Telling "white lies" within the entrepreneurial firm: How rationalized knowledge hiding influences new product development

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Abstract

Most knowledge hiding studies focus on its dark side. In contrast, we theorize the potential positive effect of rationalized knowledge hiding in the context of entrepreneurial firms' new product development (NPD) speed. We extended and integrated theoretical perspectives of rationalized knowledge hiding and trust in theorizing that rationalized knowledge hiding accelerates NPD—a component considered critical to firm survival and growth. We developed and analyzed two datasets on the founder CEOs and the founder CTOs of 279 high-technology entrepreneurial firms in China to test this assumption. Empirical results suggest that CTOs' rationalized knowledge hiding from CEOs accelerates these firms' NPD. Further, such acceleration is slower (faster) when CEOs' affective (cognitive) trust in CTOs is higher.

Overall, we theorize that rationalized knowledge hiding has a positive impact on entrepreneurial firms' NPD. The study offers a unique contribution to understanding the link between knowledge hiding and NPD, and practical implications for entrepreneurial firms.

Keywords: Entrepreneurial firm; Rationalized knowledge hiding; Trust; New product development speed, Innovation

1. Introduction

The role of effective knowledge management in driving organization-level innovation and firm performance is widely recognized (e.g., Del Giudice & Maggioni, 2017) because it helps organizations achieve competitive advantages (Arain et al., 2020; Bavik et al., 2018; Orlando et al., 2020). Therefore, numerous studies have explored the contribution of knowledge sharing to facilitating effective knowledge management and organizational performance, that is, financial and innovation performance (Jamshed & Majeed, 2019; Markovic & Bagherzadeh, 2018; Singh et al., 2021; Wang & Hu, 2020). Poor organizational performance has been attributed to knowledge hiding, which has been consistently considered an ineffective element of organizational knowledge management (Wang & Hu, 2020). Knowledge hiding is defined as the intentional withholding or concealing of knowledge on others' requests, distinguishing it from the lack of knowledge sharing (Connelly et al., 2012; Webster et al., 2008). In the past decade, knowledge hiding has attracted the attention of many scholars and business practitioners since the related literature has identified the undesirable effects of knowledge hiding on key outcomes, such as individual- and team-level creativity (Connelly et al., 2019; Connelly & Zweig, 2015; Jiang et al., 2019; Serenko & Bontis, 2016; Sukumaran & Lanke, 2021).

A review of the studies on knowledge hiding behavior showed that most studies have focused on identifying the antecedents of the behavior and the corresponding mechanisms (Xiong et al., 2019). These studies have identified numerous factors leading to this behavior from various perspectives—including those of individuals, organizations, and society—and have tremendously enriched the understanding of this behavior by offering insights into business practices in different management contexts (Connelly et al., 2019). Meanwhile, scholars have explored the counterproductive effects of knowledge hiding from different viewpoints. They revealed that knowledge hiding could negatively affect employees' work and team

performance (see Černe et al., 2014; Xiong et al., 2019; Zhang & Min, 2019), their job satisfaction (Offergelt et al., 2019), and their workplace behaviors (Fong et al., 2018). Since effective knowledge management within firms of different scales affects their innovation outcomes, studies on knowledge hiding have attempted to show how it leads to reduced creativity at both individual and team levels (Bogilović et al., 2017; Fong et al., 2018; Malik et al., 2018; Zhu et al., 2019). Understanding the dark side of knowledge hiding behavior is of great significance, given that the research findings may provide useful insights to practitioners in designing strategies to reduce the corresponding negative impact on outcomes such as performance (Connelly et al., 2012; Serenko & Bontis, 2016).

In contrast, the current study aims to contribute to the knowledge hiding literature by exploring how knowledge hiding could lead to positive organizational-level outcomes related to innovation. Scholars have been encouraged to explore knowledge hiding outcomes further at different levels (Connelly et al., 2019). Thus, intensive scholarly attention has been devoted to investigating the outcomes of knowledge hiding on individual-level performance measures. Therefore, further research concerning organizational-level outcomes is needed. In addition, scholars have called for research on the potential desirable outcomes of knowledge hiding, considering the scarcity of such research and its significance to the literature (i.e., Connelly et al., 2019; Xiao & Cooke, 2019). In this study, we argue that the chief technology officer's (CTO's) knowledge hiding from the chief executive officer (CEO) in the setting of an entrepreneurial firm's top management team may reduce team conflict and improve top managers' decision-making efficiency. Hence, we further argue that a certain type of knowledge hiding between the top management team members may accelerate the NPD process, which can help the firm gain market advantages by responding to changing customer needs. Thus, the current study aimed to fill the research gap on organizational-level outcomes by focusing on the potential positive impact of knowledge hiding on these outcomes.

