How does contract completeness affect tacit knowledge acquisition?


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How does contract completeness affect tacit knowledge acquisition?

Purpose - This study aims to empirically investigate the role of contracts in tacit knowledge acquisition in research and development (R&D) alliances. By combining the perspectives of sensemaking and transaction cost economics (TCE), this study proposes a model about the mechanisms through which shared goals and contract completeness jointly affect tacit knowledge acquisition.

Design/methodology/approach - This study adopted a quantitative design and used the questionnaire survey method to collect data. We finally collected data on 196 R&D alliance samples in China. Multiple regression analysis was used to test the hypotheses.

Findings - There is strong empirical support that contract completeness has a positive effect on shared goals and that shared goals have a positive effect on tacit knowledge acquisition. Meanwhile, contract completeness weakens the positive effect of shared goals on tacit knowledge acquisition. Therefore, this study reveals that contract completeness has an inverted U-shaped effect on tacit knowledge acquisition.

Practical implications - The findings suggest that managers should consider both the psychological and rational effects of contract governance simultaneously, thus recognizing the importance of a moderate level of contract completeness for tacit knowledge acquisition in R&D alliances.

Originality/value - This study enhances our current understanding of contract governance by integrating the sensemaking and TCE perspectives. The findings provide a possible explanation of how contracts affect tacit knowledge acquisition in R&D alliances. We expand
the research on contract governance and alliance knowledge acquisition by revealing the inverted U-shaped relationship between contract governance and tacit knowledge acquisition.

**Keywords** - TCE perspective, Sensemaking perspective, Contract completeness, Shared goals, Tacit knowledge acquisition

**Paper type** - Research paper
1. Introduction

Innovation is critical for firms to deal with changing environments (Hendarsjah et al., 2019), achieve organizational success and gain competitive advantages (Oliva et al., 2019a; Nguyen et al., 2019). Innovation requires firms to acquire and integrate knowledge from various sources (Singh et al., 2019a), which depends on collaborations with external partners (Singh et al., 2019b). Research and development (R&D) alliances provide opportunities for firms to acquire and create new knowledge because the alliances allow firms to integrate knowledge and resources to solve business problems that cannot be tackled individually (Kaur et al., 2019; Tallman and Chacar, 2011).

Due to the widespread problems of uncertainty, opportunistic risks and inter-organizational conflicts, formal contracts have become a critical control vehicle for firms to effectively manage R&D alliances (Reuer and Ariño, 2002; Ariño et al., 2014; Schilke and Lumineau, 2018). Based on transaction cost economics (TCE), scholars believe that by pre-defining information needs and stipulating cooperation goals, rules and problem-solving procedures (Williamson, 1991), contracts provide an institutional assurance and control mechanism for information sharing and knowledge transferring in R&D alliances (Li et al., 2010; Zhang and Zhou, 2013; Liu et al., 2017; Jen et al., 2019).

Although previous studies are insightful, there remain two gaps that need to be addressed. First, although managers are increasingly aware of the importance of tacit knowledge (Borges et al., 2019), existing studies generally focus on explicit knowledge or knowledge in general (Zhang and Zhou, 2013; Jen et al., 2019). The effects of contract governance on tacit knowledge acquisition remain under-examined and unclear. With the characteristics of high
clarity and low cohesion (Nonaka and Takeuchi, 1995), a complete contract can improve explicit knowledge acquisition in alliances by directly specifying the scope and mode of explicit knowledge transfer (Li et al., 2010; Zhang and Zhou, 2013). While tacit knowledge is embedded in organizational practices, routines, and structures (Nonaka and Takeuchi, 1995; Nielsen and Nielsen, 2009) and is an individual merit (Akhavan et al., 2018), it is difficult to accurately describe which kind of tacit knowledge should be transferred in contracts and in what way. In addition, the skills needed to use tacit knowledge are difficult to document or codify (Kaur et al., 2019). Firms also risk transferring their core competencies to partners, which may lead to potentially harmful consequences (Janowicz-Panjaitan and Noorderhaven, 2009). Compared with that of explicit knowledge, the transfer of tacit knowledge requires not only basic institutional assurance based on legal effects but also psychological motivation among partners (Dervin, 1998; Yang and Farn, 2009). This argument implies that contracts’ effects on tacit knowledge acquisition may involve different processes and mechanisms compared to those of explicit knowledge. However, few studies have paid attention to this issue. Consequently, a deep understanding of contracts’ effects on tacit knowledge acquisition is called for.

