

Knowledge withholding intentions in teams: The roles of normative conformity, affective bonding, rational choice and social cognition



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ABSTRACT

The decision of members in a knowledge-intensive team to withhold their knowledge may threaten the performance of the team. To address the problem of knowledge resource risk in project teams, we maintain that it is important to understand why team members choose to withhold their knowledge, conceptualized as knowledge-withholding intentions. In line with the literature on effort withholding, the research on multifoci relations between justice perceptions and social exchanges, and social cognitive theory, we proposed that the social exchange relationships that individuals form in the workplace, their perceptions of justice, and their knowledge withholding self-efficacy would influence their knowledge-withholding intentions. Through a survey of 227 information system development team workers, we found that all social exchange relationship variables had a significant impact on knowledge-withholding intentions. However, the justice perception variables only indirectly influenced knowledge-withholding intentions through the mediation of social exchange relationships. In addition, one of the task variables, task interdependence, influenced knowledge withholding intentions through the mediation of knowledge withholding self-efficacy. Our results contribute to the knowledge management literature by providing a better understanding of the antecedents of knowledge withholding. We also offer suggestions for future research utilizing the framework of Kidwell and Bennett (1993) to study effort and knowledge withholding.

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1. Introduction

Many factors combine to determine the performance of a knowledge-intensive project team. One critical determinant is whether the team as a whole can acquire strong collective knowledge gleaned and integrated from individual members' expertise. Some roadblocks, called "knowledge risks," have to be overcome to achieve this collective knowledge. For a typical knowledge-intensive project team like an information system development (ISD) team, Reich et al. identified several knowledge risks that greatly influence the performance of ISD projects. Two distant knowledge risks, knowledge resource risk and

structural risk, determine how the other three proximal risk factors (i.e., organizational support, management practice, and project change) influence project performance. Among these risks, knowledge resource risk is especially important, since elements inherent in knowledge resources, such as team members' competence, expertise, and knowledge, are critical to organizational support and management practice risks, both of which wield great impact on the project's process and performance [1].

There are two common explanations for the lack of knowledge resources. First, the team as a whole may lack the expertise and knowledge required for the project. Second, team members may for some reason withhold their knowledge, showing an unwillingness to contribute the most valuable part of their expertise to the ISD project. In the first situation, a lack of expertise or knowledge is basically an issue of talent management. Research has explored issues such as personnel recruitment, development, and training [2]. Little attention has been given to the second situation of knowledge-withholding intentions (KWI). Knowledge, with its contextual nature, is often implicit, which makes it difficult to identify or evaluate a person's knowledge contribution. The very difficulty of identification may in turn engender more KWI. Since it is difficult to detect knowledge-withholding behaviors, it would be reasonable to assume that such behaviors, as well as KWI,

Abbreviations: AVE, average variance extracted; CFI, comparative fit index; DJ, distributive justice; IJ, interactional justice; ISD, information system development; KWI, knowledge-withholding intentions; KWSE, knowledge withholding self-efficacy; LMX, leader-member exchange; MIS, management information systems; PJ, procedural justice; POS, perceived organizational support; RMSEA, root mean square error of approximation; SCT, social cognitive theory; SEM, structural equation modeling; SET, social exchange theory; SRMR, standardized root mean square residual; TI, task interdependence; TV, task visibility; TMX, team-member exchange.

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are widespread. Very few studies have investigated KWI, particularly with regard to its potential antecedents [3–5].

Prior studies on knowledge sharing have tended to probe from comparatively positive perspectives, basing research models on theories of trust, social capital, reward expectation, task-technology fit, or information system success [6–9]. However, very few studies have approached the topic from an effort-withholding perspective to explain why people do not contribute their knowledge. In conceptualizing KWI, we contend that knowledge withholding is not simply the absence of knowledge sharing. Instead, KWI is the intentional attempt to withhold or conceal knowledge that may be able to contribute to a team's performance. Behaviorally, knowledge withholding and a lack of knowledge sharing may appear quite similar, but the drivers behind KWI and a lack of knowledge sharing are strikingly different. While a lack of knowledge sharing is mainly driven by unfamiliarity with the subject and lack of time [10], knowledge withholding may be caused by a number of different reasons. With this notion in mind, we try to identify antecedents of knowledge withholding from the perspective of effort withholding.

In fact, using the two-factor theory [11] as an analogy may well explain the difference between KWI and knowledge sharing. Factors influencing KWI can be viewed as hygiene factors, while those influencing knowledge sharing can be viewed as motivators. The absence of some factors may cause members to withdraw knowledge contribution, but the presence of those factors may not necessarily encourage knowledge sharing. Therefore, we propose that due to different antecedents, knowledge withholding and knowledge sharing may display independent patterns of relationships with other variables. Indeed, prior studies on knowledge withholding and hiding [3,5] have proposed several KWI antecedents, which differ from the antecedents of knowledge sharing [12]. For example, prior knowledge sharing studies have seldom focused on variables such as justice perceptions, social exchange variables, and task variables, even though the literature on effort withholding suggests these variables are highly useful when tracing the origin of knowledge withholding [13,14]. Therefore, our first research question investigated the origins of KWI from the perspective of effort withholding: *What are the antecedents of KWI in teams?*

Researchers have analyzed the impact of a wide diversity of variables on effort withholding, including group characteristics, task characteristics, personality, interpersonal relationships, responsibility, and norms [14–17]. Each variable is in itself fruitful but somewhat fragmented when the whole picture of effort withholding is to be considered. Synthesizing different bodies of literature from economics, sociology, and psychology, Kidwell and Bennett [13] developed a comprehensive model and proposed that the behavior of effort withholding is triggered by three factors: the extent to which a team member wants to conform to normative expectations based on existing organizational justice (normative conformity); how well interpersonal bonds, or bonds between different parties, are maintained based on social exchange (affective bonding); and how a choice to withhold after considering the task features is deemed as rational (rational choice).

Comprehensive as their model is, Kidwell and Bennett seemed to assume that key variables in each dimension work independently. More recent studies in related research streams and inconsistent findings of studies based on Kidwell and Bennett's framework motivated us to revise their effort-withholding framework. First, from research on justice perceptions and work-related outcomes, scholars have suggested that justice variables influence employees' actions and reactions through social exchange variables [18–20]. Second, in the dimension of rational choice, researchers used task variables as a way to determine how individuals make rational choices. However, the inconsistent findings of effects of task variables on effort withholding suggest the possibility of mediators. Although the degrees of task interdependence (TI) and task visibility (TV) seem to be objective, whether team members withhold their effort in knowledge contribution still depends on whether they are confident in being able to do so without being noticed. Drawing on social cognitive theory (SCT) [21], we developed and proposed

knowledge-withholding self-efficacy (KWSE) as a mediator between task variables and KWI. Thus, a further investigation of relationships among variables of the three dimensions is warranted to better understand how individual perceptions and social cognitions influence KWI, an immediate antecedent to knowledge-withholding behaviors. We therefore asked a second research question: *What are the relationships among KWI antecedents based on Kidwell and Bennett's framework of effort withholding?*

In examining some of the antecedents of KWI and the mechanism through which those antecedents influence KWI, this study aims to contribute to research and practice in knowledge management. Through the study findings, researchers and practitioners can be more aware of the causes of KWI and mitigate its risk in knowledge-intensive project teams.

2. Theoretical background and hypotheses

The research model in Fig. 1 depicts the antecedents of KWI based on the framework of Kidwell and Bennett. We modified their framework by incorporating multifoci relations of organizational justice, social exchange, and social cognition of KWSE. We propose that three distinct types of justice perceptions relate to KWI not only directly, but also indirectly through corresponding social exchange relationship variables of perceived organization support (POS), leader–member exchange (LMX), and team–member exchange (TMX). In addition, the influence of task variables on KWI is mediated by a social cognitive factor, KWSE.