Specifically, we focus on investigating how rationalized knowledge hiding that occurs between the founder and the cofounder in start-ups affects the firms' NPD speed. In comparison, prior studies have generated insights into knowledge hiding outcomes between leaders and their subordinates. The current study complements this stream of literature by examining knowledge hiding within the same organizational level (i.e., the C-suite; see Weng et al., 2020). One contribution of the current study to the knowledge hiding and NPD literature is that it mainly focuses on the interactions between the members of the top management team. We argue that their interactions are more likely to affect organizational-level outcomes and performance measures. In addition, the literature has argued that the collaboration among the senior management team members of entrepreneurial firms may affect firms' NPD (Lahiri et al., 2019). Hence, we argue that exploring team interactions in terms of knowledge hiding behavior may offer further valuable insights in investigating the antecedents of entrepreneurial firms' NPD speed. In this regard, we focus on rationalized knowledge hiding (i.e., providing explanations for not forwarding the requested information) in the specific context of the founding teams of new ventures, rather than the other two facets of knowledge hiding behavior. Rationalized knowledge hiding has been identified as the least deceptive of the three forms of knowledge hiding (Connelly et al., 2019) since the knowledge hider does not provide misleading information to, or ignore the request from, the knowledge seeker. Given that the founder and the cofounders jointly own the new venture, we expect that founding team members engage more frequently in rationalized knowledge hiding than in the other two forms of knowledge hiding. We hypothesize that rationalized knowledge hiding may positively influence innovation outcomes in the specific context of running new ventures, as demonstrated through NPD speed. Therefore, to test our assumptions, we aim to answer the following research question: *How does rationalized knowledge hiding between the founder CEO and the cofounder CTO of an entrepreneurial firm influence its speed of new product development?*

We use a quantitative study design and collect survey data from numerous technology-driven new ventures to address this research question. We analyze these data using the partial least squares structural equation modeling (PLS-SEM) technique (Hair et al., 2012). We also discuss the implications of knowledge hiding research and business practices, as well as the limitations of the current study.

By focusing on NPD speed, we contribute to the knowledge hiding and innovation literature. In addition, the unique focus on the founding teams of start-ups allows us to explore various consequences of knowledge hiding behavior, which has been identified as a key area that needs further research to complement the current understanding of the behavior (Connelly et al., 2019). By investigating the potential facilitating effect of rationalized knowledge hiding in new ventures, we aim to extend the understanding of this phenomenon by identifying the circumstances under which knowledge hiding may lead to positive outcomes and the corresponding boundary conditions (Connelly et al., 2019; Xiao & Cooke, 2019).

The remainder of this paper is organized as follows. In Section 2, we present the theoretical foundation of this study, based on which we develop a hypothesis associated with rationalized knowledge hiding and entrepreneurial firms' NPD speed. We also discuss the contingent effects of affective and cognitive trust between the founder CEO and the cofounder CTO. In Sections 3 and 4, we describe the research design and empirical test. We discuss the study's results, including its theoretical contributions and practical implications, in Section 5. Last, we present future research directions and conclusions in Section 6.

2. Theoretical background and hypotheses development

The first to have conceptualized and measured knowledge hiding behavior is Connelly et al. (2012). Knowledge hiding behavior has three dimensions or forms: evasive hiding, playing dumb and rationalized hiding (Connelly et al., 2012, 2019). These three forms differ in terms

of the information content that the knowledge hider provides when requested. The first, evasive knowledge hiding, refers to a_situation in which the knowledge hider provides partial or incorrect information to the knowledge seeker, which usually results in the knowledge seeker misunderstanding the specific piece of knowledge. The second, playing dumb, refers to a situation in which the knowledge hider ignores the knowledge seeker's request. In addition, scholars have tried to identify other dimensions of knowledge hiding, such as bullying hiding (Yuan et al., 2021). The power distance between employees from different organizational levels is the main cause of bullying hiding, and we choose not to focus on this dimension because the participants in the current study are from one organizational level.

Although individuals engaging in rationalized knowledge hiding also hide information that a knowledge seeker has requested, while doing so, they explain to the seeker their reason for not sharing the information. On examining the difference between the three forms of knowledge hiding behavior, it could be argued that rationalized knowledge hiding is the least deceptive form. To explain further, it is the least deceptive because the knowledge hider provides justifications for not sharing the information, rather than providing no such explanations as in the other two situations of playing dumb and of being evasive by giving misleading information to the seeker.

The literature has focused intensively on exploring the factors that lead to knowledge hiding behaviors. Thus, scholars have identified the associated influencing factors through multiple lenses. They have argued that individual-level factors, such as personal attributes, cognition, and demographics (see Anand et al., 2020); organization-level factors, such as leadership and organizational culture (Alassaf et al., 2020; Banagou et al., n.d.; Yao, Zhang, et al., 2020); and an intrinsic characteristic of the requested knowledge (i.e., Škerlavaj et al., 2018), are the

factors contributing to knowledge hiding behavior. They have also identified certain inter-organizational factors that lead to knowledge hiding (Scuotto, Beatrice, et al., 2020).

In contrast, studies focusing on the outcomes of knowledge hiding are limited. The relevant studies of knowledge hiding have mainly focused on the dark side of the behavior (Xiao & Cooke, 2019). These studies have argued that knowledge hiding could negatively affect an individual's job performance (i.e., Singh, 2019), attitude (i.e., Offergelt et al., 2019), tendency to engage in counterproductive workplace behavior (i.e., Burmeister et al., 2019), interpersonal relationships with coworkers (i.e., Weng et al., 2020), and the value creation in the global value chain (Scuotto, Garcia-Perez, et al., 2020). However, a limited number of studies have considered the team- or organization-level consequences. Among those studies, innovation outcomes, such as creativity (Černe et al., 2014; del Giudice et al., 2017; Khoreva & Wechtler, 2020), R&D performance (Xiong et al., 2019), and team performance (Zhang & Min, 2019), are at the core of the discussion.

