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ORIGINAL PAPER

A Virtual Net Locks Me In: How and When Information and Communication Technology Use Intensity Leads to Knowledge Hiding

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Abstract
The research explores a novel phenomenon in which information and communication technology (ICT), which is originally designed for knowledge transferring, may result in employees' knowledge hiding due to increasing use intensity. Specifically, drawing upon the appraisal theory of empathy, we develop a moderated mediation model of empathy linking ICT use intensity and knowledge hiding. The hypothesized model is tested by conducting a scenario-based experimental study (Study 1, $N = 194$) and a multi-wave field study (Study 2, $N = 350$). Results show that ICT use intensity is positively related to employees' knowledge hiding through the mediating role of their empathy. Moreover, competitive goal interdependence strengthens the negative relationship between ICT use intensity and employees' empathy, and the indirect positive effect between ICT use intensity and employees' knowledge hiding. Overall, the research answers the questions of how and when ICT use intensity may influence employees' knowledge hiding. Finally, the theoretical and practical implications of the research findings are discussed.

Keywords Information and communication technology (ICT) use intensity · Empathy · Goal interdependence · Knowledge hiding

Introduction

Under the condition of the knowledge and technology-driven contemporary economy, organizations heavily take advantage of information and communication technology (ICT) to support knowledge management (Pandey et al., 2021; Santoro et al., 2018). This is because ICT breaks the limitation of time and space, which helps employees transfer and request for knowledge anytime and anywhere (Serenko et al., 2016). Besides, the COVID-19 pandemic further enhances the role of ICT in knowledge management (Zhai et al., 2021), given that telework has become the "new normal" in the post-pandemic era (Burbano & Chiles, 2021). Unsurprisingly, the conveniences offered by ICT have also led employees to experience high ICT use intensity. However, employees who heavily occupy themselves in the "virtual world" are likely to engage in knowledge hiding (Choudhary & Mishra, 2021). Considering that the ethical issues arising from the increasing ICT use intensity deserve more attention (Leclercq-Vandelannoitte, 2019), it is necessary for us to explore how and when ICT use intensity may influence employees' knowledge hiding.

Prior studies have separately emphasized the benefits and risks of ICT use intensity. On the one hand, ICT use intensity has a positive effect on work productivity (Bautista et al., 2018) and work engagement (Zoonen & Rice, 2017). On the other hand, unexpected consequences may arise from the increase of ICT use intensity. For example, the increase of ICT use intensity can trigger employees' work-life conflict (Boswell & Olson-Buchanan, 2007; Derks et al., 2015) and emotional exhaustion (Wang et al., 2020; Yu et al., 2018), and reduce their well-being (Király et al., 2020). Therefore, we can conclude that ICT use intensity has the "double-edged sword" characteristics. However, to our knowledge, among the studies on ICT use intensity in knowledge management filed, most of them emphasize the benefits of ICT

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use intensity (Caputo et al., 2019; Haas et al., 2015; Mazmanian et al., 2013; Wang et al., 2020), and nearly all of them fail to consider the possible risks of ICT use intensity to trigger employees' knowledge hiding. What is more, knowledge hiding is a prevalent unethical behavior among employees, and the factors that contribute to knowledge hiding beg for more research attention (Connelly et al., 2019; Men et al., 2020; Zhao et al., 2019). Accordingly, it is imperative for us to explore how and when ICT use intensity has an influence on employees' knowledge hiding.

With the increase of ICT use intensity, ICT-mediated communication gradually substitutes face-to-face interactions (Verduyn et al., 2021). In the virtual world, whether individuals can understand others' feelings becomes a noteworthy issue (Lin et al., 2021; Ouvrein et al., 2018; Powell & Roberts, 2017). Empathy is exactly the construct that reflects whether individuals can profoundly experience what others feel (Clark et al., 2019). Furthermore, empathy, feeling what others feel (Wondra & Ellsworth, 2015), effectively discourages unethical behavior (Cohen, 2010; Moore et al., 2012; Ouvrein et al., 2018; Pierce & Thompson, 2018). Therefore, to illustrate how ICT use intensity influences knowledge hiding, we draw on the appraisal theory of empathy (Wondra & Ellsworth, 2015) and introduce empathy as the underlying mechanism to explore the above relationship. Specifically, according to the appraisal theory of empathy (Wondra & Ellsworth, 2015), *a lack of attention to coworkers' emotional situations* and *a lack of information about coworkers' emotional situations* prevent employees from experiencing empathy. Accordingly, we posit that the reason why ICT use intensity decreases employees' empathy lies in that with the increase of ICT use intensity, on the one hand, employees occupy themselves with work-related contents, which leaves them with limited attention to coworkers' emotional situations. On the other hand, employees spend most of their time and energy in processing work-related information (Matthes et al., 2020), which leaves them with little time and energy to gain access to information about coworkers' emotional situations. Thus, we argue that ICT use intensity is negatively related to employees' empathy, and their empathy in turn inhibits knowledge hiding.

Furthermore, to illustrate when ICT use intensity influences employees' knowledge hiding, we draw on the appraisal theory of empathy (Wondra & Ellsworth, 2015) and introduces two kinds of goal interdependence (i.e., competitive goal interdependence and cooperative goal interdependence) as boundary conditions of the aforementioned relationships. According to the appraisal theory of empathy (Wondra & Ellsworth, 2015), the goal (in)congruence between employees and their coworkers shapes employees' intrinsic emotional experience. Goal interdependence, which includes competitive goal interdependence and cooperative goal interdependence, describes employees' perceptions of their goal relationship with coworkers (Leung et al., 2015). Specifically, under the condition of competitive goal interdependence, employees perceive that their goals are incompatible with those of their coworkers (Chen et al., 2006). To work better, employees are more likely to devote all of their attention to work-related contents and spend nearly all of their time and energy in processing work-related information. Thus, we suggest that competitive goal interdependence will strengthen the negative relationship between ICT use intensity and empathy. By contrast, under the condition of cooperative goal interdependence, employees perceive that their goals are compatible with those of their coworkers (Chen et al., 2006), and thus they may be willing to be concerned about coworkers and to take time and energy to learn information about coworkers' emotional situations. Thus, we suggest that cooperative goal interdependence will weaken the negative relationship between ICT use intensity and empathy. In summary, we examine a moderated mediation model in which the mediating effect of empathy on the relationship between ICT use intensity and employees' knowledge hiding is moderated by two specific kinds of goal interdependence (i.e., competitive goal interdependence and cooperative goal interdependence). Figure 1 depicts the theoretical model.