Second, most of the previous studies analysed the effects of contracts on knowledge acquisition in alliances from the perspective of TCE, which mainly emphasizes the safeguard function of complete contracts on the costs and risks of knowledge exchange (Lui and Ngo, 2004; Liu et al., 2017). Although this perspective can explain the impact of contracts on knowledge acquisition using a rational view, it overlooks the effects of contract governance on partners’ psychological cognition (Weber and Mayer, 2011; Schilke and Lumineau, 2018).
The sensemaking perspective suggests that contracts can psychologically influence knowledge exchanges (Vlaar et al., 2006). This perspective argues that knowledge acquisition involves emotional and feeling framings of knowing and has been widely applied in the design of knowledge management systems (Dervin, 1998). Contracts provide a timely opportunity for alliance partners to engage in sensemaking and develop shared goals (Abdi and Aulakh, 2017). Shared goals, whereby network members share a common understanding, approach, and vision for achieving outcomes, are often regarded as the most important form of psychological cognition in alliance relationships (Inkpen and Tsang, 2005; Peltokorpi and Yamao, 2017). By providing a clear roadmap and long-term outlook, shared goals create a motivated working atmosphere (Nguyen et al., 2019) and play a leading role in transferring tacit knowledge effectively (Li et al., 2010; Ganguly et al., 2019). Given that tacit knowledge transfer requires both rational and psychological motivation, the sensemaking perspective can complement the TCE perspective appropriately, as it suggests that contracts influence exchanges psychologically. Integrating the two perspectives allows us to accurately interpret the influence of contracts on tacit knowledge acquisition in alliances.

In this study, we apply the sensemaking and TCE perspectives to empirically investigate the mechanisms through which shared goals and contract completeness jointly affect tacit knowledge acquisition in R&D alliances. The study contributes to the literature in two ways. First, we expand the research on contract governance and alliance knowledge acquisition by revealing the inverted U-shaped relationship between contract governance and tacit knowledge acquisition. Second, by integrating the sensemaking and TCE perspectives, we shed light on the underlying mechanism through which contract governance influences tacit
knowledge acquisition. In addition, our study provides insights to managers regarding how to
design an optimal contract to improve inter-organizational tacit knowledge acquisition.