2.1 Rationalized knowledge hiding and new product development speed

Knowledge hiding may have a positive impact on individuals and organizations (Connelly et al., 2012), and researchers have called for relevant research into the bright side of knowledge hiding to gain a more holistic view of how knowledge hiding affects organizational members and performance (Connelly et al., 2019; Xiao & Cooke, 2019). In the situations of evasive hiding and playing dumb, the knowledge hider often provides misleading information or provides nothing, respectively, to the knowledge seeker. It is reasonable to believe that these two forms of knowledge hiding could negatively influence the performance of employees and the organization. However, the effect of rationalized knowledge hiding may differ since knowledge seekers are less likely to receive misleading or incomplete information that would affect their decision-making process. Therefore, the present study intends to complement the

current understanding of the behavior by focusing on the potential positive outcomes of rationalized knowledge hiding. This study would complement the knowledge hiding literature that has treated knowledge hiding as a single construct (i.e., Arain et al., 2019; Černe et al., 2017) or has measured it inappropriately (i.e., Zhang & Min, 2019).

Some studies have attempted to explore the potential positive impact of knowledge hiding. For instance, a recent study that investigated the effects of knowledge hiding on employees' individual performance found that rationalized knowledge hiding and playing dumb may improve innovative performance and in-role performance, respectively (Khoreva & Wechtler, 2020). Moreover, on examining the psychological consequences of knowledge hiding behavior to understand its impact on organizational citizenship behavior, it was found that knowledge hiders' guilt and shame triggered by playing dumb and by evasive hiding may lead to higher intentions to engage in organizational citizenship behavior (Burmeister et al., 2019). Following this line of research, in the current study, we investigate the potential desirable outcomes of rationalized knowledge hiding on organization-level outcomes further.

Further, scholars have discussed the positive and negative outcomes of ineffective knowledge management on firms' innovation outcomes (i.e., Crupi et al., 2020). Entrepreneurial firms' innovation outcomes may be affected by the knowledge management process, knowledge workers' productivity (He et al., 2020; Hemmert et al., 2019), knowledge sharing, and the quality of knowledge (Ganguly et al., 2019). Knowledge hiding may stimulate a higher level of innovative work behaviors in situations that allow employees high decision autonomy (Černe et al., 2014). The literature on knowledge hiding has asserted that knowledge hiding may improve employees' short-term job performance but may reduce it in the long term (Connelly et al., 2012). Inspired by their focus on the temporal factor when assessing the consequences of knowledge hiding, we decided to conduct our study within a specific

context—that of new ventures for whom timing is a crucial success factor (Cai et al., 2017; Chen et al., 2010). For new ventures to survive, time is a crucial issue, for they need to deliver their new products or services to the market to maximize their profits and optimize their positioning (Wu et al., 2020).

NPD speed is a crucial evaluation of a firm's NPD performance (Wu et al., 2020; Zheng et al., 2021), especially when firms are facing the fast-changing world with the challenges brought by the continuously reducing product life cycle and the intensifying market competition facilitated by emerging technologies (Chen et al., 2010). In particular, NPD speed is of great significance to technology-driven new ventures (Cohen et al., 1996) for a higher NPD speed could yield positive effects, such as cost reductions in developing new products, the enhanced ability to attract more customers with new products, and more efficient management of market-entry timing (Cankurtaran et al., 2013; Lin et al., 2012; Moreno-Moya & Munuera-Aleman, 2016; Wu et al., 2017, 2020).

We argue that the CTO of a technology-driven new venture may intend to conduct rationalized knowledge hiding while communicating with the CEO to accelerate the NPD process for the following reasons. When the CEO requests for information on any core technology details, the CTO may choose to hide the knowledge but may offer a satisfactory explanation for the lack of a detailed description. By doing so, the CTO can save a significant amount of time on the communication with the CEO and can invest this time into NPD. Another reason that a CTO may conduct rationalized knowledge hiding is to avoid or reduce conflicts with the CEO. A reduced conflict level may contribute to guarantee a higher level of internal integration of the start-up's founding team, and, in turn, internal integration would transform a function-oriented focus to a common-value-oriented focus, which will benefit the NPD process (Chen et al., 2010; Eisenhardt & Tabrizi, 1995). A higher level of internal integration could be demonstrated

through the improved quality of coordination, cooperation, and mutual support (Hoegl et al., 2004; Keller, 2001), which would be achieved when there is a minimum conflict between the CTO and CEO.