Our theoretical applications and empirical results make significant contributions to business ethics literature, moral emotion literature, and the appraisal theory of empathy. *First*, we contribute to business ethics literature by extending it into the ICT use intensity literature. Specifically, to the best of our knowledge, our research is the first one to link ICT use intensity and a specific unethical behavior of employees, which is knowledge hiding. *Second*, we extend the moral emotion literature by considering one of the most important moral emotions, namely, empathy. Specifically, we identify a relatively new antecedent of empathy (i.e., ICT use intensity) and a relatively new outcome of empathy (i.e., knowledge hiding). *Third*, we enrich the appraisal theory of empathy by considering the boundary conditions of goal interdependence (i.e., competitive goal interdependence versus cooperative goal interdependence). Therefore, the research provides a new insight to explore how and when ICT use intensity affects employees' knowledge hiding.

Literature Review

ICT Use Intensity

ICT is defined as "any electronic device or technology that is capable of gathering, storing, or sending information" (Day et al., 2012, p. 473), such as personal computers and smartphone. ICT use, referred to as employees' use of ICT for work, strongly shapes employees' work pattern and

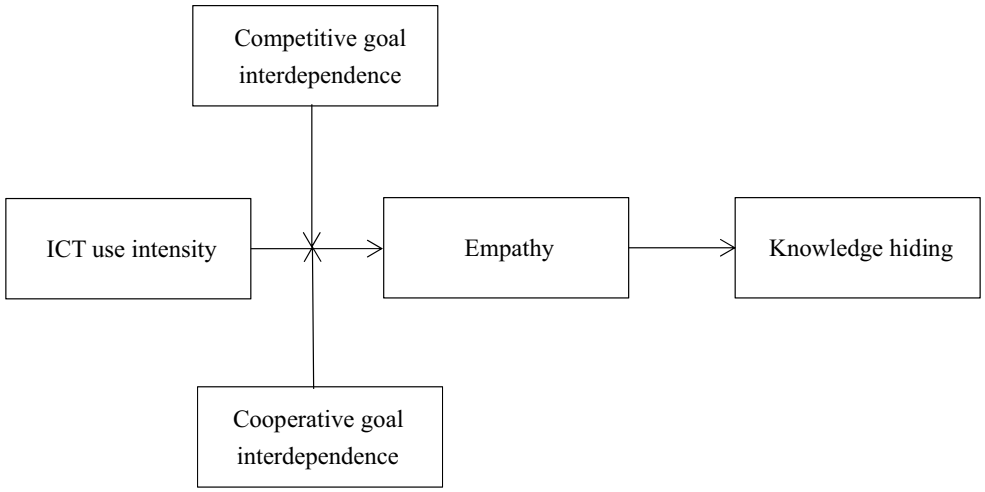

Fig. 1 Conceptual framework

interaction mode (Wang et al., 2020). Wang et al. (2020) identified two elements of ICT use: functions of ICT use and ICT use intensity. The functions of ICT use are then divided into the aspects of accomplishing work (task function) and communicating with coworkers (social function), and different functions of ICT use have different influences on work. Furthermore, ICT use intensity reflects the time or frequency of ICT use (Wang et al., 2020, p. 699); the higher the ICT use intensity, the greater the impacts on employees. Recently, with the increase of ICT use intensity among employees, the subsequent ethical issues have also raised public and scholars' concern (Leclercq-Vandelannoitte, 2019). In the research, we explore the relationship between ICT use intensity and knowledge hiding, a kind of unethical behavior of employees.

Knowledge Hiding

Knowledge hiding refers to employees' intentional withholding or concealing of knowledge when requested by others (Connelly et al., 2012). Connelly and Zweig (2015) proposed that knowledge hiding has three types: evasive hiding, playing dumb, and rationalized hiding. Specifically, evasive hiding refers to employees providing incorrect knowledge to coworkers or delaying it as long as possible, without any intent of actual helping. Playing dumb refers to employees pretending to know nothing about the coworkers' requests. Lastly, rationalized hiding refers to employees providing a justification that fails to provide the knowledge that coworkers requested. In summary, knowledge hiding consists of varying levels of employee deception when faced with coworkers' knowledge requests (Bogilović et al., 2017; Connelly et al., 2012).

Knowledge hiding is an unethical and counterproductive behavior (Arain et al., 2020; Men et al., 2020; Serenko et al., 2016). Previous studies have explored the negative effects of knowledge hiding such as destroying creativity (Bogilović et al., 2017; Černe et al., 2014, 2017), reducing performance (Kumar Jha & Varkkey, 2018; Peng, 2013; Xiong et al., 2019), and increasing turnover intention (Connelly et al., 2012). Thus, it is imperative for us to explore the antecedents of knowledge hiding and find ways to prevent it. Although limited in scope, past research has explored the antecedents of knowledge hiding, such as leader–member exchange (He et al., 2020), distrust (Connelly et al., 2012; Kumar Jha & Varkkey, 2018), workplace ostracism (Zhao et al., 2016), knowledge self-efficacy (Kumar Jha & Varkkey, 2018), and job insecurity (Ali et al., 2020). However, little is known about the effect of ICT use intensity on knowledge hiding. To fill the gap, we explore a new antecedent, ICT use intensity, of employees' knowledge hiding.

Hypotheses Development

ICT Use Intensity and Empathy

We investigate the effects of ICT use intensity on employees' empathy by introducing the appraisal theory of empathy (Wondra & Ellsworth, 2015). Although several theories of empathy (Hoffman, 2000; Preston & de Waal, 2002) have explored why empathy happens, that is why the observer feels the same as the target, however, they fail to explain why "empathy failure" happens, that is why the observer does not feel what the target feels. To fill the theoretical gap, on the basis of previous empathy theories, Wondra and Ellsworth (2015) introduced the appraisal theory of empathy,

which highlights several specific factors that cause the "empathy failure." Specifically, *first*, to generate empathy, the observer must notice the target's emotional situation first (Wondra & Ellsworth, 2015). Conversely, if the observer pays insufficient attention to the target's situation, then he/she is less likely to "notice, appraise what has happened," and feel empathy for the target (Wondra & Ellsworth, 2015, p. 420). For example, if the observer is occupied with ICT, then he/she is unlikely to "react emotionally" to the target's emotional situations. *Second*, once the observer has noticed the target's emotional situation, he/she must have enough information about the target's emotional situation to make relevant appraisals (Wondra & Ellsworth, 2015). Conversely, if the observer does not have enough information about the target's emotional situation to appraise it, then he/she is less likely to feel empathy for the target (Wondra & Ellsworth, 2015). In summary, the appraisal theory of empathy (Wondra & Ellsworth, 2015) points out that *a lack of attention to the target's emotional situation* and *a lack of information about the target's emotional situation* are two reasons why the observer does not feel empathy for the target. Accordingly, we explore why ICT use intensity influences employees' empathy from the above two reasons.

