowledge value using the nine-item scale developed and validated by Ford and Staples (2006). The Cronbach's alpha was 0.81.

- *Knowledge hiding*: We measured knowledge hiding using the 12-item scale developed by Connelly *et al.* (2012), including rationalized hiding, evasive hiding and playing dumb.

- *Task dependency*: We measured task dependency using the scale developed by Liden *et al.* (1997). The Cronbach's alpha was 0.88.

- *Control variables*: Team size and the heterogeneity of the three main background characteristics of team members (gender, age and job tenure) were included as control variables because the literature has noted their effects on knowledge management behavior (Connelly *et al.*, 2012). Team size was the total number of team members reported on the questionnaire. Gender heterogeneity was assessed by Blau (1977)'s index, and males were coded as 1, females as 0. We used dummy variables to control age (0 = below 30, 1 = 30-39, 2 = 40-49, 3 = 50-59) and job tenure (0 = below 1 year, 1 = 1 to 2 years, 2 = 3 to 5 years, 3 = above 5 years). Because this research topic is related to knowledge hiding and "territoriality", we set up lie scale in the questionnaire to avoid socially desirable responses.

4. Model testing

4.1 Reliability and validity

We performed Harman's one-factor test to verify the risk of common method effect, which indicated that the majority of variance was not explained by a single factor (maximum 19.1 per cent). Structural equations require that data should meet normal distribution. We used SPSS to calculate the skewness and kurtosis of items, which showed that the skewness values of the measurement items ranged between 0.046 and 0.843, and the peak value was between 0.081 and 1.125. They were below the assessment standard of skewness and kurtosis value, so neither significantly affected the validity of the analysis.

The reliability of all variables was significant (Cohen's kappa > 0.72, p < 0.01). Again, all measures that were originally in English were translated into Chinese following the translation-back-translation procedure to ensure good content validity. The variables had Cronbach's α coefficients greater than 0.72, so the whole questionnaire showed good reliability. In this paper, we used foreign mature scales, a double-blind translation and pre-testing methods to ensure that the questionnaire had good content validity. To further establish measurement validity, we conducted a confirmatory factor analysis on psychological ownership, territoriality, organizational justice, knowledge hiding, task dependency and perceived knowledge value using AMOS17.0. This indicated that the model fit the data perfectly (including RMSEA, GFI, CFI).

4.2 Data aggregation

Given the nested structure of our data and the multilevel nature of our hypotheses, we used hierarchical linear modeling (HLM) to examine the latter (Zhang and Lei, 2005). Because the focus of our study is the team-level outcomes, we aggregated each team member's subjective ratings to form measures for each organization before we conducted HLM analysis. To determine whether aggregation was justified, we assessed within-team agreement, rwg(j), Intrarater ICC(1), interrater reliability ICC(2). This showed that organizational justice was indexed as the average rating of justice across the members of each team and exhibited a high degree of consistency, rwg(j) = 0.74; and reliability, ICC(1) = 0.17, ICC(2) = 0.81; and task dependency rwg(j) = 0.78; and reliability, ICC(1) = 0.19, ICC(2) = 0.85.
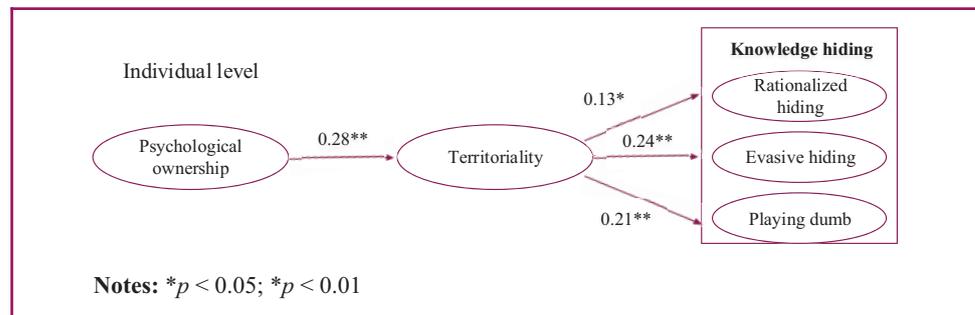
5. Results