We argue that in addition to reducing the level of conflict between CTOs and CEOs of start-ups, rationalized knowledge hiding by CTOs could improve the efficiency of the NPD process, resulting in a shorter NPD time. A certain level of knowledge hiding may help the top management team members to reach a shared value system that benefits their NPD strategy design and implementation (Abdulkader et al., 2020). According to a meta-analysis of studies exploring the antecedents of NPD speed, a crucial factor that drives NPD speed is the R&D team's or CTOs' autonomy to make their own decisions; this factor has been conceptualized as the team empowerment perceived by the CTO or the R&D team leader (Chen et al., 2010; Kessler & Chakrabarti, 1996). In the situation of rationalized knowledge hiding, CTOs enhance their decision-making autonomy on technology-related NPD issues. In this scenario, it is less likely that the CEO will negatively affect the CTO's decision-making process when the CEO has lower or zero proficiency in technical issues. Meanwhile, rationalized knowledge hiding that helps to reduce noise in CTOs' decision-making processes may also benefit their idea generation (Cheng & Yang, 2019) and effectuation processes (Wu et al., 2020). Therefore, rationalized knowledge hiding by CTOs likely reduces the time needed for NPD by resulting in a higher level of internal integration and CTO empowerment. Thus, we hypothesize:

> H1: The founder CTO's rationalized knowledge hiding from the founder CEO is positively associated with the NPD speed of entrepreneurial firms.

2.2 Moderating effect of CEO's trust in CTO

Given that knowledge hiding differs from knowledge sharing in that knowledge hiding behavior occurs between the knowledge hider and seeker (Connelly et al., 2012, 2019), it is

imperative to examine the knowledge seeker's perceptions of hiding behavior to gain a more thorough understanding of its impact on organization-level outcomes. In the context of new ventures, since CTOs conduct rationalized knowledge hiding from CEOs, the CEOs' perception of such hiding behaviors should be considered in assessing the impact on NPD speed of CTOs' rationalized knowledge hiding.

Trust is a core topic of leadership studies, given its potential to affect the positive attitude and workplace behaviors of employees or team members significantly (Newman et al., 2014; Xiao & Cooke, 2019; Yang & Mossholder, 2010). Trust-related studies often explore the construct of trust from two different perspectives—cognitive trust and affective trust (i.e., Dunn et al., 2012; McKnight et al., 1998; Olson et al., 2007; Williams, 2001; Yao, Luo, et al., 2020). These two dimensions of trust have separate origins. Cognitive trust focuses on task-related interactions with another party, whereas affective trust focuses on socioemotional factors in the interactions (Dirks & Ferrin, 2002). It has been argued that cognitive trust could help reduce the waste of attentional resources so that individuals could focus more on their own tasks and responsibilities (Dirks & Ferrin, 2002).

We assume that when the CEO has a higher level of cognitive trust in the CTO, the CTO's rationalized knowledge hiding would help the CEO save more attentional resources, since the CEO would regard the CTO as reliable in terms of own tasks and duties. In this way, the CEO could be more efficient and perform the company's overall management and specific tasks better, such as business development, marketing, and cultivating the organizational culture, which would lead to better coordination within the firm to speed up the NPD process. Therefore, we propose the following hypothesis:

> H2: The founder CEO's cognitive trust in the cofounder CTO positively moderates the relationship between the CTO's rationalized knowledge hiding and NPD speed. That

is, the higher the level of cognitive trust, the greater the positive impact of rationalized knowledge hiding on NPD speed.

Although we hypothesize that the CEO's cognitive trust in the CTO positively moderates the impact of the CTO's rationalized knowledge hiding behavior on NPD speed, we argue that the CEO's affective trust in the CTO, which is another dimension of trust, weakens the relationship between the CTO's rationalized knowledge hiding and NPD speed. According to McAllister (1995) and many later studies (Dunn et al., 2012; Newman et al., 2014; Yang & Mossholder, 2010), affective trust develops through personal bonds, and it emphasizes care and consideration from the other party in the relationship.

Therefore, if the CEO has a higher level of affective trust in the CTO, they expect the CTO to care about their feelings by providing the correct information when the CEO requests for a specific piece of knowledge, even if the knowledge is challenging for the CTO to explain and for the CEO to understand. In this situation, if the CTO conducts rationalized knowledge hiding, the CEO may feel ignored and underestimated by their business partner. We argue that this feeling will demotivate the CEO from engaging in productive workplace behaviors and reduce NPD speed. Therefore, we hypothesize that:

H3: The founder CEO's affective trust in the cofounder CTO negatively moderates the relationship between the CTO's rationalized knowledge hiding and NPD speed. In other words, the higher the level of affective trust, the weaker the positive impact of rationalized knowledge hiding on NPD speed.

3. Research design

3.1 Sample and data collection

The data used for testing the proposed hypotheses demonstrated in Figure 1 were collected from 279 technology-driven new ventures in China. The reason is that new product

development has been recognized as one of the important innovative activities that matters venture survival and growth (e.g., He, Zheng, Wu et al., 2020; Zheng et al., 2021). We adopted a CEO–CTO dyadic design to reduce the potential common method variance and self-reported bias. To initiate the data collection process, we emailed the basic information of the study to the contact persons (e.g., business development managers, and human resource management managers) of the start-ups in a database that we have developed through conducting several studies on topics related to entrepreneurship and innovation. In all, 434 firms responded that they were interested in participating in this study, and the contact persons provided the email address of their CEOs and CTOs. Then, we sent the link to two different online surveys, one for CEOs and the other for CTOs. In the CEO survey, we asked questions regarding their cognitive and affective trust in their CTOs as well as their evaluation of the NPD speed of the new venture and some control variables. In the CTO survey, we asked questions about their rationalized knowledge hiding behavior.