2.1. Effort withholding and knowledge withholding

Effort withholding refers to the likelihood that an individual will give less than full effort on a job-related task [13]. It is a common denominator of duty shirking, job neglect, social loafing, and free-riding [13]. All of these behaviors have one thing in common: an individual's withholding effort while performing a task. While shirking and job neglect occur more often when employees work alone, social loafing and free-riding take place in a group context.

Knowledge withholding is a specific form of effort withholding. Since it is difficult to ask individuals about actual knowledge-withholding behaviors, we used a proximal variable, KWI, to describe the likelihood a person would give less than full effort in contributing knowledge that may potentially influence performance. The contextual nature of knowledge and individual beliefs (e.g., psychological ownership) distinguish knowledge withholding from other forms of effort withholding. Although some forms of knowledge can be codified, other forms of knowledge are implicit and cannot easily be expressed. Haldin-Herrgard [22] used the metaphor of an iceberg to describe organizations' knowledge resources. Whereas structured, explicit knowledge is the visible top of the iceberg, tacit knowledge resources, such as intuition, rule-of-thumb, gut feeling, and personal skills, are usually beneath the surface. Individuals are the primary repositories of tacit knowledge in organizations. It is therefore difficult to detect whether someone has implicit knowledge and easy for him or her to hide implicit knowledge. Furthermore, what differentiates withholding knowledge from social loafing, free-riding, or shrinking may be the notion of “psychological ownership.” Researchers have suggested that by contributing a part of one's unique knowledge, one gives up sole claim to the benefits stemming from such knowledge [23]. For example, Peng found that if individuals believe they own the knowledge they use in work settings, they are more likely to hide knowledge [5].

2.2. Antecedents of withholding effort

Researchers have tried to predict effort withholding using different variables such as task characteristics, personality, group characteristics, equity perceptions, interpersonal relationships, and norms [14–17,24]. Kidwell and Bennett formulated a systematic framework that was widely adopted and empirically validated in the research stream of effort

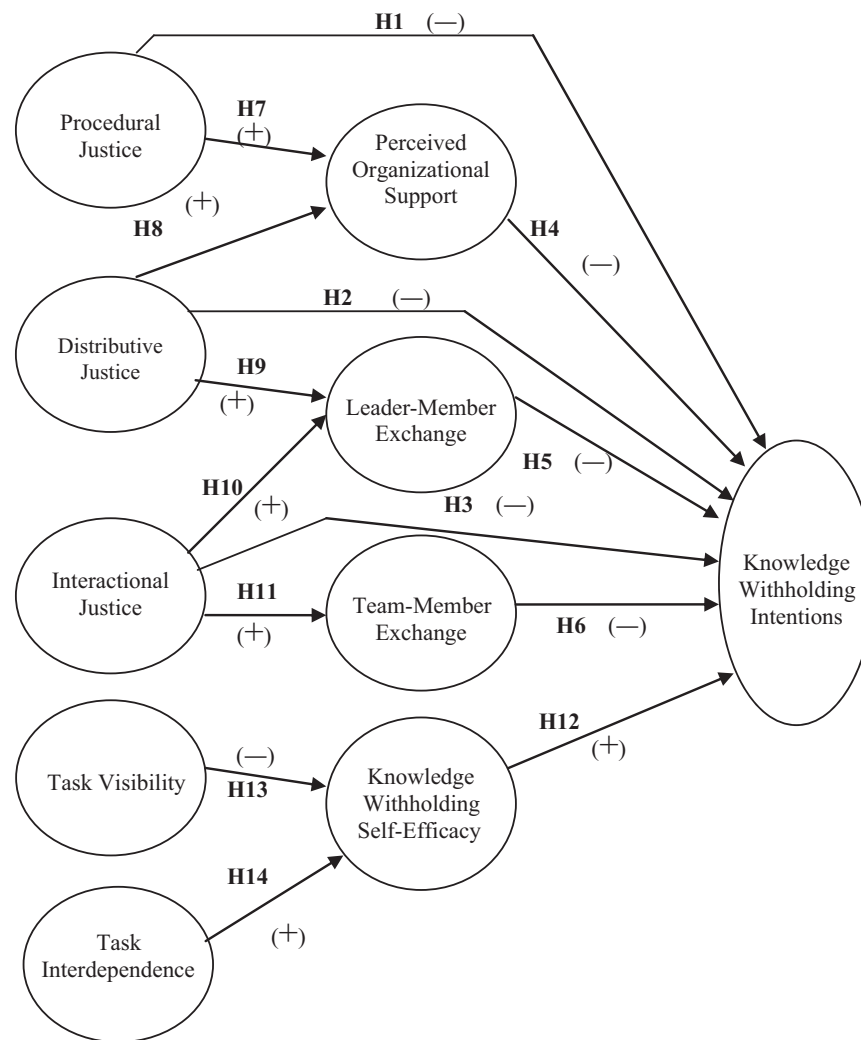


Fig. 1. Research model.

withholding [14,16]. Studies based on their framework are summarized in Table 1. They proposed that effort withholding behavior is triggered by three factors: normative conformity, affective bonding, and rational choice. First, normative conformity is team members' perception of peer compliance norms, justice, and equality. For example, if members perceive group loafing or inequality in their team, they tend to withhold their knowledge. Second, affective bonding is the affection and emotional attachment between members or groups. Variables such as group cohesion, interpersonal relationships, mutual respect, group turnover rate, and other factors related to bonding influence one's intention to withhold knowledge. Third, rational choice refers to the fact that individuals make "rational" decisions based on the benefit/cost evaluation of their work environment. The decision to withhold knowledge is rationally made by considering the task and environmental features such as wage premium, group size, task visibility, and task interdependence [13].

Empirical evidence from other bodies of literature suggests that it may be helpful to revise the framework to better understand effort withholding in general and knowledge withholding in particular. First, research on multifoci relations of justice and social exchanges [14,18,19,25] suggests that key variables in the three dimensions of Kidwell and Bennett's framework may not act independently. Rather, fair treatment/procedure influences employees' perception of social exchange relationships, which in turn influences their reaction to day-to-day work. Second, inconsistent findings of the effects of task variables

suggest potential mediating variables [14,16,17]. Third, the objective environmental features may not directly influence the withholding behaviors; instead, the rational withholding decision may be influenced by individual social cognition. As a result, we integrated research on justice and social exchange relationships and social cognitive theory into Kidwell and Bennett's framework of effort withholding to better understand KWI. We discuss each construct and its relationship to KWI in the following sections.

2.3. Justice perceptions and knowledge withholding intention

Models considering normative conformity motivations maintain that a person's behavior is influenced by a desire to adhere to standards grounded in socially instilled values [26]. Fairness perception can be viewed as a specific norm that determines members' contribution in organizational activities [27]. Research on organizational justice suggests that individuals are sensitive to others' receiving similar rewards for less effort, and effort may be adjusted to reflect individual perceptions of justice [27,28]. The role of organizational justice in the decision to withhold knowledge is based on the "norm of retaliation" [29]. When project team members feel they are treated unfairly, they will attempt to "even the score" by engaging in retaliatory behavior [29], that is, withholding knowledge [13,16,20,30].

Three major dimensions of organizational justice—procedural justice (PJ), distributive justice (DJ), and interactional justice (IJ)—have

Table 1

Summary of relevant studies on effort withholding.