As noted in Table I, individual psychological ownership and territory have a positive relationship with knowledge hiding. This study involves individual- and team-level data, so we used two-level HLM (Mplus) (Baron and Kenny, 1986). Because the indirect effect of multilevel path estimation does not obey normal distribution, we adopted the parametric bootstrapping method to sample repeatedly (Liu *et al.*, 2012). To test the significance of the variables' indirect effects, the confidence interval of indirect effect was used in place of Mplus.

The hypothesis test of the multilevel moderation model showed that (path coefficient Figure 2): the influence of individual psychological ownership on knowledge hiding is mediated by territoriality in that psychological ownership is positively related to territoriality (r = 0.28, p < 0.01) and territoriality is positively related to rationalized hiding (r = 0.13, p < 0.01), evasive hiding (r = 0.24, p < 0.01) and playing dumb (r = 0.21, p < 0.01). Therefore, *H1* is supported.

Table I	Means, standard deviations, correlations											
	M	SD	1	2	3	4	5	6	7	8	9	10
1. Gender	0.67	0.49										
2. Age	33.51	5.07	0.09									
3. Job tenure	3.96	2.87	0.13**	−0.06								
4. Team size	9.24	0.84	0.06	0.02	−0.03							
5. Organizational justice	3.62	1.12	−0.04	0.08	−0.01	−0.11**	(0.85)					
6. Psychological ownership	3.26	0.95	−0.08	−0.03	−0.02	0.01	−0.08	(0.87)				
7. Territoriality	2.94	1.34	−0.12	0.07	0.14**	0.06	0.06	0.32**	(0.79)			
8. Perceived knowledge value	4.01	1.96	−0.11	0.04	0.06	0.03	0.05	0.08	0.01	(0.81)		
9. Task dependence	3.44	2.13	−0.08	0.05	−0.05	−0.02	−0.04	−0.06	0.02	0.01	(0.88)	
10. Knowledge hiding	2.09	1.35	0.05	0.09	−0.04	0.04	−0.28**	0.19*	0.31**	−0.01	−0.11*	(0.92)

Notes: *p < 0.05; **p < 0.01

Figure 2 Path coefficient results

Individual level

Psychological ownership → 0.28** → Territoriality

Knowledge hiding
Territoriality → 0.13* → Rationalized hiding
Territoriality → 0.24** → Evasive hiding
Territoriality → 0.21** → Playing dumb

Notes: *$p < 0.05$; *$p < 0.01$

Result justice was predicted to moderate the relationship between territoriality and knowledge hiding across levels. Result justice significantly influenced the random slops of territoriality and rationalized hiding ($r = 0.11$, $p < 0.01$), territoriality and evasive hiding ($r = 0.23$, $p < 0.001$) and playing dumb ($r = 0.18$, $p < 0.001$). Therefore, *H4a*, *H4b* and *H4c* are supported. Procedure justice was predicted to moderate the relationship between territoriality and evasive hiding across levels, as well as the relationship between territoriality and rationalized hiding across levels. Procedure justice significantly influenced the random slops of territoriality and rationalized hiding ($r = 0.13$, $p < 0.01$), and of territoriality and evasive hiding ($r = 0.16$, $p < 0.001$). Therefore, *H5a* and *H5b* are supported. Procedure justice did not significantly influence the random slops of territoriality and playing dumb ($r = 0.09$, n.s.), and so *H5c* is not supported. Interactive justice was predicted to moderate the relationship between territoriality and evasive hiding across levels, as well as the relationship between territoriality and rationalized hiding across levels. Interactive justice significantly influenced the random slops of territoriality and rationalized hiding ($r = 0.15$, $p < 0.01$), territoriality and evasive hiding ($r = 0.12$, $p < 0.001$); thus, *H6a* and *H6b* are supported. Procedure justice did not significantly influence the random slops of territoriality and playing dumb ($r = 0.09$, n.s.). Therefore, *H6c* is not supported.