First, ICT use intensity is positively associated with employees' lack of attention to coworkers' emotional situations, thereby influencing employees' empathy. According to the appraisal theory of empathy (Wondra & Ellsworth, 2015), a lack of attention causes "empathy failure." Prior study demonstrates that when individuals are using ICT, they are likely to exhibit "inattentional blindness" (Simons, 2000, p. 150) to other people in surrounding environment (Hyman et al., 2010), which means they may pay insufficient attention to the emotional situations of coworkers around them. Besides, even employees are using ICT for communication, they prefer to pay more attention to work-related contents and engage in fewer social interactions (Siampou et al., 2014; Wang et al., 2020). However, employees have limited attention capacity to their surroundings (Matthes et al.2020; Lang et al., 2012; Lang, 2000). In this case, higher ICT use intensity means employees are more occupied with work-related contents and are more likely to lack enough attention to coworkers' emotional situations. Thus, ICT use intensity is positively associated with employees' lack of attention to coworkers' emotional situations, which hinders the occurrence of empathy.

Second, ICT use intensity is positively associated with employees' lack of information about coworkers' emotional situations, thereby influencing employees' empathy. According to the appraisal theory of empathy (Wondra & Ellsworth, 2015), a lack of information causes "empathy failure." Previous studies demonstrate that when exposed to both work-related information and the other information, employees tend to direct time and energy to work-related information first (Matthes et al., 2020). For example, suppose that employees have noticed coworkers' emotional situations and decide to learn more information about what happened to coworkers, at the same time, they receive an email that contains useful information about primary work. In this situation, they are likely to shift their time and energy to process the email. Moreover, with the increase of ICT use intensity, employees will receive a growing amount of work-related information (Lee et al., 2016; Schmitt et al., 2018). Given that work-related information has occupied many employees' time and energy, less time and energy are left for other information (Lang, 2000; Lang et al., 2012; Matthes et al., 2020). In this case, employees have difficulty obtaining enough information about coworkers' emotional situations. As such, we argue that ICT use intensity is associated with employees' lack of information about coworkers' emotional situations, which prevents the emergence of empathy. Taken together, we hypothesize the following hypothesis:

Hypothesis 1 ICT use intensity is negatively related to employees' empathy.

Moderating Role of Goal Interdependence in the Relationship Between ICT Use Intensity and Empathy

According to the appraisal theory of empathy (Wondra & Ellsworth, 2015), the impacts of ICT use intensity on employees' empathy are influenced by the relationship between employees' and their coworkers' goals. Thus, in our research context, we suggest that goal interdependence plays a moderating role in the relationship between ICT use intensity and employees' empathy. Previous studies have shown that goal interdependence, which consists of competitive goal interdependence and cooperative goal interdependence (Deutsch, 1949), affects employees' relationships with coworkers (Qiao et al., 2019; Wu et al., 2015) and the interaction pattern between them (Chen et al., 2020; Swab & Johnson, 2019). Specifically, competitive goal interdependence describes a condition in which employees perceive their goals to be incompatible with those of their coworkers, and only when employees exceed their coworkers can they receive rewards (Qiao et al., 2019; Wu et al., 2015). By contrast, cooperative goal interdependence describes a condition in which employees perceive their goals as compatible, and their coworkers' effective work is helpful for employees to achieve their goals (Kistruck et al., 2016; Qiao et al., 2019; Wu et al., 2015).

On the basis of the appraisal theory of empathy (Wondra & Ellsworth, 2015), we suggest that competitive goal interdependence exacerbates the negative relationship between ICT use intensity and employees' empathy for two reasons. *First*, competitive goal interdependence motivates

employees to pay less attention to coworkers' emotional situations, thereby reinforcing the negative effect of ICT use intensity on employees' empathy. According to the appraisal theory of empathy (Wondra & Ellsworth, 2015), less attention to coworkers' emotional situations makes the "empathy failure" more likely to happen. Competitive goal interdependence reflects a "zero-sum" competitive situation in which employees desire to work better than their coworkers (Qiao et al., 2019; Connelly et al., 2014). The desire for better performance motivates employees to concentrate more on their own work (Chen et al., 2020; Swab & Johnson, 2019). Besides, in the context of competitive goal interdependence which fosters antagonistic relationships between employees and their coworkers, employees tend to avoid social interactions with coworkers (Chen & Tjosvold, 2012). As a result, employees have difficulty noticing coworkers' emotional situations. Given that ICT use intensity attracts employees' nearly full attention to work-related contents, employees are left with little attention to coworkers' emotional situations (Matthes et al.2020; Lang, 2000). On this basis, we argue that competitive goal interdependence promotes the emergence of employees' lack of attention to coworkers' emotional situations brought by ICT use intensity, thereby intensifying the process of "empathy failure" caused by ICT use intensity. As such, we propose that competitive goal interdependence exacerbates the negative effect of ICT use intensity on employees' empathy.

Second, competitive goal interdependence poses more difficulty for employees to master enough information about coworkers' emotional situations, thereby reinforcing the negative effect of ICT use intensity on employees' empathy. According to the appraisal theory of empathy (Wondra & Ellsworth, 2015), the less information employees have about coworkers' emotional situations, the more likely "empathy failure" will happen. In the context of competitive goal interdependence, employees prioritize their own interests and devote themselves to their own goal accomplishment (Chen et al., 2020). Given that ICT use intensity motivates employees to spend most of their time and energy to process work-related information, employees have less access to information about coworkers' emotional situations because they hardly have any time or energy left for it (Matthes et al.2020; Lang, 2000). On this basis, we argue that competitive goal interdependence increases the possibility of employees' lack of information about coworkers' emotional situations brought by ICT use intensity, thereby intensifying the process of "empathy failure" caused by ICT use intensity. Thus, we suggest that competitive goal interdependence exacerbates the negative effect of ICT use intensity on employees' empathy and propose the following hypothesis:

Hypothesis 2 Competitive goal interdependence moderates the negative relationship between ICT use intensity and employees' empathy, such that the relationship is stronger when competitive goal interdependence is high rather than low.

By contrast, we suggest that cooperative goal interdependence mitigates the negative relationship between ICT use intensity and empathy. Previous studies have found that when employees are using ICT, they easily ignore surroundings (Hyman et al., 2010). However, in the context of cooperative goal interdependence, employees show more concern for their coworkers (Wu et al., 2015). In this case, even if ICT use intensity attracts most of employees' attention to work-related contents, "empathy failure" is unlikely to happen because employees in the context of cooperative goal interdependence are willing to pay attention to coworker' emotional situations. Thus, we argue that cooperative goal interdependence mitigates the negative effect of ICT use intensity on empathy.