Author	Study aim	Antecedents (significance)
Kidwell and Bennett (1993)	Clarify/reconceptualize past theory and research and develop hypotheses to direct future research on propensity to withhold effort.	Normative conformity (–) Peer compliance norms (–) Equity perceptions Affective bonding (–) Altruism (+) Group turnover rate (–) Length-of-service homogeneity Rational choice (–) Wage premium (+) Work group size (+) Task interdependence (–) Task visibility
Wagner (1995)	Test a model of cooperation in a group of 492 undergraduate students in an introductory management course at a large Midwestern university.	(–) Individualism–collectivism (S.) Rational choice (+) Group size (S.) (–) Identifiability (S.) (–) Shared responsibility (S.)
Murphy et al. (2003)	Based on social exchange theory, test 301 employees from 18 work groups, managed by 13 supervisors, at a mid-sized, family-owned manufacturing company.	Affective bonding (–) Leader–member exchange (S.) (–) Team–member exchange (N.S.) Control variables (–) Task visibility (N.S.) (–) Negative affectivity (N.S.)
Liden et al. (2004)	Test a multilevel model among 23 intact work groups comprising 168 employees representing two organizations.	<i>Individual level</i> Normative conformity (–) Distributive justice (S.) (–) Procedural justice (N.S.) Rational choice (+) Task interdependence (S.) (–) Task visibility (S.) <i>Group level</i> Normative conformity (+) Coworker loafing (N.S.) Affective bonding (–) Group cohesiveness (S.) Rational choice (+) Work group size (S.) (–) External competition (S.)
Kidwell et al. (2007)	Base on agency theory and social exchange theory, investigate contextual antecedents of free-riding by franchisees on franchisor brand reputation and effects of free-riding on performance in a multinational corporation's franchising network.	Normative conformity (–) Formalization (S.) Affective bonding (–) Interaction (S.) Rational choice (+) Centralization (S.)
Tan and Tan (2008)	Examine the roles of personality, motives, and contextual factors in influencing organizational citizenship behavior and social loafing in a sample of 341 individuals working in project groups.	Contextual factors (–) Task visibility (N.S.) (–) Task interdependence (N.S.) (–) Group cohesiveness (N.S.) (–) Felt responsibility (S.) Motives (–) Prosocial values (N.S.) (–) Organizational concern (N.S.) Personality (–) Conscientiousness (S.)
Nov and Kuk (2008)	Address concerns about the sustainability of the open source content model.	Personality (–) Fairness trait × justice (S.) Context (–) Perceived justice (S.) (–) Intrinsic motivations (S.)

(S.): significant; (N.S.): not significant; (+): positive relationship; (–): negative relationship.

been found to negatively influence withholding effort in the workplace [16,17,27]. PJ refers to the perceived fairness of the formal decision-making procedures used in the project [31]. It can convey to employees that they are valued by the team and consequently create an environment in which team members have better task performance [32]. Karau and Williams [33] pointed out the salience of PJ in individual decisions regarding the degree of effort to expend on tasks. When individuals perceive that they are being treated fairly in their work procedures, they are less likely to withhold knowledge. We therefore propose:

H1. PJ is negatively related to KWI.

DJ refers to the perceived fairness of outcomes or rewards that an employee receives from the organization [31]. Rewards from the organization are often seen as a gauge by which team members perceive whether their competence and effectiveness in task are fairly valued [34]. A study by Liden et al. [35] indicated that individuals reduce their effort when they feel that they are not receiving an equitable amount of resources or rewards from the organization relative to their inputs. Accordingly, we propose:

H2. DJ is negatively related to KWI.

IJ refers to the perceived fairness of interpersonal communication and treatment individuals receive from others in the organization [36]. Research has demonstrated a correlation between organizational retaliatory behaviors and IJ [27,29]. When individuals perceive that they are not being treated with honesty, respect, and openness, they experience low levels of IJ and therefore are more likely to perform organizational retaliatory behaviors [29]. In the context of project teamwork, members are more likely to withhold knowledge as an implicit way to retaliate against unfair interpersonal treatment. We therefore hypothesize:

H3. IJ is negatively related to KWI.

2.4. Social exchange relationships and knowledge withholding intention

Social exchange theory (SET) is a broad term that designates a family of related conceptual models. Early SET research focused on the role of material self-interest in the formation of fairness perceptions, whereas contemporary research emphasizes the formation of interpersonal relationships [19]. Behind SET are several basic assumptions: (1) social behavior is a series of exchanges; (2) individuals attempt to maximize their rewards and minimize their costs; and (3) when individuals receive rewards from others, they feel an unspecified obligation to reciprocate, though exactly when the obligation will occur and in what form is often unclear [37,38]. The unspecified obligation to reciprocate has been termed the “norm of reciprocity” [14,38]. SET asserts that personal interactions are dictated by the exchange of intangible social costs and benefits (e.g., respect, honor, and friendship) and are often not governed by explicit rules. After comparing the potential gain from certain behavior with the gain from alternatives, one will select the behavior that brings the best returns.

According to SET, the quality of exchange relationships provides incentives to minimize effort withholding (in our case, knowledge withholding) [13,14]. That is, individuals are motivated to make an effort because of their emotional attachments to other people [13]. When individuals are in a high-quality relationship, they tend to behave in ways that benefit their exchange partners by performing at high levels and exerting extra effort [14]. Affective bonds evolve as parties in a relationship interact with one another and mature over time. In the organizational context of withholding effort, an individual's relationships with his or her coworkers, direct supervisor, and the organization will influence his or her decision to exert or conceal effort. As a result, POS, LMX, and TMX are important factors in this dimension [14,39].

POS refers to the extent to which employees believe that their organization values their contributions and cares about their well-being [40]. Since POS is an exchange relationship between employees and their organization, the norm of reciprocity implies that high POS would elicit employees' felt obligation to care about the organization's welfare and to help the organization reach its objectives [41]. For project team workers, the most immediate and effective way to help achieve organizational objectives is to exert greater effort and offer high-quality knowledge for project teamwork. We propose:

H4. POS is negatively related to KWI.

LMX refers to perceptions relative to the relationship between an individual and his or her immediate supervisor [20]. In LMX theory, the quality of the relationship between supervisors and subordinates falls into two categories [20]. The term “in-group” is used to mean a higher quality of LMX characterized by trust, affection, and mutual respect, while “out-group” is used to mean a lower quality of LMX based on formal rules, policies, and authority [42]. In-group employees make contributions that go beyond their literal job description, whereas out-group employees perform no more than the routine tasks asked of them by a leader or an immediate supervisor [42]. This implies that individuals with high levels of LMX tend not to withhold knowledge in reciprocation. We therefore propose:

H5. LMX is negatively related to KWI.

TMX refers to the quality and reciprocity of relationships between team members and their perceptions of intrateam willingness to reciprocate information and assistance [43]. In teams with high teamwork quality, positive TMX motivates team members to contribute their knowledge to their full potential [43]. Prior research has demonstrated a negative association between quality of TMX and effort withholding [33]. With low-quality TMX, team members will not hesitate to withhold effort and allow others to pick up the slack [39]. Therefore, we propose:

H6. TMX is negatively related to KWI.

2.5. Task features and knowledge withholding intention

A rational choice or action is a decision made after comparing the costs and benefits of different environmental constraints [44]. In a team-based setting, rational choice implies that individuals adjust their effort levels to maximize their interests after taking into consideration group contextual effects as well as the supervisor's control and monitoring [13]. Researchers have identified TI and TV as two of the most crucial factors in rational choice [16,17,45].