The test of the interaction model among team task dependence, perceived knowledge value psychological ownership and territoriality (Table II). When the demographic variables were controlled, psychological ownership was positively related to territoriality (M2, $r = 0.28$, $p < 0.001$). The interaction among team task dependence, perceived knowledge value, psychological ownership and territoriality was positively related to individual territoriality (M5, $r = -0.13$, $p < 0.001$). Thus, *H3* is supported.

Table II Results of regression analysis for territoriality

Variables/Model	M1	M2	M3	M4	M5
Gender	0.09	0.10	0.05	0.05	0.03
Age	−0.09	−0.10	0.05	0.05	0.03
Job tenure	0.23**	0.24**	0.11	0.09	0.04
Team size	0.05	0.05	−0.07	−0.06	−0.08
Psychological ownership		0.28**	0.26**	0.24**	0.21**
Task independence			0.05	0.04	0.08
Perceived knowledge value			−0.21**	−0.23**	−0.26**
Psychological ownership × Perceived knowledge value				0.09	0.06
Psychological ownership × Task independence				0.05	0.03
Perceived knowledge value × Task independence				0.07	0.04
Psychological ownership × Perceived knowledge value × Task independence					−0.13**
ΔR^2	0.14	0.08	0.05	0.03	0.02
ΔF	8.51**	22.39**	13.14**	1.02	7.36**

Notes: * $p < 0.05$; **$p < 0.01$

To assess the interactive effects, we performed simple slope tests (Cohen *et al.*, 2003). We chose one standard deviation below and above the mean as a standard and analyzed the changing influence of perceived knowledge value on the relationship between psychological ownership and territoriality as a result of higher and lower conditions of task dependence (Cohen *et al.*, 2003). The results indicate a significant interactive effect: the relationship between individual psychological ownership and territoriality is weaker with lower perceived knowledge value and higher task dependence, and stronger with higher perceived knowledge value and lower task dependence (Figure 3).

6. Discussion and implications

6.1 Discussion

This paper adopted paired samples of R&D team leaders and their subordinates as research objects, developed and validated a multilevel theoretical model of the relationship between individual psychological ownership and knowledge hiding, and then discussed the triple interactive effects of organizational justice and perceived knowledge value on the two above-mentioned relationships from the perspective of integration with individual psychological ownership territoriality and organizational justice.

The results can be listed as follows:

- individual-level psychological ownership has a significant positive impact on knowledge hiding, and territoriality mediates the relationship between psychological ownership and knowledge hiding, which supports *H1*; and

- perceived knowledge value significantly and positively moderates the relationship between individual psychological ownership and territoriality, upholding *H2*.

From the cross-level perspective, first, result justice hierarchically moderates the relationship between individual territoriality and knowledge hiding, which means that result justice can weaken the positive relationship between territoriality and knowledge hiding for team members with higher perceived justice. Thus, *H4a*, *H4b* and *H4c* are supported. Second, the positive relationships between territoriality and evasive and rationalized hiding are hierarchically moderated by procedural justice: procedural justice weakens the positive relationships between territoriality and evasive and rationalized hiding, supporting *H5b* and *H5c*. Third, the results illustrate that interactive justice hierarchically moderates the