Besides, in the context of cooperative goal interdependence, employees share mutual goals with their coworkers (Kistruck et al., 2016; Wu et al., 2015); In this case, coworkers' situations may indirectly influence employees' progress toward their goals (Qiao et al., 2019). Thus, employees who are working in the context of cooperative goal interdependence will unlikely have no access to the information about coworkers' emotional situations because they are willing to spend time and energy on it. Therefore, we argue that cooperative goal interdependence decreases the possibility of employees' lack of information about coworkers' emotional situations brought by ICT use intensity to some extent, thereby alleviating the process of "empathy failure" caused by ICT use intensity. Thus, we suggest that competitive goal interdependence mitigates the negative effect of ICT use intensity on employees' empathy. Taken together, we propose the following hypothesis:

Hypothesis 3 Cooperative goal interdependence moderates the negative relationship between ICT use intensity and employees' empathy, such that the relationship is stronger when cooperative goal interdependence is low rather than high.

Empathy and Knowledge Hiding

Emotions have a strong effect on employees' behavior (De Klerk, 2016; Matta & Van Dyne, 2018); thus, employees' empathy will influence their subsequent actions. In this research, we focus on knowledge hiding as a behavioral consequence and discuss how empathy decreases employees' knowledge hiding.

First, employees who experience empathy are unwilling to do unethical behaviors, such as knowledge hiding. Employees with empathy are more likely to experience

a moral cognition process and a moral conation process (Pohling et al., 2016), which inhibit their moral disengagement and prevent their unethical behaviors (Detert et al., 2008). According to Serenko et al. (2016), most employees perceive knowledge hiding as an unethical behavior. Thus, employees who experience empathy are less likely to hide their knowledge. Previous studies have also shown that employees with empathy are better able to consider the ethical implications and effects of their potential actions and decisions (Cartabuke et al., 2019; Mencl & May, 2009), which can effectively predict ethical behaviors (Cartabuke et al., 2019) and discourage unethical behaviors (Cohen, 2010; Ouvrein et al., 2018; Pierce & Thompson, 2018). For example, Cohen (2010) proposed that empathy is negatively associated with unethical tactics in a negotiation context. Therefore, employees who experience empathy are unwilling to morally disengage by hiding their knowledge intentionally.

Second, employees who experience empathy are unwilling to hide knowledge from coworkers who are in need of knowledge. Employees feeling empathy share the same emotion with coworkers (Clark et al., 2019), and once they experience their coworkers' feelings, they are less likely to take advantage of and harm coworkers (Cohen, 2010; Detert et al., 2008). Therefore, employees' experience of empathy will make them "stand in the shoes" of their coworkers, especially among those who need their help in knowledge. Thus, empathy can help prevent employees from hiding knowledge intentionally.

Hypothesis 4 Empathy is negatively related to employees' knowledge hiding.

Conditional Indirect Effect of ICT Use Intensity on Knowledge Hiding

Hypotheses 1 to 4 suggest the necessity of a first-stage moderated mediation model (Edwards & Lambert, 2007). Specifically, the indirect effect of ICT use intensity on employees' knowledge hiding through empathy is conditional at the levels of competitive goal interdependence and cooperative goal interdependence. This moderated mediation model clarifies when (i.e., high competitive goal interdependence and low cooperative goal interdependence) and why (i.e., through employees' empathy) ICT use intensity can positively lead to employees' knowledge hiding.

Hypothesis 5 The indirect effect of ICT use intensity on employees' knowledge hiding through empathy is moderated by competitive goal interdependence, such that the effect is stronger when competitive goal interdependence is high rather than low.

Hypothesis 6 The indirect effect of ICT use intensity on employees' knowledge hiding through empathy is moderated by cooperative goal interdependence, such that the effect is stronger when cooperative goal interdependence is low rather than high.

Method

Two studies were conducted to provide insights into the relationship between ICT use intensity and employees' knowledge hiding through their empathy. The studies included a scenario-based experimental study (study 1) and a multi-wave field study (study 2). In study 1, 194 students from a large Chinese university were included as samples. We manipulated goal interdependence and measured ICT use intensity, empathy, and their knowledge hiding. In view of further boosting the external validity of our findings, in study 2, we used a multi-wave field study that consisted of a sample of 350 full-time employees to test our full model, which could provide support for the developed model in an organizational environment. The multi-method design was helpful in establishing the internal and external validity of our research.

Study 1

Participant

The participants of study 1 consisted of 194 undergraduate students from a renowned university in Northwest China. Among them, 62.40% of participants are female, and the average age was ($M = 22.50$, SD = 2.67). Goal interdependence was manipulated as different pairs of designs, one from the competition perspective and the other from the cooperation perspective.

Procedure

Following previous research (Qiao et al., 2019), before the experiment, participants were told that they would be randomly assigned to a team in pairs and then attend a tournament. In the tournament, the participants would see 20 arithmetic calculations, e.g., $98 + 112 - 77 = 133$, with half of the calculation items with errors. The participants were instructed to find the calculations with errors.

Goal Interdependence Manipulation We manipulated goal interdependence by varying the descriptions of the competitive or cooperative relationship between teammates (Lee et al., 2015; Qiao et al., 2019). Under the condition of competitive (cooperative) goal interdependence, the participants would read the following instructions:

You are going to participate in a tournament to correct arithmetic calculations. Please find out as many calculations with errors as possible. Your competitor is your teammate (the other teams). The winning person (team) is the one who finds the more erroneous calculations within a certain time.

Manipulation Checks Two questions were used to check the effectiveness of goal interdependence manipulation, which measured the extent to which the participants perceived themselves to be in a competitive or cooperative relationship with their respective teammate (Lee et al., 2015). Under the condition of competitive goal interdependence ($M = 3.80$, SD = 0.92), the participants ($N = 75$) felt a higher level of competitive relationship with their teammate than those under the condition of cooperative goal interdependence ($M = 2.12$, SD = 1.21), thereby supporting the effectiveness of our competitive experimental manipulation (t [194] = 10.88, $p < 0.01$). By contrast, under the condition of cooperative goal interdependence ($M = 4.14$, SD = 1.08), the participants ($N = 119$) felt a higher level of cooperative relationship with their teammates than those under the condition of competitive goal interdependence ($M = 2.77$, SD = 0.89), thereby supporting the effectiveness of our cooperative experimental manipulation (t [194] = 9.56, $p < 0.05$). Overall, the effectiveness of the goal interdependence manipulation was supported.