TI refers to the degree to which individuals perceive that they interact with and depend upon others to accomplish their work [8]. Empirical evidence has shown mixed findings on the influence of TI on effort withholding. Arguing that as TI increases, individual members tend to rationally choose to withhold personal, informational, or organizational resources from each other due to the difficulty in distinguishing and identifying individual contribution and performance, Liden et al. [16] found that TI was positively related to social loafing. However, Tan and Tan [17] did not find a significant relationship between TI and social loafing. Another study conducted by Stark et al. [46] showed that low TI predicted peer-rated social loafing. The rationale behind this negative relationship is that in the situation of low TI, team member behaviors are more difficult to observe, and opportunities for mutual monitoring of team member behavior are fewer. Thus, social loafing becomes more prevalent [46].

TV refers to the perceived belief that a supervisor is aware of individual effort on the job [28,45]. Generally speaking, researchers argue that in the case of high TV, individuals will make a rational choice not to withhold effort because they believe that the benefits of effort withholding are far less than the costs, such as being punished by managers. Likewise, when team members' contributions are highly visible to supervisors, team members would choose not to withhold their knowledge to avoid punishment. Nevertheless, empirical findings on the TV-effort withholding relationship are inconsistent. In some studies, the relationship between TV and social loafing was negatively significant [16,45], while in other studies, the relationship was not significant (e.g., [14,17]).

Due to inconsistent findings, we have not included a hypothesis about the relationship between task variables and KWI. Instead, we propose that task variables indirectly influence KWI through the mediation of KWSE, as explained in Section 2.7.

2.6. Justice perceptions and social exchange relationships

A small but consistent body of research has identified organizational justice perceptions as an important factor related to social exchange relationships in the workplace [18,19,47]. Based on the principle of social exchange, individual workers identify the responsible party for the perceived justice or injustice and modify their actions accordingly. Once the responsible party has been identified, individuals develop a desire to reciprocate, leading to the creation of mutual obligation in the relationship. A number of researchers have found varying relationships between particular types of organizational justice and seemingly corresponding social exchange relationship [48]. We also echo the

multifoci relations between justice perceptions and social exchange relationships [19]. The basic rationale is that domain-specific justice perceptions influence the quality of social exchange relationships within that particular domain.

Justice perceptions may well be one aspect of an employee's evaluation of discretionary actions taken by the organization that are indicative of the degree of organizational support. Based on the arguments of Wayne et al. [20], we propose that PJ and DJ contribute to POS. We did not include IJ as a predictor of POS because IJ is about the perception of being treated with respect and dignity by individual members in an organization, such as team leaders and members, rather than the organization as a whole.

When outcomes of organizational treatment are considered fair, employees may interpret this as evidence that their organization cares about their values and well-being. Also, when employees perceive their organization as designing fair procedures for decision making, they may form a desire to reciprocate this favorable treatment, leading to the formation of a high-quality relationship with the organization. Initial empirical support has shown a relation between PJ and POS and between DJ and POS. For example, Fasolo [49] found that both DJ and PJ explained the unique variance in POS when controlling for other types of justice. Similarly, Wayne et al. [20] found that PJ and DJ contributed greatly to POS compared to other factors such as inclusion or organizational tenure. We therefore propose:

H7. PJ is positively related to POS.

H8. DJ is positively related to POS.

SET suggests that justice perceptions contribute to relationships with leaders only when individuals attribute justice to leaders [50]. This reasoning implies that DJ and IJ are relevant to LMX. With regard to DJ and LMX, prior studies have generated mixed findings. While McFarlin and Sweeney found a positive relationship between DJ and evaluations of supervisors [51], Andrews and Kacmar found no significant relationship between DJ and LMX in a large government organization [52]. It has been speculated that the nonsignificant relationship is due to leaders' limited roles in influencing individual outcomes. Although the role of leaders in reward distribution in government organizations may be limited, we examined a field setting in which leaders had some role in individual reward allocations, whether rewards were tangible or intangible. Therefore, we still argue that individuals will attribute DJ to the actions of their leaders.

H9. DJ is positively related to LMX.

IJ refers to fairness of interpersonal communication and is strongly related to LMX [53]. Given that project team workers are in constant interaction with not only their leaders but also other team members, both leaders and members may be held responsible for IJ perceptions. To our knowledge, only one study has examined the relationship between IJ and TMX [14]. Therefore, we argue that IJ will be positively related to both LMX and TMX.

H10. IJ is positively related to LMX.

H11. IJ is positively related to TMX.

2.7. Task variables, KWSE, and KWI

In SCT, perceived self-efficacy is a key element that influences an individual's behavior [54], especially in the context of knowledge management [8,55–57]. Self-efficacy is a form of self-evaluation that influences decisions about what behaviors to undertake, how much effort to put forth, and the mastery of the behavior [21]. We argue that to withhold knowledge, individuals would have to be confident that they would not be caught or punished in the process. Therefore, we developed a new variable named KWSE and defined it as the confidence in

one's ability to withhold knowledge without being noticed. Since employees' belief that their manager has the power to exert punishment has been shown to have a positive impact on knowledge contribution behavior [58,59], we inferred that when team members are confident in their capability to conceal knowledge without being discovered (high KWSE), they are more likely to engage in such behavior; on the contrary, those who are low in KWSE do not tend to withhold knowledge for the fear of experiencing negative consequences such as being ostracized by team members or punished by supervisors. Thus, we propose:

H12. KWSE is positively related to KWI.

Although Kidwell and Bennett argued that TV and TI were key variables in rational choice that influenced effort withholding, inconsistent empirical findings led us to suspect that the nature of a team task may serve more as a contextual factor that provides a good environment to withhold effort. However, to make a rational choice to withhold effort still depends on individuals' efficacious beliefs that they can do so without being noticed. Individuals with low KWSE may give up the chance to withhold knowledge despite the objective nature of low task visibility.

Also, SCT instructs that task characteristics such as perceived difficulty or perceived complexity have an important effect on the formation of one's efficacious belief [60]. That is, when a task is perceived as more difficult than usual, an individual's self-efficacy tends to be low, whereas self-efficacy is increased if the task assigned is less overwhelming and more doable [36,61]. When team members perceive that the visibility of a task is high, it becomes more difficult to hide knowledge. Accordingly, KWSE will be low. Similarly, when tasks are highly interdependent and thus it is less clear who is doing what, the ambiguity of personal contributions increases self-efficacy to withhold knowledge. Therefore, we propose:

H13. TV is negatively related to KWSE.

H14. TI is positively related to KWSE.

3. Research method

3.1. Operationalization of constructs

A survey was constructed with 66 items: 5 on TV, 5 on TI, 5 on KWSE, 6 on PJ, 6 on DJ, 9 on IJ, 7 on POS, 6 on LMX, 10 on TMX, and 7 on KWI. The constructs, the sources of the measures, and questionnaire items are reported in Appendix A. All items had a 7-point scale ranging from 1, *strongly disagree*, to 7, *strongly agree*. The questionnaire was translated and administered in Chinese and later back-translated into English; backward translation was used to ensure consistency between the Chinese and the original English versions of the instrument [22].

A pretest of the questionnaire was performed with five knowledge management professors to assess logical consistencies, ease of understanding, question item sequence adequacy, and context fitness. Based on comments collected from these experts, we modified the wording and readjusted the sequence of some questions. Subsequently, 7 management information systems (MIS) doctoral students and 10 knowledge management working professionals were invited and participated in a pilot study. They were also asked to give suggestions on the item content and the structure of the instrument.

Items measuring KWI and KWSE were pretested with 84 college students participating in MIS projects. Exploratory component analysis using principal component extraction was performed. With the use of a scree plot and based on the guideline that the Eigenvalue be greater than one, two factors of the varimax rotation emerged. Items that loaded higher than 0.6 were kept without modification.