[Insert Figure 1 here]

To facilitate the successful matching of the CEO and CTO questionnaires while ensuring the research participants' anonymity, we asked the contact person to generate a matching code for the CEOs and CTOs to use on their completing the online survey. The 9-digit matching code consists of three different 3-digit numbers, and we requested that they use each digit only once in forming the matching code to minimize the possibility of matching failure. We merged 279 successfully matched pairs of questionnaires in the same dataset used for the data analysis, representing a response rate of around 64.3%. The demographics and descriptive statistics of control variables are shown in Table 1.

[Insert Table 1 here]

3.2 Measurements

Rationalized Knowledge Hiding was measured using four items adopted from the 12-item knowledge hiding scale of Connelly et al. (2012), and these four items were specifically used for measuring rationale knowledge hiding. A sample of the items is "*Sometimes when requested a piece of knowledge from the CEO, I explained that I would like to tell him/her but was not supposed to*." We used a 7-point Likert scale anchored by 1 (*strongly disagree*) and 7 (*strongly agree*) to record their responses.

We measured *NPD Speed* using a 4-item scale that we adopted from Ganesan et al. (2005) and Lukas and Menon (2004). A sample statement used for the measurements is "*In the past year, our new product development speed is much faster than we expected*." The CEOs answered these items, ranking them on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

As stated in Section 2 on hypotheses development, we argue that CEO's cognitive and affective trust in the CTO may moderate the impact of the CTO's rationalized knowledge hiding behavior on the NPD speed of the new venture; the CEOs completed the measurement items of cognitive and affective trust. We adopted the 5-item scale that McAllister (1995) developed to assess the cognitive and affective trust between peer managers and also considered Yang and Mossholder's (2010) findings. The CEOs measured these items also by using a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). An example of cognitive trust items is "*I can depend on the CTO to meet his or her responsibilities*," and an example of affective trust items is "*I'm sure I may freely communicate my feelings to the CTO*."

To minimize the potential impact of other factors on the NPD speed of new ventures, we included a group of control variables in the framework. CEOs need to report other firm-related control variables, such as firm size, firm age, R&D expenditure, and their start-up experience.

In addition, considering the potential impact, on their NPD speed, of the founding team size, whether the team secured financing (0 = No, 1 = Yes), and whether the firm operates in an incubator (0 = No, 1 = Yes), we further controlled these variables using the self-reported data from the CEOs.

3.3 Analytical strategy

We employed the PLS-SEM technique (Hair et al., 2014) to test the proposed hypotheses using SmartPLS 3.0, a statistical package designed for PLS-SEM analysis. The data analysis process consists of two stages. First, construct reliability, convergent validity, and discriminant validity are used to assess the measurement model (Henseler et al., 2014). Next is the assessment of the structural model, where the hypotheses are tested to provide the basis for further discussion.

The main reason we chose PLS-SEM for the data analysis is that it generates more accurate estimations for small samples (N = 279) and the data need not be normally distributed for further analysis (Hair et al., 2017). In addition, to the best of our knowledge, the potential positive impact of rationalized knowledge hiding on NPD speed has not been tested by prior studies. Therefore, given the exploratory nature of the study, the PLS-SEM technique is the best choice for analyzing the survey data. Moreover, other studies on knowledge hiding have employed this technique (Arain et al., 2020; Zhang & Min, 2019).

4. Findings

4.1 Measurement model

In the current study, we employed composite reliability to assess the internal consistency reliability of the measurement model, whereas we assessed construct reliability through factor loadings. We evaluated the measurement model's validity by assessing convergent validity and discriminant validity, which we evaluated using the average variance extracted (AVE) values, the Fornell–Larcker criterion (Fornell & Larcker, 1981), and the heterotrait–monotrait (HTMT)

ratio (Henseler et al., 2014). Although the overall model fit of data analysis with PLS-SEM could not be assessed with the traditional indicators (Hair et al., 2013), the value of R^2 and the predictive relevance Q^2 derived from the blindfolding algorithm could also provide insights into the overall model fit.

The results on assessing factor loadings, AVE, and composite reliability are presented in Table 2. The Cronbach's alpha and composite reliability values are greater than the cut-off value of 0.70 (Hair et al., 2012). In addition, the factor loadings of each item are greater than the suggested value of 0.70, and the AVE value of each construct exceeds the cut-off value of 0.60, which indicates that the model has satisfactory construct reliability and convergent validity.

[Insert Table 2 here]

Tables 3, 4, and 5 present the results of the Fornell–Larcker test (Fornell & Larcker, 1981), the cross-loading check (Grégoire & Fisher, 2006), and the HTMT ratio test (Henseler et al., 2014). As Table 3 shows, the square root of the AVE value of each variable exceeds the absolute value of correlations with other variables, which satisfies the requirement for discriminant validity (Fornell & Larcker, 1981). The highest value of the HTMT ratios in the measurement model is 0.66, below the cut-off value of 0.85 (Hair et al., 2017). It could be concluded, on taking these results together with the cross-loading check results in Table 4, that the model demonstrates satisfactory discriminant validity for further analysis.

[Insert Tables 3 & 4 here]

4.2 Structural model and hypotheses testing

Based on the results in Tables 5 and 6, we used the R^2 and Q^2 values (calculated by running the blindfolding algorithm) to assess the overall model fit when conducting the PLS-SEM technique (Hair et al., 2017). In the current model, the R^2 value of the dependent variable is

0.593, with the Q^2 value being 0.418, which is evidence that the model has satisfactory explaining power and predictive relevance (Hair et al., 2012; Henseler et al., 2009).