2. Theoretical background and hypotheses

2.1 Alliance tacit knowledge acquisition

Firms possess both explicit and tacit knowledge. Explicit knowledge is codified and can
be transmitted without loss of integrity, whereas tacit knowledge is complex and intuitive and
is largely based on an individual’s own experience and reflections (Borges et al., 2019). In
R&D alliances, much work-related knowledge, such as knowhow regarding technical skills
and new product and process ideas, is highly tacit in nature (Kaur et al., 2019; Tallman and
Chacar, 2011). Tacit knowledge is regarded as the main source of a firm’s competitive
advantages because it is unique, rare and difficult for competitors to replicate (Janowicz-
Panjaitan and Noorderhaven, 2009; Ganguly et al., 2019; Sikombe and Phiri, 2019). Acquiring tacit knowledge from alliance partners allows firms to obtain critical components
for innovations and improve collective performance in dynamic markets (Oliva et al., 2019a;
Singh et al., 2019b). As tacit knowledge is personal and difficult to communicate and
formalize, acquiring and absorbing tacit knowledge is a complicated task (Akhavan et al.,
2018). Firms must develop effective processes to manage knowledge exchange and
consciously monitor the flow of tacit knowledge across a firm’s borders using different tools
(Singh et al., 2019a; Oliva et al., 2019b). R&D alliances provide a critical instrument for
firms to acquire tacit knowledge because they facilitate cooperation and collaboration,
face-to-face contact and information sharing between alliance partners (Tallman and Chacar,
2011; Kaur et al., 2019). However, partners may be highly sensitive to sharing that
information and often worry that their private knowledge may be abused or transferred to
other firms, which would cause personal losses (Janowicz-Panjaitan and Noorderhaven, 2009;
Yang and Farn, 2009). In addition, it is difficult to measure and price tacit knowledge in a
detailed contract, which makes sharing it with others a concern for alliance partners due to the
lack of proper reward mechanisms (Osterloh and Frey, 2000; Yang and Farn, 2009). Rational
and psychological motivations are intertwined in tacit knowledge transfer and cannot easily
be decoupled. Thus, tacit knowledge transfer in R&D alliances must meet two prerequisites:
First, as R&D alliance cooperation must be more rational than personal social interaction, the
most primary precondition of tacit knowledge transfer is basic institutional assurance. Second,
the transfer of tacit knowledge between alliance partners much achieve a higher level of
psychological motivation to interact with partners actively. We argue that it is necessary to
simultaneously consider both perspectives, as this can enrich our understanding of alliance
tacit knowledge transfer.

2.2 Two perspectives on a contract

Since uncertainty, information asymmetry and opportunism exist, firms suffer from a
variety of risks in alliances (Lui and Ngo, 2004; Carson et al., 2006). According to TCE,
contracts are key formal control mechanisms used to reduce cooperation risk and ensure
knowledge exchange (Zhang and Zhou, 2013; Liu et al., 2017). Contract control emphasizes
that both parties seek a complete contract to guide and safeguard exchange. Contractual
completeness is a legally binding framework that codifies alliance partners’ rights, duties and
responsibilities as well as procedures and policies involving joint activities, which is generally
reflected by the quantity, integrity, clarity, and adaptability of the contract terms (Luo, 2002;
Luo, 2005; de Jong and Woolthuis, 2008). As the degree of contract completeness is determined before formal cooperation, the purpose of designing a complete contract is to prevent the various latent costs during cooperation. TCE has been the dominant perspective in contract research (Weber and Mayer, 2008; Jen et al., 2019). However, TCE can explain the knowledge transfer in R&D alliances only by explaining the rational motivation. Compared with explicit knowledge transfer, tacit knowledge transfer also requires more psychological motivation, such as shared goals (Li et al., 2010; Ganguly et al., 2019). Thus, we argue that the TCE perspective alone is inadequate to explain the effects of contracts on tacit knowledge transfer, and an additional perspective is necessary. The latest research indicates that contracts can also psychologically influence exchanges or ongoing partner relationships (Schilke and Lumineau, 2018; Weber and Mayer, 2011). Contracts entail socio-psychological processes and function as a means for sensemaking, enabling partners to conform to expectations and beliefs about the future (Vlaar et al., 2006; Abdi and Aulakh, 2017). Therefore, we propose that the sensemaking perspective can interpret how alliance contracts motivate partners to engage in tacit knowledge sharing psychologically.

The TCE perspective emphasizes the economic and rational motivations of alliance partners to pursue the maximization of self-interests; it asserts that a contract is an important means to prevent and control opportunistic risks (Williamson, 1991; Luo, 2002). First, a complete contract can reduce the monitoring and coordination cost of alliances by clearly defining the rights, responsibilities and obligations of the parties as well as the procedures for task completion (Reuer and Ariño, 2002). Second, the reward and punishment clauses in contracts can change the pay-off structure by increasing the cost of self-interest activities. It is
costly to violate contracts that clearly stipulate penalties for opportunistic behaviour (Lui and Ngo, 2004). Although alliance contracts can safeguard against transaction risks, a highly complete contract also suffers from some limitations in practice. First, an R&D alliance is highly uncertain, and many unforeseen market changes often challenge the formal contract during transaction processes (Yang et al., 2011). It is difficult to adjust and revise the procedures and standards of alliance decisions and execution, resulting in the rigidity of alliance operation (Poppo and Zenger, 2002; Jen et al., 2019). Second, a highly complete contract often makes alliance partners over-emphasize their own rights, obligation and punishment when controversy arises, which is likely to result in a win-lose scenario (Yang et al., 2017; Lumineau and Malhotra, 2011).