3.2. Sample and procedure

We targeted knowledge workers whose team projects were of a knowledge-intensive nature. ISD teams are usually composed of knowledge workers with different expertise: system analysts, system designers, database administrators, network specialists, and programmers. Performance of such teams hinges greatly on the collaborative contribution of team members. Participants were selected from a list of 1000 MIS alumni of a university located in southern Taiwan and worked in local or multinational companies across Taiwan. We sent out an email invitation with a hyperlink to our online survey, and we requested and ensured that all participants answered every question. Therefore, there were no missing values. After ensuring confidentiality, we asked participants to answer our questions based on the ISD team that they had most recently joined. Eventually, 227 usable responses were collected after deleting three extreme cases in the data screening process. Barnett and Lewis [62] suggested that extreme cases, outliers, should be removed because the presence of outliers can lead to inflated error rates and substantial distortions of statistic parameters. Outliers can decrease normality and reduce the power of statistical tests, altering the odds of making both Type I and Type II errors [62,63]. Scholars thus argue for removal of outliers to increase the accuracy of statistical tests [64].

Table 2 reports participant demographic information. The average age of participants was 37. The team size ranged from 5 to 11 (70%), with an average of 8. Among participants, 42.7% were programmers, 18.9% were system designers, 18.1% were database administrators, and 16.8% were system analysts. All participants were ISD team members and were considered a suitable sample for the purpose of our study.

3.3. Assessing nonresponse bias and common-method bias

Nonresponse may lead to a smaller final sample size and, therefore, to a loss of accuracy in population estimates [65]. Dillman [66] suggested that researchers conduct a nonresponse bias test to judge whether nonresponse might have distorted the survey results. A time-trend extrapolation test was thus used to examine nonresponse bias, wherein early and late respondents were compared based on a multivariate analysis of the variance of all variables of construct items and demographic data. There were no significant differences between our early 25% and late 25% respondents, so the possibility of nonresponse bias was safely excluded.

To address the issue of common-method bias, we arranged the questionnaire items so that the dependent variables followed rather than

preceded the independent variables. Harman's single-factor test was then used to detect bias. Results revealed 10 factors with an Eigenvalue greater than one, and no single factor explained most of the variance (i.e., the variances explained 6.67% to 14.08% of the variance). Such results are consistent with the absence of a significant variance common to the measures. In addition, we employed partial correlation, following the method used by Podsakoff et al. [67]. The first factor from the principal components factor analysis was put into the structural equation model as a control variable on all dependent variables. This factor was assumed to contain the best approximation of the common-method variance if it was a general factor on which all variables loaded. The controlled factor did not produce a significant change in the variance explained in any of the dependent variables of our questionnaire items, indicating a lack of common-method bias. In sum, the tests suggested that common-method bias did not constitute a problem in this study.

3.4. Data analysis

To test the hypotheses, we used structural equation modeling (SEM) with latent variables using LISREL 8.704 [68]. This analytical method has advantages over traditional hierarchical regression because SEM allows researchers to simultaneously examine multiple interrelated relationships among variables and to take random measurement error into account [69]. The SEM process generally centers around two steps: validating the measurement model and fitting the structural model. The measurement model tests the loadings of the observed variables to their latent factors, and the structural model specifies relationships among the latent variables. The two-stage procedure for SEM has been shown to produce less biased parameter estimates than simultaneous estimation of both measurement and structural parameters [70].

4. Results

4.1. Assessment of the measurement model

We employed confirmatory factor analysis (CFA) to assess the validity of the scales. Kline [69] recommended that four tests—the ratio of chi-square to degrees of freedom ($\chi^2/\text{d.f.}$); comparative fit index (CFI); standardized root mean square residual (SRMR); and root mean square error of approximation (RMSEA)—should be interpreted to assess model fit. For a good model fit, the $\chi^2/\text{d.f.}$ should have a ratio under 3 [62]; CFI, a value above 0.95; SRMR, a value less than 0.10; and RMSEA, a value less than 0.08 [61]. For the current measurement model, the $\chi^2/\text{d.f.}$ was 1.904 ($\chi^2 = 4250.517$, $\text{d.f.} = 2232$), CFI was 0.872, RMSEA was 0.063, and SRMR was 0.078. Since the goodness-of-fit indices, except for CFI, indicate an adequate fit for the hypothesized model and all items loaded significantly on the latent constructs they were designed to measure, we can reasonably conclude that the hypothesized model fits the data well.

We also assessed Cronbach's alpha, the composite reliability of constructs, and average variance extracted (AVE) to test convergent validity. As shown in Table 3, the Cronbach's alpha values of all constructs were above the benchmark value of 0.70. Composite reliability values ranged from 0.90 to 0.97 and were above the benchmark value of 0.70. AVE values ranged from 0.57 to 0.82. These results indicated that the measurement model had satisfactory convergent validity. In addition, the square roots of the AVEs for all constructs were greater than the correlations between constructs, demonstrating the discriminant validity of the measurement model. Finally, we ran multicollinearity tests and found that the constructs' variance inflation factor values were acceptable (i.e., between 1.30 and 2.04). Thus, multicollinearity did not appear to be a significant problem.

Table 2
Demographic characteristics of the sample.

Demographic variable	Sample composition (N = 227)			
Gender	Male	167 (73.6%)	Female	60 (26.4%)
Education	College (2 years)	84 (37.0%)	Master's degree	26 (11.5%)
	Bachelor's degree (4 years)	112 (49.3%)	Ph.D.	5 (2.2%)
Work position	Programmer	97 (42.7%)	System designer	43 (18.9%)
	System analyst	38 (16.8%)	Other technician	8 (3.5%)
	Database administrator	41 (18.1%)		
Industry	Manufacturing	46 (20.2%)	Information technology	62 (27.3%)
	Service	42 (18.7%)	Finance	40 (17.6%)
	Hospital	12 (5.3%)	Education	10 (4.4%)
	Government	13 (5.7%)	Others	2 (0.8%)
Project age	Less than 3 months	38 (16.7%)	19–24 months	17 (7.5%)
	4–6 months	50 (22.0%)	25–36 months	15 (6.65%)
	7–12 months	73 (32.2%)	More than 37 months	6 (2.6%)
	13–18 months	28 (12.3%)		

Table 3
Convergent, discriminant validity and correlations.

Cons.	Mean	SD	AVE	CR	α	Construct									
						KWI	TV	TI	KWSE	PJ	DJ	IJ	LMX	TMX	POS
KWI	3.01	1.06	0.77	0.96	0.95	0.88									
TV	4.86	0.96	0.74	0.93	0.91	-.39**	0.86								
TI	5.13	0.93	0.69	0.92	0.89	-.36**	.33**	0.83							
KWSE	3.11	1.06	0.80	0.95	0.94	.59**	-.27**	-.25**	0.89						
PJ	5.01	0.98	0.82	0.97	0.96	-.51**	.48**	.30**	-.31**	0.91					
DJ	4.87	0.94	0.79	0.96	0.95	-.37**	.48**	.37**	-.14*	.56**	0.89				
IJ	4.71	1.00	0.78	0.97	0.96	-.34**	.42**	.30**	.016*	.51**	.59**	0.88			
LMX	4.77	0.87	0.77	0.95	0.95	-.53**	.43**	.28**	-.32**	.58**	.51**	.43**	0.88		
TMX	4.73	0.84	0.72	0.96	0.96	-.56**	.46**	.40**	-.31**	.58**	.53**	.51**	.55**	0.85	
POS	4.53	0.64	0.57	0.90	0.87	-.47**	.30**	.26**	-.20**	.45**	.46**	.32**	.39**	.50**	0.75

Note: AVE = average variance extracted; CR = composite reliability; SD = standard deviation. Diagonal elements are the square root of AVE.

* $p < 0.05$.