[Insert Tables 5&6 here]

Our hypothesis that the CTO's rationalized knowledge hiding has a positive effect on the NPD speed of the new venture (H1) is supported by the data analysis ($\beta = 0.337, 95\%\ CI = [0.180, 0.478]$). Therefore, the direct positive effect of rationalized knowledge hiding on NPD speed is established, forming the basis for the moderation analysis. In terms of the moderation analysis, we hypothesize that the CEO's cognitive trust in the CTO strengthens the direct impact of the CTO's rationalized knowledge hiding on the NPD speed (H2), whereas their affective trust in the CTO weakens the relationship (H3). These two hypotheses are also supported by the sample and the corresponding data analysis; the CEO's cognitive trust ($\beta = 0.166, 95\%\ CI = [0.072, 0.259]$) and affective trust ($\beta = -0.157, 95\%\ CI = [-0.300, -0.018]$) indeed moderate the impact of the CTO's rationalized knowledge hiding on NPD speed. Therefore, the proposed direct impact of rationalized knowledge hiding on NPD speed (H1), and the potential moderating effects of the CEO's cognitive trust (H2) and affective trust (H3) on the relationship between the CTO's rationalized knowledge hiding and NPD speed, are all supported by the data analysis.

5. Discussion

The analysis results support all three hypotheses of this study. Specifically, the results show that the CTO's rationalized knowledge hiding exerts a significant positive impact on the new venture's NPD speed. In addition, the moderation analysis shows support for the potential moderating effect of the CEO's cognitive and affective trust in the CTO. As hypothesized, the CEO's cognitive trust in the CTO strengthens the positive impact of the CTO's rationalized knowledge hiding on NPD speed. In contrast, the CEO's affective trust in the CTO significantly

weakens the relationship. When the CEO has a higher level of cognitive trust in the CTO, the CEO is more likely to perceive the increased reliability of the CTO, which will further strengthen the impact of rationalized knowledge hiding on NPD speed by allowing the CTO to be more focused on the NPD process. In contrast, when the CEO has a higher level of affective trust in the CTO, they will assume that the CTO should give them all the information they have requested the CTO to provide. Hence, in this situation, the CTO's rationalized knowledge hiding behavior may result in the CEO developing negative emotions, which may adversely affect the CEO's motivation and performance and, ultimately, the NPD speed of the new venture.

5.1 Theoretical implications

This study contributes to the literature on knowledge hiding and innovation performance from three perspectives. First, to the best of our knowledge, it is the first study to investigate the potential positive impact of rationalized knowledge hiding. Although studies have explored the outcomes of the knowledge hiding behavior, almost all studies focused on exploring its undesirable outcomes. Zhang and Min (2019) explored the consequences of knowledge hiding and NPD team performance, and they found that knowledge hiding negatively influences NPD team performance. However, after careful investigation, we found that they used an incomplete knowledge hiding scale that did not include items to measure rationalized knowledge hiding. Considering that Connelly et al. (2012) argued that knowledge hiding may have a positive effect on certain outcomes and the call for further research (Connelly et al., 2019), the current study contributes to the understanding of knowledge hiding by revealing the potential positive impact of the behavior.

In addition, the current study also contributes to the innovation literature with a specific focus on a crucial innovation outcome (i.e., NPD speed). According to the results, the CTO's

rationalized knowledge hiding behavior may have a positive effect on the NPD speed of a new venture. We also explored the boundary conditions of a specific relationship. Knowledge hiding differs from knowledge sharing, hoarding, and withholding in that hiding occurs when a knowledge seeker makes a request to a knowledge hider (Černe et al., 2014; Connelly et al., 2012, 2019). When CTOs conduct rationalized knowledge hiding, CEOs' perceptions of this behavior may differ. We argue that the CEO's affective and cognitive trust in the CTO may affect the CEO's perception of the CTO's rationalized knowledge hiding. Data analyses supported the argument that the CEO's affective and cognitive trust in CTO is a potential boundary condition for the rationalized knowledge hiding of the CTO to influence the NPD speed positively. Meanwhile, the study also contributes to the entrepreneurship and innovation literature by delineating how the interactions and interpersonal relationships between founders and cofounders affect the innovation outcomes in the early stage of their business.

5.2 Practical implications

This study's findings offer valuable insights for managing new ventures from the perspective of their founders and cofounders. While running a new venture, the CEOs and CTOs should be aware of the potential positive effect of knowledge hiding on their innovation outcomes, such as their NPD speed. This may be achieved through the positive effect that rationalized knowledge hiding brings, such as the improved idea generation of R&D teams, the potential reduction of conflict within the founding team, and the improvement in the CTO's efficiency and autonomy to resolve technical issues. Unlike knowledge sharing, which has received much attention from both scholars and practitioners, knowledge hiding and its implications are frequently ignored by practitioners. The current study provides useful insights for CEOs and CTOs in technology-driven new ventures to pay attention to their knowledge hiding behaviors. For instance, CEOs should be aware that a certain level of rationalized knowledge hiding by

CTOs may not originate from the reduced motivation or engagement of the CTOs and that this specific knowledge hiding behavior could positively affect their firm's NPD process.