Measures

ICT Use Intensity We adopted a single-item scale developed by Lanaj et al. (2014) to measure ICT use intensity. In this scheme, the time that participants used ICT to study on that day was calculated.

Empathy We adopted Molinsky et al. (2012)' three-item scale to measure empathy. We deleted one item (i.e., soft-hearted) on empathy because it exhibited low inter-item and insufficient item total correlation. Thus, the final items included "sympathetic" and "moved." The task of the participants was to indicate to what extent they agreed with each of the statements by using a 5-point Likert-type scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"). The Cronbach's alpha for empathy was 0.743.

Knowledge Hiding We adopted a 12-item self-reported scale developed by Connelly et al. (2012) to measure knowledge hiding. The scale began with the following statement: "In the tournament, your teammate requires knowledge from you" (Černe et al., 2014). A sample item was "I pretended that I didn't know the knowledge he/she required" (1 = "strongly disagree," 5 = "strongly agree"). The Cronbach's alpha for knowledge hiding was 0.91.

Results

Empathy The results of regression analysis revealed that ICT use intensity was negatively related to empathy ($B = -0.05$, $p < 0.01$). Thus, Hypothesis 1 was supported.

We used the Model 1 of PROCESS macro (Hayes, 2013) to analyze the moderating effect of goal interdependence among the relationship between ICT use intensity and empathy. The results (in Table 1) revealed that the negative relationship between ICT use intensity and empathy was stronger in the context of competitive goal interdependence ($B = -0.15$, $p < 0.01$) than that in the context of cooperative goal interdependence ($B = -0.12$, $p < 0.01$). Thus, Hypotheses 2 and 3 got a certain support.

Knowledge Hiding Hypothesis 4 was used to predict whether employees' empathy was negatively related to their knowledge hiding. Regression was adopted to examine the relationship. We controlled for the age and gender of the participants. The results revealed that empathy was negatively and significantly related to knowledge hiding ($B = -0.57$, $p < 0.01$). Thus, Hypothesis 4 was supported.

We conducted moderated mediation analyses by using the Model 7 of PROCESS macro (Hayes, 2013) to test Hypotheses 5 and 6. The number of bootstrap samples extracted was 1000, and the bias-corrected confidence intervals were set at 95%. The results revealed that the conditional indirect effect of ICT use intensity on knowledge hiding was stronger under the condition of competitive goal interdependence ($B = 0.11$, $p < 0.05$, 95% CI [0.029, 0.203]) than that under the condition of cooperative goal interdependence ($B = 0.10$, $p < 0.05$, 95% CI [0.013, 0.213]), which provided a certain support for Hypotheses 5 and 6.

Discussion

In study 1, we found that the negative relationship between ICT use intensity and employees' empathy was stronger in the context of competitive goal interdependence compared with that in the context of cooperative goal interdependence. Furthermore, employees' empathy was negatively related to their knowledge hiding.

Table 1 Summary of the effects of ICT use intensity on empathy for study 1

Dependent variable	Independent variable	Goal interdependence	
		Competition	Cooperation
Empathy	ICT use intensity	−0.15**	−0.12**

$N = 194$. Two-tailed tests

*$p < 0.05$; **$p < 0.01$

However, in study 1, the high and low levels of competitive (cooperative) goal interdependence had not been manipulated. Thus, we could not examine whether competitive (cooperative) goal interdependence moderates the relationship between ICT use intensity, employees' emotional reaction (i.e., empathy) and their subsequent behavior (i.e., knowledge hiding). To directly test Hypotheses 2, 3, 5, and 6 and extend external validity of our research, we conducted a multi-wave field study (study 2).

Study 2

Sample and Procedure

To test our hypotheses, two waves of survey data were collected from 455 full-time employees who had been attending part-time MBA classes in a large Chinese university. The employees belong to a range of industries: financial, energy, manufacturing, high-tech industries, and more. At time 1 (T1), we assessed ICT use intensity, competitive goal interdependence, cooperative goal interdependence, empathy, and the control variables. After 2 weeks, at time 2 (T2), we distributed a survey to assess knowledge hiding.

All of the above variable data were obtained from the participants' self-report, which may arise concerns about common method variance (CMV). However, self-reported data are reasonable in our research. Specifically, ICT use intensity, employees' empathy, and goal interdependence are appropriate to be measured by self-reports, because others (e.g., coworkers) will have difficulty knowing about the focal employee's personal ICT use intensity, inner feelings, and perceptions (Podsakoff & Organ, 1986). Similarly, Connelly et al. (2012) emphasized that only the focal employee knows whether knowledge hiding occurs, and thus supervisors or coworkers are unable to assess the focal employee's knowledge hiding accurately. In summary, it was reasonable that ICT use intensity, goal interdependence, empathy, and knowledge hiding were reported by the participants themselves.

At T1, we distributed questionnaires to 455 part-time MBA students. Of these, we received 418 responses at T1 (response rate of 91.87%) and 369 responses at T2 (response rate of 81.10%). We used the last four digits of participants' mobile phone numbers to match the responses from T1 and T2. After eliminating all incomplete questionnaires, we obtained 350 effective responses from 455 distributed questionnaires, yielding a response rate of 76.90%. In the sample, 47% were female with an average age of 32.59 (SD = 6.12) and 53% were male with an average age of 33.48 (SD = 5.69).

Measures

ICT Use Intensity We adopted a single-item scale developed by Lanaj et al. (2014) to measure ICT use intensity. In this scheme, the average time that the participants used ICT for work every day was calculated.

Empathy The measurement of empathy in study 2 was the same as that in study 1. The Cronbach's alpha for empathy was 0.85.

Competitive and Cooperative Goal Interdependence Competitive goal interdependence was measured on a 5-item scale developed by Chen et al. (2006). A sample item was "Our team members have a win-lose relationship" (1 = "strongly disagree," 5 = "strongly agree"). The Cronbach's alpha for competitive goal interdependence was 0.78. Cooperative goal interdependence was measured on a 5-item scale developed by Chen et al. (2006). A sample item was "Our team members want each other to succeed" (1 = "strongly disagree," 5 = "strongly agree"). The Cronbach's alpha for cooperative goal interdependence was 0.77.

Knowledge Hiding The measurement of knowledge hiding in study 2 was the same as that in study 1. The Cronbach' s alpha for knowledge hiding was 0.87.

Control Variables In consideration of the other factors that were theoretically or empirically related to the focal variables, we controlled for the gender and age of participants in this research.