The sensemaking perspective emphasizes that inter-organizational relationships are frequently characterized by relatively high levels of ambiguity and uncertainty and views a formal contract as a means to make sense, which helps partners in collaborative relationships cope with problems of equivocality (Vlaar et al., 2006; Kumar and Patriotta, 2011). Formal contracts entail socio-psychological processes of sensemaking through which alliance partners socially construct or enact their realities and reduce the cognitive disorder, ambiguity and uncertainty that they experience (Carson et al., 2006; Vlaar et al., 2006). Sensemaking is a crucial process with which to incorporate expectations and beliefs about the future and create a new mental framework (Lundgren-Henriksson and Kock, 2016). There are four mechanisms through which contracts may facilitate sensemaking (Weick et al., 2005; Vlaar et al., 2006): (1) focusing partners’ attention; (2) provoking articulation, deliberation and reflection; (3) instigating and maintaining interaction; and (4) reducing judgement errors and individual
biases and diminishing the incompleteness and inconsistency of cognition. By creating a solid understanding of inter-organizational cooperation, sharing a common factual base, and agreeing on important assumptions, formal contracts promote the building of shared goals about the exchange, which influences knowledge transfer in alliances. This approach also heeds earlier calls for alliance research by studying how contract governance shapes the psychological framework with which organizational actors make judgements and how it influences subsequent firm and inter-firm behaviours (Lumineau and Malhotra, 2011).

2.3 Contract completeness and shared goals

Contract governance affects partners’ behaviour not only directly by delineating appropriate behaviours but also indirectly by influencing their beliefs and expectations (Weber and Mayer, 2011; Schilke and Lumineau, 2018). A complete contract provides a framework for alliance cooperation and contributes to shared goals.

A complete contract entails a socio-psychological process of sensemaking (Vlaar et al., 2006; Abdi and Aulakh, 2017). First, a complete contract helps partners focus their attention on a set of common issues by demarcating what is allowed, expected, acceptable and possible and what is not, providing them with meaning and direction (Lumineau et al., 2011). Second, a complete contract drives the partners to reflect and think deeply about their intentions and their views on the alliance. Meanwhile, it also helps partners articulate and codify their mutual goals and make sure that they are carefully expressed (Vlaar et al., 2006). Third, a complete contract serves as a blueprint for guiding communication. Contracts contain routines that support complex forms of interaction and communication by triggering a set of sequenced actions and activities (Li et al., 2010). Fourth, a complete contract defines key terms
accurately and thereby helps overcome any misunderstanding linked with their respective
terminology, firm jargon, and mental models (Vlaar et al., 2006); hence, it allows firms to
effectively manage risks in alliances and reduces equivocality (Akhavan et al., 2018). As such,
a complete contract facilitates sensemaking, and partners in alliances come to share
synthesized knowledge, implicit assumptions and mental models (Kumar and Patriotta, 2011).
Thus, the contract is conducive to establishing shared goals among alliance partners. The
more complete a contract is, the more likely it is that they can share a common understanding,
approach, and vision for achieving alliance outcomes. Thus, we hypothesize that:

H1. Contract completeness has a positive effect on shared goals between partners.