By examining the boundary conditions of the positive effect of rationalized knowledge hiding and NPD speed, this study also encourages the founding team members (i.e., founder and cofounders) of technology-driven new ventures to develop and cultivate their mutual cognitive trust. The analysis results support our hypothesis that the CEO's higher cognitive trust in the CTO strengthens the positive impact of rationalized knowledge hiding on NPD speed, which would benefit new ventures. The reason is that a shortened NPD process would enhance the market competitiveness of these ventures and their ability to respond rapidly to cater to the changing consumer needs in a turbulent market environment (Chen et al., 2010).

6. Conclusion

The current study offers a unique contribution to the literature on knowledge hiding and new product performance by examining the potential positive impact of rationalized knowledge hiding (i.e., the least deceptive form of knowledge hiding behavior) on the NPD speed of new ventures. The study also proposed the potential moderating effect of the CEO's cognitive and affective trust on the relationship to explore its potential boundary conditions. We collected survey data from 279 technology-driven start-ups in China. We analyzed the data using the PLS-SEM technique to overcome the potential impact of the relatively small sample size. In the data analysis process, the PLS algorithm, bootstrapping algorithm (5,000 subsamples), and the blindfolding algorithm (i.e., for calculating predictive relevance to support the assessment on the overall model fit) were executed using the SmartPLS 3.0 statistical package.

Despite its unique contribution to the literature, the study does have some limitations. First, we collected the survey data from technology-driven new ventures in China alone. The use of single-country data is a shortcoming that limits the possibility of conducting cross-cultural

studies. In order to address this limitation, future research could use data on two cultures (i.e., China and the United States) to facilitate the exploration of the impact of culture on the consequences of knowledge hiding. This investigation should be interesting, given that different cultures (i.e., individualism vs. collectivism) may affect how CEOs perceive the knowledge hiding behaviors of CTOs. Although we have addressed the limitation of the relatively small sample size by using the PLS-SEM technique, future studies could examine the generalizability of the research findings by using a larger sample size. Meanwhile, the PLS-SEM is not without limitations, even if it provides a rigorous analytical strategy and the corresponding algorithms (Hair et al., 2013, 2017; Streukens & Leroi-Werelds, 2016). For instance, the PLS-SEM technique does not allow the use of traditional goodness-of-fit indices to assess the overall model design. Therefore, the study's findings should be interpreted with caution even if the model we used has satisfactory explaining power and predictive relevance.

In addition, although we explored the impact of rationalized knowledge hiding on a new venture's innovation outcome, we did not explore the potential mechanisms through which this specific knowledge hiding behavior affects the start-ups' NPD speed. As argued above, CTOs' rationalized knowledge hiding may have a different impact on the emotion, attitude, and behavior of CEOs as well as of CTOs. An insightful study that of Burmeister et al. (2019) has explored the psychological changes in knowledge hiders after they hide knowledge as well as the changes in their workplace behaviors. Future studies could also explore other potential mechanisms to explain how rationalized knowledge hiding affects the NPD speed of new ventures. Researchers could also consider replicating this study using data collected from a more diverse sample apart from exploring potential mechanisms. For example, data collected from firms of different sizes and at different life cycle stages could provide additional insights on whether the potential positive impact of rationalized knowledge hiding exists in those settings as well. From the knowledge hider and seeker perspectives, in addition to the dyadic

design using founders and cofounders, future research could focus on the rationalized knowledge hiding behaviors of leaders or subordinates while considering crucial mechanisms, such as a leader-member exchange. The adoption of this approach will facilitate further exploration of the potential positive impact of rationalized knowledge hiding when the knowledge hider and seeker are in different social and organizational roles.

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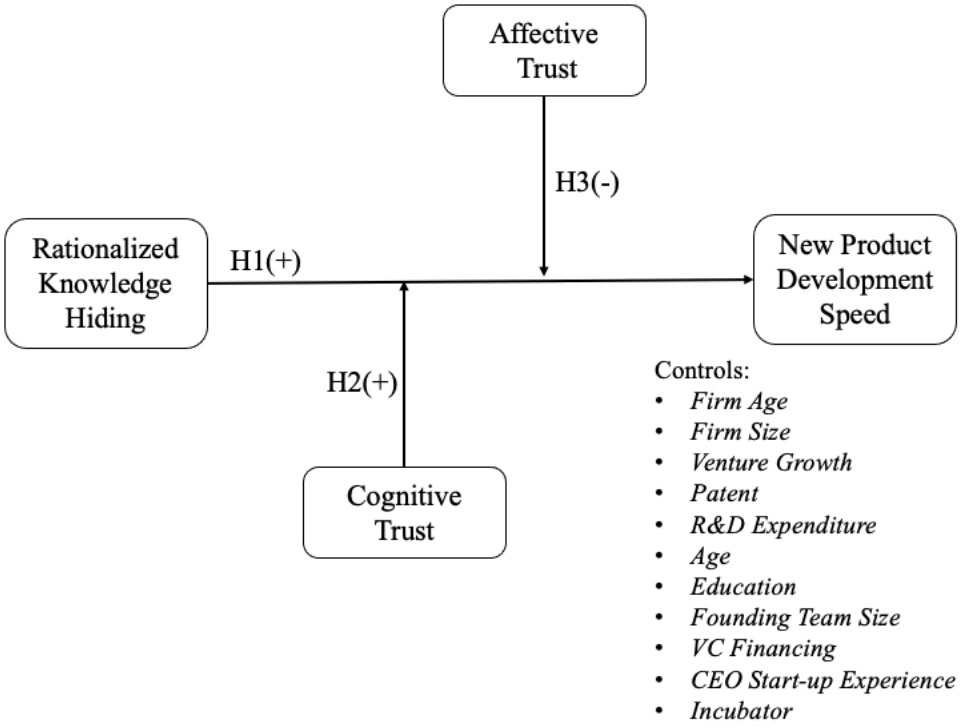