Results

Table 2 lists the means, standard deviations, and correlations.

Following the recommendations of Podsakoff et al. (2003), confirmatory factor analysis (CFA) was conducted to establish the distinctiveness of empathy, competitive goal interdependence, cooperative goal interdependence, and knowledge hiding. The results (in Table 3) showed that the proposed four-factor model (i.e., Model 1) fits the data well (χ^2 [350] = 147.62, $p < 0.01$, CFI = 0.96, TLI = 0.96, RMSEA = 0.05, SRMR = 0.04) and better than alternative models (i.e., Models 2-4), thus verifying the distinctiveness of our measures.

Hypothesis 1 predicted that ICT use intensity was negatively related to employees' empathy. We used regression to test this relationship. The results revealed a negative relationship between ICT use intensity and empathy ($B = -0.08$, $p < 0.01$). Thus, Hypothesis 1 was supported.

Next, we used the Model 1 of PROCESS macro (Hayes, 2013) to test hypothesis 2 and hypothesis 3. The number of bootstrap samples extracted was 5000, and the bias-corrected

Table 2 Means, standard deviations, and correlations of the variables for Study 2

	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Age	33.06	5.90	1						
(2) Gender	1.47	0.50	−0.08	1					
(3) ICT use intensity	5.70	2.44	−0.17**	0.07	1				
(4) Empathy	3.36	1.10	0.08	−0.01	−0.19**	1			
(5) Competitive goal interdependence	2.42	0.76	0.02	0.00	−0.11*	−0.17**	1		
(6) Cooperative goal interdependence	4.15	0.56	0.06	−0.06	−0.07	0.22**	−0.51**	1	
(7) Knowledge hiding	2.04	0.63	−0.10	−0.07	0.04	−0.20**	0.52**	−0.47**	1

$N = 350$. Gender was coded "1" for men and "2" for women. Two-tailed tests

*$p < 0.05$; **$p < 0.01$

Table 3 Results of confirmatory factor analysis

Model	Factor	χ^2	df	χ^2/df	CFI	TLI	RMSEA	SRMR
Model 1	Four factors: E, COM, COO, KH	147.62**	84	1.76	0.96	0.96	0.05	0.04
Model 2	Three factors: E + COM, COO, KH	423.11**	87	4.86	0.81	0.77	0.11	0.07
Model 3	Two factors: E + COM + COO, KH	550.33**	89	6.18	0.74	0.69	0.12	0.09
Model 4	One factor: E + COM + COO + KH	665.96**	90	7.40	0.67	0.62	0.14	0.09

"+" Represents factors combined; E represents empathy; COM represents competitive goal interdependence; COO represents cooperative goal interdependence; KH represents knowledge hiding

*$p < 0.05$; **$p < 0.01$

confidence intervals were set at 95%. Additionally, the predictor (i.e., ICT use intensity) and moderators (i.e., competitive goal interdependence and cooperative goal interdependence) were standardized.

Hypothesis 2 predicted that competitive goal interdependence moderated the relationship between ICT use intensity and employees' empathy, such that the negative relationship between ICT use intensity and employees' empathy was stronger when competitive goal interdependence was high (versus low). The results (in Table 4) showed that the interaction between ICT use intensity and competitive goal interdependence significantly predicted empathy ($B = -0.18$, $p < 0.01$, $\Delta R^2 = 0.02$, $p < 0.01$). We plotted the interactions to further explore this relationship. As shown in Fig. 2, the negative relationship between ICT use intensity and employees' empathy was stronger when competitive goal interdependence was high than when it was low. In sum, Hypothesis 2 was supported.

Hypothesis 3 predicted that cooperative goal interdependence moderated the relationship between ICT use intensity and empathy, such that the negative relationship between ICT use intensity and empathy was stronger when cooperative goal interdependence was low (versus high). The results (in Table 4) showed that the interaction effect of ICT use intensity and cooperative goal interdependence on empathy was non-significant ($B = 0.05$, $p = 0.35$). Thus, Hypothesis 3 was not supported.

Hypothesis 4 predicted that empathy was negatively associated with employees' knowledge hiding. We used regression to test this relationship. Our results showed a negative relationship between empathy and knowledge hiding ($B = -0.11$, $p < 0.01$). Thus, Hypothesis 4 was supported.

Hypothesis 5 predicted that competitive goal interdependence moderated the indirect effects of ICT use intensity on employees' knowledge hiding through their empathy, such that the positive indirect effect was stronger when competitive goal interdependence was high (versus low). We used the Model 7 of PROCESS macro (Hayes, 2013) to test the relationship. The results (in Table 5) showed that the conditional indirect effect of ICT use intensity on knowledge hiding through empathy was positive and significant when the competitive goal interdependence was higher (+ 1 SD from the mean) (indirect effect = 0.043, $p < 0.05$, 95% CI [0.020, 0.069]) and non-significant when the competitive goal interdependence was lower (− 1 SD from the mean) (indirect effect = 0.005, $p < 0.05$, 95% CI [−0.012, 0.023]). Additionally, the confidence internal for the index of moderated mediation did not cross zero (Index = 0.019, $p < 0.05$, 95% CI [0.007, 0.034]). Thus, Hypothesis 5 was supported.

Hypothesis 6 predicted that cooperative goal interdependence moderated the indirect effect of ICT use intensity on knowledge hiding through empathy, such that the positive indirect effect was stronger when cooperative goal interdependence was low (versus high). We also used the Model 7 of PROCESS macro (Hayes, 2013) to test the relationship.

Table 4 Moderated mediation analyses for study 2

Predictor	Outcome			
	Empathy		Knowledge hiding	
	B	SE	*B*	SE
Moderator: competitive goal interdependence				
Constant	3.15**	0.38	2.89**	0.24
Age (years)	0.01	0.01	−0.01	0.01
Gender	−0.02	0.11	−0.10	0.07
ICT use intensity	−0.22**	0.06	−0.01	0.03
Competitive goal interdependence	−0.24**	0.06		
ICT use intensity × competitive goal interdependence	−0.18**	0.06		
Empathy			−0.11**	0.03
R^2	0.09**	1.12	0.05**	0.38
Moderator: cooperative goal interdependence				
Constant	3.07**	0.38	2.89**	0.24
Age (years)	0.01	0.01	−0.01	0.01
Gender	0.03	0.12	−0.10	0.07
ICT use intensity	−0.18**	0.06	−0.01	0.03
Cooperative goal interdependence	0.23**	0.06		
ICT use intensity × cooperative goal interdependence	0.05	0.06		
Empathy			−0.11**	0.03
R^2	0.08**	1.13	0.05**	0.38