2.4 Shared goals and tacit knowledge acquisition

As one of the most salient forms of psychological cognition of alliance relationships
(Inkpen and Tsang, 2005; Peltokorpi and Yamao, 2017), shared goals allow partners to
recognize that cooperation can enhance their joint competitive positions, which improves
knowledge exchange and joint innovation (Inkpen, 2008; Molina-Morales and Martínez-
Fernández, 2010). We argue that shared goals have a positive effect on tacit knowledge
acquisition.

First, shared goals can foster a more open and interactive learning environment in which
tacit knowledge and technology are more freely exchanged (Foos et al., 2006). Shared goals
align the understanding between the source and the recipient and encourage the members to
attach importance to the potential value of resource exchange (Chow and Chan, 2008). When
partners have shared goals, they are likely to work together and interact more, which might
enhance the willingness of employees and motivate them to engage in joint problem-solving
processes (Inkpen, 2008; Goswami and Agrawal, 2019). This can enable partners to communicate each other’s ideas deeply, share their R&D patterns and skills actively, and better learn and understand their thinking mode and situation-embedded skills. They can then learn and acquire proprietary knowledge in the process of dealing with new problems (Ning and Li, 2018).

Second, shared goals can lubricate the interaction process, reduce dispute resolution costs, and lower emotional conflict, which speed up tacit knowledge exchanges. Shared goals create informal norms of reciprocity and solidarity between exchange parties, which harmonize partners’ interests, signify a bilateral expectation that both parties value the relationship, and help alliance partners properly interpret obstacles and reduce risks in tacit knowledge transfer (Li et al., 2010; Inkpen and Tsang, 2005). With shared goals, partners can develop compatible missions and the same perceptions about how to interact with one another and avoid possible misunderstandings in their communications (Peltokorpi and Yamao, 2017; Nguyen et al., 2019). Thus, partners are more willing to contribute more tacit knowledge and resources to the alliance. Moreover, existing studies found a positive link between the level of shared goals and tacit knowledge acquisition (Li et al., 2010; Ganguly et al., 2019). Thus, we hypothesize that:

H2. Shared goals have a positive effect on tacit knowledge acquisition among alliance partners.

2.5 Moderating effects of contract completeness

Formal contracts are the fundamental assurance that alliance members will participate in knowledge exchange. Although they are essential for alliances, there is often a situation of
over-control in practice (Feams et al., 2008). We propose that a highly complete contract may have some negative effects on the relationship between shared goals and tacit knowledge acquisition.

First, a highly complete contract often makes the cooperation process more rigid (Yang et al., 2017), which blocks joint problem solving. As tacit knowledge is rooted in the behaviour and experience of employees, it is difficult to be encoded or transferred, and partners need to learn from each other in the process of joint problem solving (Ning and Li, 2018). Shared goals help partners actively engage in joint problem solving and thus provide more opportunities to exchange tacit knowledge (Inkpen, 2008; McEvily and Marcus, 2005). The uncertainties associated with joint problem solving require flexible and free information exchange and communication between partners, whereas the complete and pre-specified obligations constitute a restriction on both parties, and the partners can act only within the scope of the contract (Bai et al., 2016). The rigidity and stringency of contract provisions contradict the need for flexibility, greatly reduce the partners’ enthusiasm to engage in joint problem solving, and thus weaken the positive impact of shared goals on tacit knowledge acquisition.

Second, a highly complete contract often leads to cognitive conflict with shared goals when it refers to dispute resolution. A highly complete contract emphasizes rights, rules, and legal sanctions, which rely on regulatory authorities or courts to impose sanctions and thus will be more likely to result in a win-lose framing of the dispute resolution (Lumineau and Malhotra, 2011; Yang et al., 2017). Conversely, shared goals depend on informal normative conventions to coordinate exchanges when disputes arise. The third-party enforcement of
contracts conflicts with the informal norms, which demands self-discipline from partners (Zhou et al., 2014), undermining their motivation to share tacit knowledge cooperatively. Alliance partners may act more opportunistically and exhibit less willingness to share their tacit knowledge, which in turn undercuts the positive effect of shared goals on tacit knowledge acquisition. Thus, we hypothesize that:

H3. Contract completeness weakens the positive effect of shared goals on tacit knowledge acquisition.