Figure 3 Interactive effects of task independence × perceived knowledge × psychological ownership
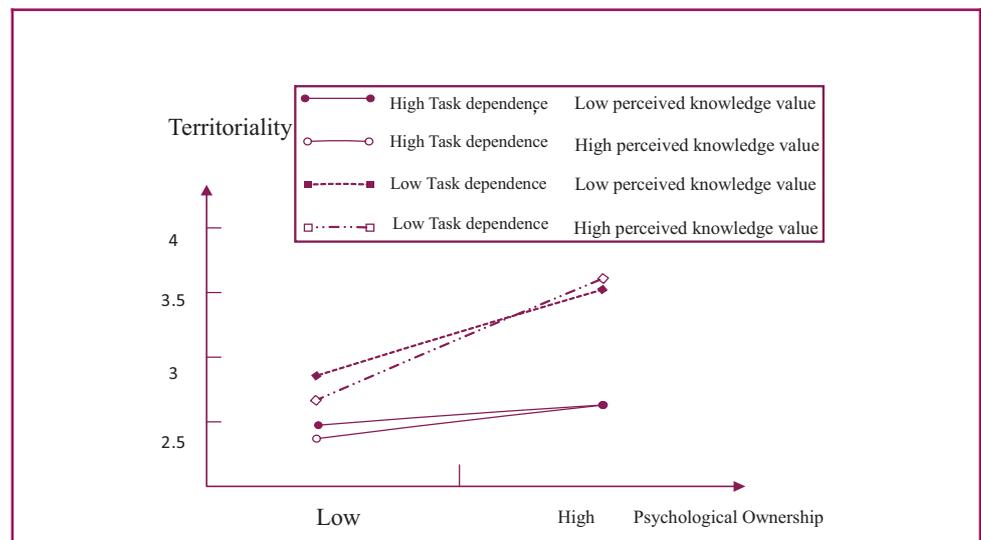
relationships between territoriality and evasive and rationalized hiding. Team members do not display a high level of knowledge hiding behaviors when the whole team has high interactive justice. Thus, *H6b* and *H6c* are supported. In addition, there is a triple interactive effect among perceived knowledge value, psychological ownership and territoriality. When the task dependency is high and individual perceived value of knowledge is low, the positive influence of psychological ownership on territoriality is at its weakest. When task dependency is low but individual perceived value of knowledge is high, territoriality behavior is at its strongest, triggered by psychological ownership, which is consistent with *H3*.

In terms of demographic background variables, members' work experience is positively related to knowledge hiding, indicating that knowledge hiding is more prominent among senior employees.

6.2 Theoretical implications

This study makes three major contributions to the literature. First, although previous research has examined the role of individual and knowledge characteristics, and interpersonal and organizational factors, the interaction among these factors has received scant attention. The findings of this study demonstrate the effect of three-way interaction among psychological ownership, perceived knowledge value and task dependence on territoriality. When employees believe that their knowledge is valuable and they need to cooperate with others to complete a task, the positive effect of psychological ownership and territoriality can be weakened. Based on the psychological ownership theory, this study contributes to the literature on knowledge hiding by considering the interactional effect of the characteristics of the knowledge and the job in the ownership-territoriality-knowledge hiding linkage.

Second, the findings demonstrate that organizational justice weakens the relationship between territoriality and knowledge hiding. Previous research has indicated that employees tend to protect and defend their knowledge territory by withholding and hiding information. However, the effect of territoriality on knowledge hiding depends on both individual and organizational factors in context. In line with this view, Peng (2013) demonstrated that organization-based psychological ownership could weaken the positive relationship between territoriality and knowledge hiding. He argued that when employees feel that their organization is their personal psychological property, they are more likely to put effort into activities that can benefit the organization, leading to a weakening of the effect of territoriality on knowledge hiding. Responding to Peng's call for more research on both individual and organizational variables in the relationship between territoriality and knowledge hiding, this study contributes to the literature by showing the role of the organizational factor of organization justice in this relationship. This study also represents a response to the call for more research on the role of justice factors in knowledge hiding (Connelly and Zweig, 2015).

Third, we have examined knowledge hiding in a non-Western context, aiming to understand the factors affecting knowledge hiding in a collectivistic culture. Researchers have investigated the role of organizational justice in knowledge hiding (Connelly *et al.*, 2012; Colquitt *et al.*, 2002). Some have indicated that the nature of the effect of organizational justice may differ as a function of individual and contextual attributes. For example, Leung and Michael (1984) found that "people from individualistic cultures used different norms of equity and equality than people in collectivistic cultures". Therefore, findings from collectivistic cultures contribute to the literature by providing evidence of the role of organizational justice in knowledge hiding behaviors.