$N = 350$. Gender was coded "1" for men and "2" for women. Two-tailed tests

*$p < 0.05$; **$p < 0.01$

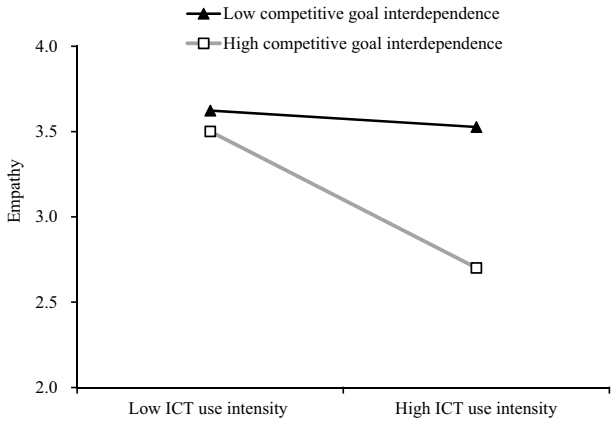

Fig. 2 The moderating effect of competitive goal interdependence for Study 2

The results showed that the confidence internal for the index of moderated mediation included zero (Index = −0.006, 95% CI [−0.020, 0.004]). Thus, Hypothesis 6 was not supported.

CMV Check

Even though procedural measures were implemented to avoid the common method bias, we nonetheless conducted Harman (1960)'s single-factor test and an unmeasured latent method factor (ULMF) test to ensure that CMV would not be a problem within our data (Podsakoff et al., 2003). On the one hand, the results of Harman (1960)'s single-factor test showed that a one-factor model did not produce an acceptable fit with the data (χ^2 [350] = 698.21, $p < 0.01$, CFI = 0.67, TLI = 0.62, RMSEA = 0.13, SRMR = 0.09). On the other hand, the results of ULMF test showed that the five-factor model with the unmeasured latent method factor obtained a good fit (χ^2 [350] = 98.23, $p < 0.01$, CFI = 0.98, TLI = 0.97, RMSEA = 0.04, SRMR = 0.03). However, the changes of the fit indices between the proposed four-factor model and the five-factor model (ΔCFI = 0.02, ΔTLI = 0.01, ΔRMSEA = 0.01, ΔSRMR = 0.01) were well below the

Table 5 Summary of the indirect effects of ICT use intensity on knowledge hiding via empathy for study 2

Moderator	Level	Indirect effects	95% CI
Competitive goal interdependence	High (+1 SD)	0.043*	[0.020, 0.069]
	Moderate (mean)	0.024*	[0.009, 0.043]
	Low (−1 SD)	0.005	[−0.012, 0.023]

$N = 350$. Two-tailed tests

*$p < 0.05$; **$p < 0.01$

suggested rule of thumb of 0.05 (Bagozzi & Yi, 1990). Furthermore, the average variance extracted by the unmeasured latent method factor was below the cutoff value of 0.50 to verify the presence of a latent factor (Hair et al., 2011). Taken together, these results indicated that CMV was not a significant problem in this study.

Supplementary Analyses

Given that knowledge hiding had three types, namely, evasive hiding, playing dumb, and rationalized hiding, we tested the robustness of our findings by using the three types of knowledge hiding as independent variables. The results are presented below.

First, the sample item of evasive hiding was "Agree to help him/her but never really intend to," and the Cronbach's alpha for evasive hiding was 0.76. The sample item of playing dumb was "Pretend that I did not know the information," and the Cronbach's alpha for playing dumb was 0.82. Lastly, the sample item of rationalized hiding was "Explain that I would like to tell him/her, but am not supposed to," and the Cronbach's alpha for rationalized hiding was 0.75. *Second*, we used the Model 4 of PROCESS macro (Hayes, 2013) to analyze separately the indirect effects of ICT use intensity on the three specific forms of knowledge hiding through empathy. The analysis results (in Table 6) showed that through the mediating effect of empathy, ICT use intensity was positively related to evasive hiding, playing dumb, and rationalized hiding. *Third*, we further used the Model 7 of PROCESS macro (Hayes, 2013) to analyze the moderating effect of competitive goal interdependence on the indirect effects of ICT use intensity on each type of knowledge hiding. The analysis results (in Table 7) showed that the indirect effects of ICT use intensity on the three types of knowledge hiding through empathy were all strengthened by competitive goal interdependence.

Table 6 Summary of indirect effects for supplementary analyses

Independent variable	Dependent variable	Indirect effects	95% CI
ICT use intensity	Evasive hiding	0.007*	[0.001, 0.014]
	Playing dumb	0.013*	[0.006, 0.023]
	Rationalized hiding	0.008*	[0.002, 0.016]

$N = 350$. Two-tailed tests

*$p < 0.05$; **$p < 0.01$

Discussion

The results of study 2 showed that competitive goal interdependence facilitated the negative relationship between ICT use intensity and employees' empathy. Furthermore, competitive goal interdependence moderated the indirect effect of ICT use intensity on employees' knowledge hiding through their empathy. However, cooperative goal interdependence did not moderate the aforementioned relationship between ICT use intensity and employees' empathy. Moreover, cooperative goal interdependence did not moderate the indirect relationship between ICT use intensity and employees' knowledge hiding. The results had potential reason. Deutsch (1949) emphasized that employees are goal-directed. Hence, under the condition of cooperative goal interdependence, in order to achieve mutual goals, employees are likely to use ICT to learn more information about coworkers' work progress rather than that about their coworkers' emotional situations. Thus, with the increase of ICT use intensity, employees may also easily ignore their coworkers' emotional situations and can hardly master enough information about their coworkers' emotional situations. That is, even under the condition of cooperative goal interdependence, employees still have difficulty feeling empathy when they experience high ICT use intensity. Thus, it is understandable that cooperative goal interdependence does not mitigate the negative relationship between ICT use intensity and employees' empathy and the indirect relationship between ICT use intensity and employees' knowledge hiding.