2.6 Taking both perspectives into account

The sensemaking perspective emphasizes that contract completeness has a psychological impact on partners (Vlaar et al., 2006; Kumar and Patriotta, 2011). Specifically, a complete contract can boost shared goals, which are conducive to alliance tacit knowledge acquisition. The TCE perspective focuses on the safeguard roles of the contracts, emphasizing that a complete contract can control opportunistic risks but a highly complete contract can be a hazard because it can cause rigidity and cognitive conflicts (Yang et al., 2017; Zhou et al., 2014). Therefore, we need to consider both to gain a holistic picture when examining the overall effect of contract completeness on tacit knowledge acquisition.

When contract completeness increases from a low to moderate level, the sensemaking effect and safeguard effect of the contract completeness strengthen each other. The relatively complete contract helps alliance partners make sense of the cooperation which enables them to identify and avoid conflicts, develop common systems and behaviours and establish shared goals and a shared understanding (Kumar and Patriotta, 2011; Abdi and Aulakh, 2017). Meanwhile, formal contracts are supposed to respond to perceived opportunistic risk,
uncertainty and asset specificity, which build up a conduit for efficient knowledge flows and ensure knowledge exchanges through third-party surveillance and punishment (Li et al., 2010; Zhou et al., 2014). These formal safeguards provide a solid institutional foundation upon which to improve the efficiency of tacit knowledge acquisition through shared goals. Thus, we argue that the effects of a relatively complete contract on tacit knowledge acquisition should be positive.

When contract completeness moves from a moderate to high level, however, the additional effects of sensemaking on shared goals increase incrementally, but the negative effects of rigidity and cognitive conflict become more evident. First, a highly complete contract often stiffens alliance cooperation (Yang et al., 2017). The highly complete contract contains many rules and regulations, which greatly reduce the variability, flexibility and adjustability of the alliances (Srivastava and Teo, 2012), thus hindering their joint problem solving. Second, a highly complete contract causes cognitive conflicts when it refers to dispute resolution, which will undermine motivation to share tacit knowledge cooperatively (Dervin, 1998), thus undercutting the positive effect of shared goals on tacit knowledge acquisition. As a result, when a contract changes from relatively complete to highly complete, it inhibits the acquisition of tacit knowledge due to increased rigidity and cognitive conflict. Therefore, we propose the following hypothesis:

H4. There is an inverted U-shaped relationship between contract completeness and tacit knowledge acquisition.

Fig. 1 summarizes the conceptual model and hypotheses developed to be tested.
3. Methods

3.1. Sample and data collection

This study focuses on how contract completeness affects tacit knowledge acquisition in R&D alliances. Hence, we take manufacturing firms that are involved in R&D activities as our research objects. China is used as our research setting because many developing economies, including that of China, are trying to promote the reform of their legal system (Yang et al., 2018). With the gradual improvement of legal systems, more and more firms are using contracts to share and transfer knowledge in R&D alliances. Meanwhile, China is experiencing economic reform, and competition has intensified substantially. Both local and foreign firms are compelled to collaborate and innovate to improve their competitive position. There is a high frequency of mutual learning and knowledge transfer within the alliances. Many firms want to understand how to promote alliance tacit knowledge acquisition and enhance their competitive advantage, and thus they were willing to participate in the survey.

Questionnaire surveys are the main method for collecting such data. We developed a questionnaire based on previous studies in English and modified it according to the business environment in China. The two-way translation method was used; the results indicated no substantial difference in the meaning of the scales between the English and Chinese questionnaires. To ensure content and face validity, as well as the clarity of measures in the Chinese context, we selected 20 MBA students who are middle and senior managers to pilot
test the questionnaire. Respondents were encouraged to answer the questionnaires and offer feedback on the wording and design of the questionnaire. Based on their feedback, we revised a few items in the questionnaire to enhance clarity.