** $p < 0.01$.

4.2. Assessment of the structural model

Fig. 2 presents the results of the structural model, with the path significance of each hypothesized association in the research model. As shown in Fig. 2, all of our hypotheses except for H1, H2, H3, and

H14 were supported. Specifically, POS ($\beta = -0.405$, $p < 0.01$), LMX ($\beta = -0.296$, $p < 0.01$), and TMX ($\beta = -0.235$, $p < 0.01$) all demonstrated significant relationships with KWI. Therefore, H4, H5, and H6 were supported. For the relationships between justice perceptions and social exchange relationships, the results indicated that PJ ($\beta = 0.192$,

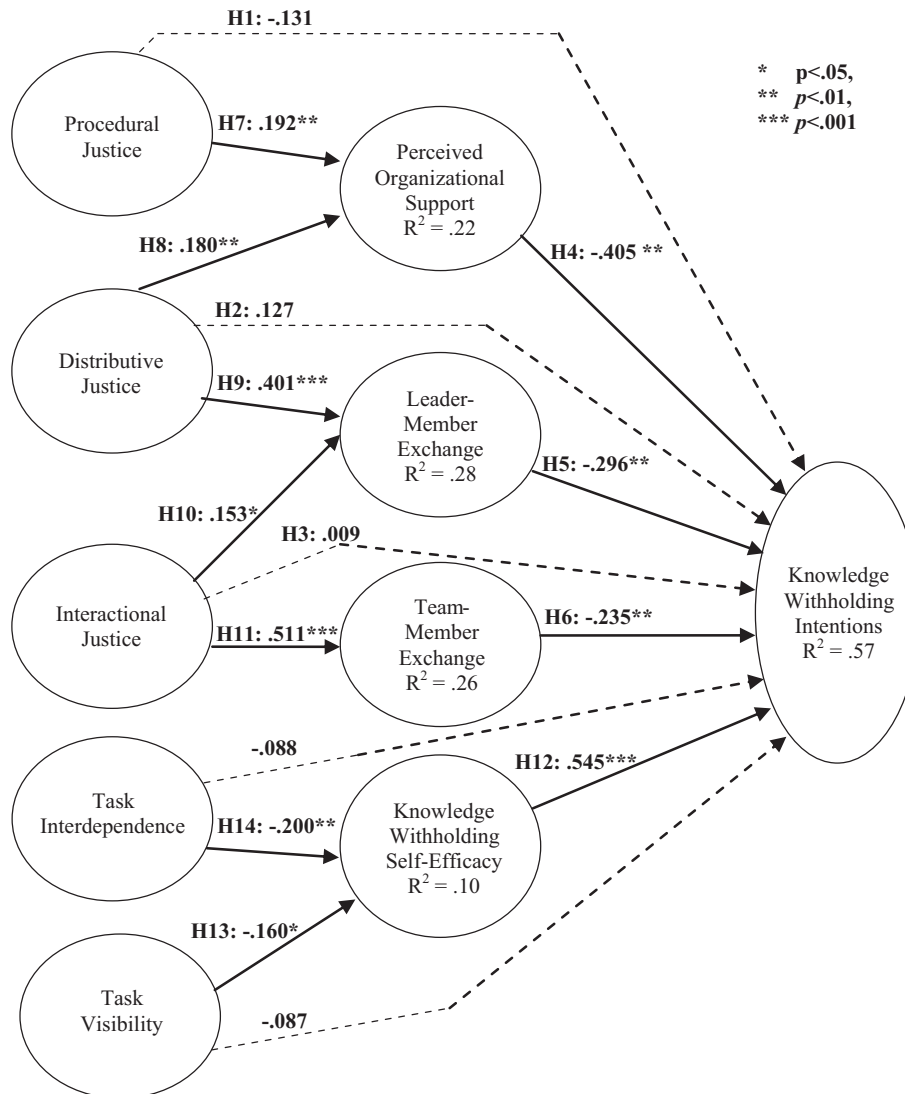


Fig. 2. Results of the hypothesis testing for the research model.

$p < 0.01$) and DJ ($\beta = 0.180, p < 0.01$) were significantly related to POS; DJ ($\beta = 0.401, p < 0.001$) and IJ ($\beta = 0.153, p < 0.05$) were significantly related to LMX; and IJ was significantly related to TMX ($\beta = 0.511, p < 0.001$). Therefore, H7, H8, H9, H10, and H11 were supported. Our results also indicated that neither of the direct paths from justice perceptions to KWI was significant, as indicated by PJ ($\beta = -0.131, n.s.$), DJ ($\beta = 0.127, n.s.$), and IJ ($\beta = 0.009, n.s.$); thus H1, H2, and H3 were not supported. However, KWSE and KWI were positively related ($\beta = 0.545, p < 0.001$) and TV was negatively related to KWSE ($\beta = -0.160, p < 0.05$); thus, H12 and H13 were supported. Although the relationship between TI and KWSE was significant ($\beta = -0.200, p < 0.01$), the relationship was negative, as opposed to the hypothesized positive relationship. Therefore, H14 was not supported. The variance explained of POS, LMX, TMX, KWSE, and KWI was 22%, 28%, 26%, 10%, and 57%, respectively. The R^2 values for all mediating variables (i.e., POS, LMX, TMX, and KWSE) and the dependent variable (i.e., KWI) yielded an excellent goodness-of-fit for the whole research model [71,72].

4.3. Mediating effect testing

To formally test whether social exchange variables and KWSE fully or partially mediated the effects of justice perceptions and task variables on KWI, we followed the procedures proposed by Lau and Cheung [73] and applied the results of decomposition of effects, a commonly used process in which the total effect of an independent variable on a dependent variable is broken down into its direct and indirect effects (e.g., [18,74]). Table 4 shows the direct and indirect effects of justice perceptions and task variables on KWI. All estimates are reported as standardized path coefficients. A significant indirect effect along with a nonsignificant direct effect indicates that the relationship between an independent variable and dependent variable is fully mediated by the mediator. A finding that the direct effect is still significant suggests that the relationship between the independent variable and dependent variable is partially mediated by the mediator. As shown in Table 4, the results indicated that all direct effects were not significant, but all indirect effects were significant, except for the mediating paths of IJ \rightarrow LMX \rightarrow KWI and TV \rightarrow KWSE \rightarrow KWI. Therefore, the results suggest that POS fully mediated the effect of PJ on KWI and, while the effect of DJ on KWI was fully mediated by POS and LMX, the effect of IJ on KWI was fully mediated only by TMX. Also, KWSE fully mediated the relationship between TI and KWI but not the relationship between TV and KWI.

5. Discussion

The results of the SEM analysis provided general support for the hypothesized model: KWI is reduced as a result of more POS, LMX, and TMX. Contrary to our hypotheses, none of the justice perceptions had a significant, direct relationship with KWI. Instead, relationships between justice perceptions and KWI were fully mediated by different

social exchange relationships. Also, the impact of TI on KWI was fully mediated by KWSE, whereas TV had neither a direct nor indirect impact on KWI.

Results confirm the argument of Kidwell and Bennett that affective bonding—or the quality of social exchange relationships that individuals form with different organizational actors—plays a key role in knowledge withholding. Individual project team workers were less inclined to withhold knowledge when they perceived that their organizations valued them and cared for their well-being. This suggests that to address knowledge resource risk in ISD project teams, organizations need to not only select people with adequate knowledge, skills, and abilities, but also convince people that they are valuable and are supported by the organizations. Our results also showed that individuals with high-quality LMX had less intention to withhold knowledge, implying that knowledge withholding is one way team members respond to low-quality exchanges with their leaders [42]. To ensure the successful operation of a project team, a leader must create a fair and cohesive work environment in which group members are willing to identify with the project vision, participate in its implementation, and share their knowledge [75,76]. Finally, TMX was shown to significantly influence KWI, meaning that a project team member with high-quality relationships with other team members reciprocates toward them by contributing helpful knowledge to show the value of their exchange relationships [77,78].