Table 7 Summary of the indirect effects of ICT use intensity on each type of knowledge hiding via empathy for supplementary analyses

Moderator	Level	Indirect effects		
		Evasive hiding	Playing dumb	Rationalized hiding
Competitive goal interdependence	High (+1 SD)	0.031* [0.005, 0.061]	0.061* [0.032, 0.097]	0.037* [0.009, 0.069]
	Moderate (mean)	0.017* [0.003, 0.038]	0.034* [0.015, 0.059]	0.021* [0.005, 0.041]
	Low (−1 SD)	0.004 [−0.008, 0.020]	0.007 [−0.016, 0.037]	0.005 [−0.010, 0.022]

$N = 350$. Two-tailed tests

*$p < 0.05$; **$p < 0.01$

General Discussion

In this research, we explore the linking mechanism underlying ICT use intensity and employees' knowledge hiding. Grounded in the appraisal theory of empathy (Wondra & Ellsworth, 2015), we focus on the mediating role of empathy and the moderating role of competitive goal interdependence. By using a scenario-based experimental study and a multi-wave field study, we conclude that ICT use intensity negatively affects employees' empathy. This, in turn, increases the possibility of knowledge hiding. Moreover, competitive goal interdependence strengthens the negative effect of ICT use intensity on employees' empathy and further moderates the indirect effect of ICT use intensity on employees' knowledge hiding through their empathy.

Theoretical Implications

This research contributes to business ethics literature, moral emotion literature, and the appraisal theory of empathy in the following ways. *First*, we contribute to business ethics literature by extending it to the ICT use intensity literature. To the best of our knowledge, we are among the first to explore the relationship between ICT use intensity and a specific unethical behavior among employees, knowledge hiding. Specifically, on the one hand, although scholars have called for in-depth investigation of the antecedents of knowledge hiding (Xiong et al., 2019; Zhao et al., 2019), the extant studies have largely ignored the influence of ICT use intensity on it. On the other hand, more attention has been drawn to the ethical implications of ICT use intensity (Leclercq-Vandelannoitte, 2019). Thus, our research not only echoes the calls mentioned above, but also extends business ethics literature to a relatively new research field, namely, ICT use intensity literature.

Second, we extend the moral emotion literature by considering empathy, one of the most important moral emotions. The studies on moral emotion have mostly focused on anger (Li et al., 2021; Lindebaum et al., 2017; Motro et al., 2018) and guilt (Motro et al., 2018; Wang et al., 2021), but pay less attention on empathy (Cartabuke et al., 2019). On the one hand, although limited studies have mentioned the antecedents of empathy, they mostly explore the situations under which empathy happens (Cheang et al., 2019; Chen et al., 2020; Ridderinkhof et al., 2017) and fail to explore the situations under which the "empathy failure" may happen. Therefore, we extend the empathy literature by means of identifying a relatively new antecedent that is ICT use intensity. On the other hand, prior studies have mostly focused on ethical behaviors (e.g., helping behaviors, Chen et al., 2020; Decelles et al., 2019; Lay et al., 2020) as the outcomes of empathy, but the studies exploring that empathy could effectively reduce unethical behaviors are limited (Cohen, 2010; Detert et al., 2008; Ouvrein et al., 2018; Pierce & Thompson, 2018). However, no research has indicated that employees' empathy could affect their knowledge hiding behavior. Thus, we extend the empathy literature by identifying a relatively new unethical outcome that is knowledge hiding.

Third, we enrich the appraisal theory of empathy (Wondra & Ellsworth, 2015) by providing a possible explanation for goal interdependence (i.e., competitive goal interdependence versus cooperative goal interdependence) influencing the negative relationship between ICT use intensity and employees' empathy. Previous studies have suggested the importance of exploring the boundary condition under which employees are more or less likely to feel empathy for others' emotional situations (Clark et al., 2019). Informed by the appraisal theory of empathy, as initially proposed by Wondra and Ellsworth (2015) in *Psychological Review*, we are among the first to consider the moderating role of competitive goal interdependence. Thus, we extend the appraisal theory of empathy (Wondra & Ellsworth, 2015) by providing an avenue to answer the important question of under which conditions ICT use intensity is more or less likely to influence employees' empathy.

Practical Implications

In addition to the theoretical contributions, our research findings offer several relevant suggestions for practitioners. *First*, we find that ICT use intensity is a trigger of employees' knowledge hiding in the workplace. That is, the higher the intensity of ICT use, the more likely that employees engage in knowledge hiding behaviors. Hence, we suggest that managers should emphasize to employees the negative consequence of high ICT use intensity and guide them to use ICT properly. For example, managers can encourage face-to-face communication among employees as much as possible. Furthermore, managers may create more opportunities for employees to communicate with coworkers face-to-face by means of tea parties and coffee talk. Also, we strongly suggest managers not to increase the burden on employees with unnecessary ICT demands, such as requiring them to respond to work-related ICT messages immediately, which may invisibly increase the ICT use intensity of employees, thereby triggering their knowledge hiding to a large extent.

Second, our findings also reveal that under the condition of competitive goal interdependence, employees who experience high levels of ICT use intensity have more difficulty feeling empathy and then are more likely to exhibit knowledge hiding. Thus, we remind organizations to be cautious in using zero-sum competitive strategy, and also, we suggest managers to assign common tasks and develop shared

rewards among employees as much as possible to avoid unnecessary competition.

Limitations and Future Research

Despite the importance of the aforementioned findings, the current research has several potential limitations. *First*, we conduct the research in China, and we are unsure as to whether the findings are applicable to other cultural settings (e.g., Western culture). Employees from different cultures may have different explanations of knowledge hiding (Servin & De Brun 2005). For example, Issac and Baral (2019) who delved into employees' knowledge hiding behavior in two different cultural settings (USA for individualistic culture and India for collectivistic culture), find different driving factors leading to knowledge hiding in the two different cultural settings. Thus, we encourage future studies to investigate the relationship between ICT use intensity and employees' knowledge hiding with respect to different cultural backgrounds.

Second, although we have briefly tested the indirect effects of ICT use intensity on the three types of knowledge hiding (i.e., evasive hiding, playing dumb, and rationalized hiding), we still hope that more scholars will be intrigued with this topic and figure out whether or not differences exist among the relationships between ICT use intensity and the three types of knowledge hiding.

Third, our research only considers the moderating effects of goal interdependence. In addition to this factor, future research can consider other personal and organizational characteristics. Numerous studies show that leaders usually have a pivotal influence on employees' interaction with their coworkers. For example, leaders with bottom-line mentality foster conflict and competitive relationships between employees and their coworkers (Babalola et al., 2020; Zhang et al., 2020). Therefore, we suggest that leaders with bottom-line mentality may strengthen the negative relationship between ICT use intensity and employees' empathy.

Conclusion

From an emotional perspective, our research shows that ICT use intensity is negatively related to employees' empathy, which subsequently increases their knowledge hiding. Moreover, competitive goal interdependence facilitates the negative relationship between ICT use intensity and employees' empathy and the indirect relationship between ICT use intensity and employees' knowledge hiding. Our research also highlights important directions that can expand our knowledge of ICT use intensity and employees' knowledge hiding. We hope that our research stimulates future scholars to delve into the ethical implications of ICT use intensity.

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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