We randomly selected 800 firms from a list provided by local governments and business research firms to confirm whether these firms are currently conducting R&D activities. We then employed professional interviewers to phone these firms’ senior managers and explain the survey’s academic purpose and confidentiality policy. Based on these responses, we identified 247 firms that had R&D alliances and were willing to participate in this research. Finally, the face-to-face interview method was adopted to obtain subjects’ responses to the survey instrument. All interviewers were PhD students and teachers in Chinese universities, and they were trained before embarking on the interview process. The research team presented the questionnaires to informants of each firm and collected the surveys after their completion. The interviews lasted, on average, approximately one hour. The informers’ positions included chairman, CEO, department management, and other project managers familiar with R&D project matters.

The research team successfully obtained responses from 189 firms, and hence the effective response rate was 76.5%. We dropped 34 cases because of excessive missing data. Therefore, the final number of valid sample firms totalled 155. Of the 155 firms, 131 were involved in 1 alliance, 12 were involved in 2 alliances, 7 were involved in 3 alliances, and 5 were involved in 4 alliances. Therefore, the final sample consisted of 196 R&D alliances. To assess the informants’ quality, we asked these respondents to indicate the time (in years) that they had worked for their firms. The means were 6.19 and 5.87 for the senior and middle
managers respectively, indicating they were qualified respondents.

The sample firms were mainly from Hunan, Hubei, Shaanxi, Liaoning, Shanghai, and Guangdong provinces of China. They are located in central, northern, eastern, and southern China, respectively. The large geographical span represents the geographic, economic and demographic diversity in China. The firms surveyed included state-owned, private and foreign-funded firms and covered major manufacturing industries such as the medicine, machinery, and chemical industries and IT. In other words, the object of our investigation was reasonable in structure.

We used two methods to evaluate non-response deviation, including a comparison of returned and non-returned samples and a comparison of early- and late-returned samples in terms of the attributes of firms, such as scale, ownership and geographical distribution. The results of two independent-sample T- tests revealed no significant difference between the samples (all p values were greater than 0.1), supporting the assumption that respondents were not different from non-respondents.

3.2 Variables and measures

The variables were measured based on existing literature and adapted to the research context. In addition to the firm scale and firm ownership, the variables were measured using the five-point Likert scale (1 represents ‘strongly disagree’, and 5 represents ‘strongly agree’).

3.2.1 Contract completeness

Contract completeness was measured by five items regarding the formal and written arrangements between partners that stipulate responsibility and the possible future situation and countermeasures. They were developed based on the studies by Luo (2002), Luo (2005)
and de Jong and Woolthuis (2008).

3.2.2 Tacit knowledge acquisition

Tacit knowledge acquisition was measured by three items regarding the non-codified innovation management skills, new product development and new technology skills obtained through R&D alliances. They were developed based on the studies by Yli-Renko et al. (2001) and Dhanaraj et al. (2004). The items were adapted to reflect the tacit knowledge acquisition in R&D alliances and modified based on the pilot tests.

3.2.3 Shared goals

Shared goals were measured using three items regarding common visions and goals in the R&D alliances. They were developed based on the studies by Molina-Morales and Martínez-Fernández (2010) and Tsai and Ghoshal (1998).

3.2.4 Control variables

This study included four groups of control variables. First, the study controlled for firm characteristics, including scale and ownership. Second, the study controlled for institution and market environment: legal inadequacy and competition intensity. Third, our study controlled for relationship characteristics: supply chain relationship and interdependence. Fourth, we also controlled for innovation orientation, which reflected a firms’ learning and knowledge exploring ability. The measurement of the variables is presented in Table 1.