Contrary to our hypotheses, none of the justice perceptions were directly related to KWI. Instead, the effects of organizational justice on KWI were fully mediated by social exchange variables (with one exception). Our findings showed counter-evidence to previous studies on justice perceptions and effort withholding (e.g., [16,24]). One reason is that previous researchers did not take social exchange variables into account. Our study suggests that future research that approaches knowledge withholding from the fairness perspective should account for social exchange relationships; otherwise, results may be misleading. A second explanation may relate to contextual sensitivity. Participants were Taiwanese, and research has shown that *guanxi* (defined as “a relationship between two or more individuals that is implicitly based on reciprocity and mutual interest” [75]), an important sociocultural factor, plays a critical role in workers' information-sharing behaviors in Chinese culture [75,79,80]. Given that the effort-withholding framework we used is based on the work of Western scholars, we did not include *guanxi* in our model. Nevertheless, we suspect that *guanxi* may be a key variable in the dimension of affective bonding in Kidwell and Bennett's framework. Specifically, the ‘obligatory’ nature of *guanxi* and the focus on long-term relationships in the Chinese culture may suppress the intention of withholding knowledge.

From the test of mediating effects, results showed that the relationships between justice perceptions and KWI were apparently indirect. Confirming the multifoci justice and social exchange relations, we found that POS fully mediated the effects of PJ and DJ on KWI, that LMX fully mediated the effects of PJ on KWI, and that TMX fully mediated the effect of IJ on KWI. That is, even though employees perceive unfair treatment by their organization, leaders, and/or coworkers, the unfair perceptions do not translate directly into attempts of “retaliation.” Rather, employees accumulate experiences of fair or unfair treatment in their social exchange accounts, which then determine whether they contribute or withhold knowledge in projects. One of our results showed that LMX did not mediate the relationship between IJ and KWI. As stated by Scandura [47], despite the fact that IJ and LMX were correlated, whether IJ is a tangential outcome to the LMX process or a more central element in the development of the LMX relationship remains unclear. It is likely that participants in our study attribute the source of interactional justice more to their team members than to their leaders. In short, by establishing social exchange variables as mediators, we have a better understanding of how employees' perception of the fairness of a singular event becomes integrated into their history of

Table 4
Significance of mediated paths from justice perceptions and task variables to KWI.

Direct effect	Path coefficient	Indirect effect	Path coefficient
PJ \rightarrow KWI	−0.131	PJ \rightarrow POS \rightarrow KWI	−0.078*
DJ \rightarrow KWI	0.127	DJ \rightarrow POS \rightarrow KWI	−0.073*
		DJ \rightarrow LMX \rightarrow KWI	−0.119**
IJ \rightarrow KWI	0.009	IJ \rightarrow LMX \rightarrow KWI	−0.045
		IJ \rightarrow TMX \rightarrow KWI	−0.120**
TI \rightarrow KWI	−0.088	TI \rightarrow KWSE \rightarrow KWI	−0.109**
TV \rightarrow KWI	−0.087	TV \rightarrow KWSE \rightarrow KWI	−0.087

* $p < 0.05$.

** $p < 0.01$.

experiences with the accountable parties, which in turn influences their knowledge-withholding attitudes and behaviors.

In the rational choice dimension, contrary to our hypothesis, TI had a significantly negative relationship with KWSE. As Tan and Tan [17] suggested, in a team where TI is high, team members commonly have different roles, skills, and resources. Team performance in the condition requires mutual interactions and coordination among team members, so members gradually recognize each other's knowledge, skills, and ability [17]. Therefore, as communications and interactions increase among ISD team members, an individual's KWSE would decrease. In addition, project managers in ISD often previously held a position of system designer or system programmer, which makes it easier for them to detect and deter knowledge withholding behavior in their team members.

Although TI was found to influence KWI only indirectly through KWSE, TV did not have any significant direct or indirect relationship with KWI. Past studies [14,16,17] have corroborated that TV and TI do not have consistent effects when they are linked with effort withholding intentions; in some cases, the relationships are negatively significant, while in other cases they are positive or nonsignificant. Some knowledge management studies have suggested that high TI would increase team members' communication, trust, and relationships and thus lead to more knowledge sharing behavior [81,82]. Our study attempts to show that only through the mediating role of KWSE can TI have an impact on withholding intentions. Since KWSE acts as a mediating variable in the relationships between KWI and TI, future studies on knowledge withholding need to take into account the factor of self-efficacy, its nature, and the underlying assumptions. Regarding the relationship between TV and KWI, although TV was negatively related to KWSE, it was not related to KWI either directly or indirectly. It is possible that TV does not influence KWI at all, or other mediating factors may exist.

6. Implications for theory and practice

We proposed the KWI concept to highlight potential knowledge resource risk in knowledge intensive project teams. By identifying antecedents of KWI from the effort withholding perspective, our findings help researchers and practitioners be aware of and understand how to address the antecedents of KWI. The academic and practical implications of our study are as follows.

First, this study extends variables in effort-withholding research to the context of knowledge management. Variables such as POS, LMX, TMX, PJ, DJ, IJ, and TI were all found to exert significant direct or indirect effects on KWI. Furthermore, we modified Kidwell and Bennett's comprehensive framework of effort withholding by incorporating the research on multifoci relationships between fairness perceptions and social exchanges and the SCT. Clearly, we demonstrated how different justice perceptions are related to different social exchange relationship variables in predicting KWI. We suggest that future researchers using Kidwell and Bennett's three dimensions (i.e., normative conformity, affective bonding, and rational choice) understand that effort withholding should consider interrelationships among each group of variables and the effect of social cognition.

Second, our study highlighted the relative importance of social exchange variables. Past research on effort withholding either studied POS and LMX separately or considered only exchange relationships at the leader–member and coworker level. By comprehensively examining social exchange relationships an individual has with different organizational actors, our results showed that POS has stronger effects than other social exchange relationship variables in predicting KWI. We thereby suggest that future research should consider a strong relationship between individuals and their organizations as an aspect in reducing knowledge resource risk.

Third, we added to the research on multifoci relations between justice perceptions and social exchange relationships in the context of

knowledge withholding by examining all relevant variables simultaneously. Our results confirmed and extended previous findings on individual relationships between justice perceptions and social exchange relationships, thus strengthening the argument of matching sources of fairness treatment with relationships with accountable parties to understand how fairness treatment influences knowledge withholding.

Fourth, the study makes another contribution by applying SCT to the research on effort withholding. Although SCT has been widely validated for human behavior in the context of knowledge sharing, rarely has the theory been applied to explain effort withholding and KWI. Our study showed that KWSE significantly strengthens individuals' intentions to withhold knowledge. We thereby suggest that future research in the area of effort withholding should take this variable into account. Practically, project managers would want to weaken a team member's efficacious beliefs in withholding knowledge. Unlike other dispositional constructs (e.g., personality, values), self-efficacy is malleable and can be “developed” [54,83]. Managers therefore can reduce KWI by weakening sources of self-efficacy. For example, managers should try to prevent members' experience with successful knowledge withholding or any opportunities to observe others' knowledge withholding behaviors.

In practice, we suggest that organizations should enhance employees' POS. This is especially critical since POS had stronger effects on KWI than other social exchange relationship variables. If employees perceive that their organization is committed to them and contributes to a general obligation based on psychological contracts, they reciprocate by caring more about their organization and contributing to organizational objectives [41]. To promote LMX, we suggest enhanced communication so that managers understand members' problems or needs, recognize their potential, and thus build a more effective manager–subordinate relationship [84]. To foster a good TMX climate, we suggest that project managers boost team members' willingness to help colleagues finish work when they lag behind. Other ways include encouraging members to recognize each other's potential, to respect each other, and to understand others' individual problems or needs [14].