6.3 Practical implications

This study provides initial evidence that how organizations and managers intervene employee's knowledge hiding process in the context of Chinese culture. Due to the

aforementioned key characteristic of knowledge sharing behaviors, the findings of this study make several recommendations of practice for Chinese managers.

First, our study shows that perception of organizational justice can weaken the relationship between territoriality and knowledge hiding. More specifically, our findings indicated that when employees perceived low organizational justice, they will try to hide the knowledge protect their territoriality of the knowledge. However, employees do not explicitly refuse to share knowledge under the request of knowledge by colleagues. Instead, they are more likely to engage in knowledge hiding behaviors, such as playing dumb, rationalized and evasive hiding. When managers find that employees share the unimportant or irrelevant information under the request of knowledge sharing, the managers may need to understand employees' motives and consider to reduce the impact of perception of territoriality on knowledge hiding behaviors. One suggestion from the findings of this study is to enhance organizational justice. For example, managers can maintain adequate organizational justice by clearly conveying to employees that their knowledge contribution will receive adequate compensation, by treating employees with equality of respect, by displaying ethical leadership and by enhancing the perception of trust among employees (Aryee *et al.*, 2002; Brown *et al.*, 2005; Laschinger, 2004).

Second, our study has found that the relationship between individual psychological ownership and territoriality is weaker with lower perceived knowledge value and higher task dependence, and stronger with higher perceived knowledge value and lower task dependence. Employees may be less likely to hide requested knowledge when they need the information from others to accomplish the task. If employees refuse to share knowledge with colleagues, they will be considered as distrusted person and other colleagues will not share knowledge with them anymore (Černe *et al.*, 2014). Thus, organizations can reduce territoriality and knowledge hiding by strengthening in-group task interdependence. Considering the aforementioned characteristics of knowledge sharing behaviors in the Chinese context, managers could design a high task interdependence workflow by creating high outcome interdependence and giving group feedback, so that employees will focus more on the collective interest.

Third, the present study has found that territoriality plays a mediating role between psychological ownership and knowledge hiding. In practice, we suggest that organizations reduce territoriality by decreasing the perception of territoriality of the knowledge. For example, managers may consider to provide more training of job-related knowledge and skills, to reduce the perception of "my" knowledge and form the perception of "our" knowledge. In addition, managers may also consider to enhance employee's organizational commitment and interpersonal relationships, so that employees will not view others as opponents and protect their territoriality from other colleagues.

7. Limitations and future directions

Due to certain objective conditions, there are several limitations to this study that bear mentioning.

First, to reduce the interference of common method bias, this study adopted a multiple-point sampling method and matching of leaders and subordinates. However, the collection of any data from questionnaires leaves room for improvement. A research design integrating questionnaires with experimental study could be considered in future research, taking intervention factors like organizational fairness as control factors in their experimental design, which could more accurately explore the intervention mechanism of knowledge hiding.

Second, integrating psychological ownership theory with territoriality theory, this study partly reveals the "black box" effect of knowledge hiding behavior. Drawing on the team-level constructs of network location, intellectual capital and *Quan zi* in the Chinese cultural context, future research can dig deeply into the mechanism of knowledge hiding.

8. Conclusion

This study has examined the mediating role of territoriality between psychological ownership and knowledge hiding. In addition, it has identified a three-way interaction among psychological ownership, perceived knowledge value and task dependency on territoriality. In other words, when employees perceive their knowledge to have a higher value and their task is interdependent, the effect of psychological ownership on territoriality is weakened. This study has also found that organizational justice moderates the relationship between territoriality and three dimensions of knowledge hiding.

Note

1. We thank one of the anonymous reviewers for raising this point.

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