Figure 1. Proposed conceptual framework.

Table 1. Descriptive statistics (N = 279).

Control Variables	Minimum	Maximum	Mean	Std. Deviation
Firm Age	3	10	5.66	2.428
Firm Size	18	186	68.66	50.747
Venture Growth	1	6	3.24	1.754
Patent	0	6	1.51	1.738
R&D Expenditure	1	7	3.24	2.105
CEO Age	26	51	33.54	6.767
CTO Age	27	54	35.32	7.135
Education	1	7	4.84	2.211
Founding Team Size	2	5	2.56	0.968
VC Financing	0	1	0.25	0.434
CEO Start-up Experience	0	3	0.31	0.749
Incubator	0	1	0.29	0.456

Table 2. Construct reliability and convergent validity.

Construct	Items	Factor Loading	Cronbach's Alpha	CR	AVE
Rationalized Knowledge Hiding	RKH1	0.892	0.875	0.914	0.727
	RKH2	0.806			
	RKH3	0.830			
	RKH4	0.881			
NPD Speed	NPS1	0.831	0.887	0.922	0.747
	NPS2	0.873			
	NPS3	0.860			
	NPS4	0.891			
Affective Trust	AT1	0.801	0.882	0.913	0.678
	AT2	0.843			
	AT3	0.815			
	AT4	0.858			
	AT5	0.797			
Cognitive Trust	CT1	0.844	0.911	0.933	0.737
	CT2	0.860			
	CT3	0.855			
	CT4	0.859			
	CT5	0.875			

Table 3. Fornell–Larcker criterion.

Variable	***RKH***	***NPS***	***AT***	***CT***
RKH	0.853			
NPS	0.592	0.864		
AT	−0.329	−0.391	0.823	
CT	0.351	0.472	−0.324	0.859

RKH: Rationalized Knowledge Hiding; *NPS:* New Product Development Speed; *AT:* Affective Trust; *CT:* Cognitive Trust.

Table 4. Cross-loadings.

Variable	***RKH***	***NPS***	***AT***	***CT***
RKH1	0.892	0.545	−0.270	0.268
RKH2	0.806	0.399	−0.328	0.281
RKH3	0.830	0.479	−0.192	0.288
RKH4	0.881	0.571	−0.335	0.357
NPS1	0.466	0.831	−0.230	0.344
NPS2	0.550	0.873	−0.368	0.440
NPS3	0.480	0.860	−0.345	0.384
NPS4	0.546	0.891	−0.402	0.457
AT1	−0.270	−0.316	0.801	−0.332
AT2	−0.355	−0.387	0.843	−0.307
AT3	−0.283	−0.324	0.815	−0.258
AT4	−0.167	−0.319	0.858	−0.233
AT5	−0.261	−0.224	0.797	−0.169
CT1	0.305	0.410	−0.285	0.844
CT2	0.324	0.468	−0.276	0.860
CT3	0.261	0.394	−0.310	0.855
CT4	0.277	0.370	−0.267	0.859
CT5	0.337	0.366	−0.249	0.875

RKH: Rationalized Knowledge Hiding; *NPS:* New Product Development Speed; *AT:* Affective Trust; *CT:* Cognitive Trust.

Table 5. Heterotrait–Monotrait ratio.

	RKH	***NPS***	***AT***	***CT***
RKH				
NPS	0.662			
AT	0.370	0.429		
CT	0.391	0.519	0.351	

RKH: Rationalized Knowledge Hiding; *NPS:* New Product Development Speed; *AT:* Affective Trust; *CT:* Cognitive Trust.

Table 6. Path coefficients and hypotheses testing.

Path	**β**	**STDEV**	**95% Confidence Intervals (Bias Corrected)**	**Hypothesis Testing**
RKH -> NPS	0.337***	0.077	[0.180, 0.478]	H1: *Supported*
RKH*AT -> NPS	−0.157*	0.072	[−0.300, −0.018]	H2: *Supported*
RKH*CT -> NPS	0.166**	0.048	[0.072, 0.259]	H3: *Supported*
AT -> NPS	−0.174**	0.056	[−0.288, −0.068]	
CT -> NPS	0.253***	0.052	[0.154, 0.360]	

N = 279;

Bootstrapping = 5000

RKH: Rationalized Knowledge Hiding; *NPS:* New Product Development Speed; *AT:* Affective Trust; *CT:* Cognitive Trust.

***< 0.001; **< 0.01; *< 0.05.