Although justice perceptions did not directly influence KWI, it is still worthwhile for managers and organizations to treat employees fairly because justice perceptions influence social exchange relationships, especially LMX and TMX, greatly. We suggest that organizations maintain adequate DJ by clearly conveying to employees how their rewards are determined and ensuring their knowledge contribution receives adequate compensation. In addition, we suggest that managers treat individual workers with respect and dignity to facilitate IJ. Furthermore, to facilitate IJ among coworkers, training programs such as appreciative inquiry [85] or effective communications may be utilized. Finally, to enhance PJ, it is important for organizations to not only standardize decision-making procedures but also invite employees to participate in the decision-making process. During decision making, concerns of all members should be considered, relevant and accurate information should be collected, and members should be allowed to challenge the decision or request further information [86].

7. Limitations and suggestions for future study

This study adds to the small number of studies investigating the phenomenon of knowledge withholding in a project team context and has provided some understanding and suggestions for knowledge management in project work settings. Yet, there are some limitations. First, we used key variables from three dimensions of Kidwell and Bennett's effort-withholding framework to test the effects of antecedents on KWI and their interrelations. However, the list of variables is by no means exhaustive. As stated in the discussion section, variables such as *guanxi* can be an important factor to examine knowledge withholding in Chinese contexts. Furthermore, we did not separate forms of

knowledge (i.e., implicit vs. explicit). It would be interesting to see how *guanxi* influences different forms of knowledge withholding. Second, our research model is mainly a motivational model, so individual characteristics were not included. Since research shows that personal traits affect knowledge contribution behavior, individual dispositional predictors of knowledge withholding can be further explored [87]. Third, based on the cross-sectional research methodology, we measured all constructs simultaneously. We suggest that future research employ a longitudinal methodology to add more understanding of the interactions between KWI and these antecedents from the beginning to the end of an ISD project team. Finally, although we completed several tests to rule out common-method bias, self-reported data could still influence the accuracy of our causal model. Future researchers can use triangulation methods to further validate our research model and findings.

Appendix A. Constructs and items.

Construct	Questionnaire items	Source
<i>Task visibility (TV)</i>		
TV1	My supervisor is aware of the amount of work I do on the project.	George [45]
TV2	It is generally hard for my supervisor to figure out how hard I am working on the project. (R)	
TV3	My supervisor usually notices when a member is slacking off on a project.	
TV4	It is difficult for my supervisor to determine how hard we are working on the project. (R)	
TV5	It is hard for my supervisor to determine how much effort I exert on the project. (R)	
<i>Task interdependence (TI)</i>		
TI1	I work fairly independently of others in my work. (R)	Lin and Huang [8]
TI2	I frequently must coordinate my efforts with others.	
TI3	In order to do my job, I need to spend most of my time talking to other people.	
TI4	I can plan my own work with little need to coordinate with others. (R)	
TI5	My own performance is dependent on receiving accurate knowledge from others.	
<i>Knowledge-withholding self-efficacy (KWSE)</i> <i>I feel confident in my capability...</i>		
KWSE1	Without being noticed to leave contributing knowledge to other members.	Kidwell and Robie [88]; George [45]
KWSE2	Without being noticed to contribute only part of the knowledge.	
KWSE3	Without being noticed to pretend to work hard in contributing knowledge.	
KWSE4	Without being noticed to pay less effort in contributing knowledge than others.	
KWSE5	Without being noticed to withhold knowledge that is valuable and relates to expertise.	
<i>Procedural justice (PJ)</i> <i>There are formal procedures in the project to ...</i>		
PJ1	Provide opportunities to appeal or challenge a decision.	Colquitt et al. [31]
PJ2	Generate standards so that decisions can be made with consistency.	
PJ3	Hear the concerns of all those affected by the decision.	
PJ4	Provide useful feedback regarding the decision and its implementation.	
PJ5	Allow for requests for clarification or additional information about the decision.	
PJ6	Collect accurate information necessary for making decisions.	

Appendix A. (continued)

Construct	Questionnaire items	Source
<i>Distributive justice (DJ)</i> <i>I am fairly rewarded ...</i>		
DJ1	Considering the responsibilities that I have.	Colquitt et al. [31]
DJ2	Taking into account the amount of education and training that I have.	
DJ3	In view of the amount of experience that I have.	
DJ4	For the amount of effort that I put forth.	
DJ5	For work that I have done well.	
DJ6	For the stresses and strains of my job.	
<i>Interactional justice (IJ)</i> <i>When decisions are made about me, ...</i>		
IJ1	My viewpoints are considered.	Moorman [86]
IJ2	I am provided with timely feedback about decisions and their implications.	
IJ3	I am treated with kindness and consideration.	
IJ4	My rights as an employee are considered.	
IJ5	I am dealt with in an honest and truthful manner.	
IJ6	I am treated with respect and dignity.	
IJ7	My personal needs are sensed.	
IJ8	I am offered adequate justification for decisions.	
IJ9	I am provided with clear explanations about decisions.	
<i>Perceived organizational support (POS)</i>		
POS1	The organization values my contribution to the project's well-being.	Eisenberger et al. [41]
POS2	The organization fails to appreciate my extra effort exerted on a project. (R)	
POS3	The organization would ignore my complaints about project work. (R)	
POS4	The organization really cares about my well-being.	
POS5	Even if I did the best job possible, the organization would fail to notice. (R)	
POS6	The organization cares about my general satisfaction with project work.	
POS7	The organization takes pride in my accomplishments in project work.	
<i>Leader-member exchange (LMX)</i>		
LMX1	My supervisor understands my problems and needs extremely well.	Wayne et al. [20]
LMX2	My supervisor recognizes my potential extremely well.	
LMX3	Regardless of his/her formal authority, my supervisor would be personally inclined to use his/her power to help me solve problems at work.	
LMX4	Regardless of his/her formal authority, I can count on my supervisor to 'bail me out' at his/her expense when I really need it.	
LMX5	I have enough confidence in my supervisor to defend and justify his/her decisions when he/she is not present to do so.	
LMX6	I would characterize my working relationship with my supervisor as extremely effective.	
<i>Team-member exchange (TMX)</i>		
TMX1	When I am busy, other members often volunteer to help me out.	Seers [43]
TMX2	When other members are busy, I often help them out.	
TMX3	Other members of my team recognize my potential.	
TMX4	Other members of my team understand my problems and needs.	
TMX5	I am willing to help finish work that has been assigned to others.	
TMX6	Other members of my team are willing to help finish work that has been assigned to me.	
TMX7	I let other members know when they have done something that affects my work.	
TMX8	Other members let me know when I do something that affects their job.	
TMX9	I make suggestions about better work methods to other members.	
TMX10	I am flexible about switching responsibilities to make things easier for other members.	

(continued on next page)

Appendix A. (continued)

Construct	Questionnaire items	Source
<i>Knowledge-withholding intentions (KWI)</i>		
KWI1	I would give less than full effort in contributing knowledge.	Kidwell and Robie [88]
KWI2	I would not intentionally withhold effort on contributing knowledge. (R)	
KWI3	I would work as hard as I can to contribute knowledge. (R)	
KWI4	I would avoid contributing knowledge as much as possible.	
KWI5	I would put in less effort to contribute knowledge than I know I can.	
KWI6	I would contribute 100% of my knowledge if I wanted to. (R)	
KWI7	Contributing knowledge to the team would not be a major concern of mine.	

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