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Insert Table 1 about here
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3.3 Reliability and validity
Table 1 shows the factor loading of the items, Cronbach’s alpha coefficient, combination reliability (CR), and average variance extracted (AVE). As shown in Table 1, Cronbach’s alpha is greater than 0.70, and the CR value is greater than 0.85, indicating that the variable reliability is good. In addition, the factor loadings are all above 0.70, and the AVE values are all greater than 0.65, indicating that the measurements have good convergent validity. To assess discriminant validity, this study followed Fornell and Larcker’s (1981) suggestion. Specifically, we compared the inter-correlations of variables with the square root of the average variance extracted (AVE) for each variable. Table 2 presents the descriptive statistics of this study. The mean, standard deviation and correlation coefficient of the variables are given. The values on the diagonal of Table 2 are the square roots of AVE, which are greater than the correlation coefficients of the variables. This result shows that the measurements have good discriminant validity. Overall, the study’s measures possess adequate reliability and validity.

3.4 Common method bias

Since this study relied on cross-sectional survey data and a single respondent from each company, the data may be biased by common method variance (Podsakoff et al., 2003). We performed two empirical tests to check for evidence of common method bias. First, we conducted the Harman single-factor test (Podsakoff and Organ, 1986), which loads all perceptual items into an exploratory factor analysis. The first factor accounted for only
19.28% of the total variance, indicating that common method bias is unlikely to be a major concern in our data. Second, we used a variable theoretically unrelated to at least one variable in the analysis as a marker variable (MV), which provided a proxy of common method variance (Lindel and Whitney, 2001; Zhou et al., 2014). The MV used was moderation principle. The minimum non-negative correlation coefficient between moderation principle and other latent variables (r =0.006) was used to adjust the correlation coefficients. As shown in Table 2, none of the significant correlations became non-significant after MV adjustment. Therefore, common method bias was unlikely to be a serious concern in this study.

4. Analyses and results

4.1 Model specification

To mitigate the problem of multicollinearity, we centered contract completeness and shared goals before constructing their interaction terms (Ailken and West, 1991). Variance inflation factors from the regression were used to assess the multicollinearity among the variables. As a result, the maximum variance inflation factor (VIF) was 1.552, well below the critical value of 10.0, which indicates that multicollinearity is not a serious problem in this study.

4.2 Hypotheses testing

To test the hypotheses, we conducted hierarchical regression analyses, which were used extensively in prior studies to test both main effects and interaction effects. The coefficients and model statistics for the analyses are reported in Table 3. Model 1 and model 6 are the base models and contain only the control variables.

To test H1, we added contract completeness to model 2. The results of model 2 indicate
that there is a positive relationship between contract completeness and shared goals ($\beta = 0.337$, $p<0.001$), and H1 is supported. Model 4 tests the effects of shared goals on tacit knowledge acquisition. The findings also reveal that shared goals improve tacit knowledge acquisition ($\beta = 0.219$, $p<0.01$), in support of H2. Model 5 was developed to test the moderate effects of contract completeness on the relationship between shared goals and tacit knowledge acquisition. As shown by model 5, the interaction term of contract completeness and shared goals has a negative effect on tacit knowledge acquisition ($\beta = -0.215$, $p<0.05$). Thus, H3 is supported.

According to the research conclusion of Haans et al. (2016), an inverted U-shaped relationship between the independent variable and a dependent variable must satisfy three conditions. First, $\beta_2$ needs to be significant and negative. Second, when $X$ is the lowest value, the slope of the curve is positive and significant; when $X$ is the highest value, the slope is negative and significant. Third, the inflection point of the curve should be within the value range of $X$.

As shown in Table 3, we can test whether the main effect hypothesis meets the following three conditions: (1) As shown in model 7, the coefficient of the quadratic term of contract completeness is negative and significant ($\beta_2 = -0.169$, $p<0.05$), which satisfies the first condition. (2) Suppose the following regression equation of contract completeness $X$ and tacit knowledge acquisition $Y$: $Y = \beta_0 + \beta_1 X + \beta_2 X^2$ ($Y$ is the dependent variable, $X$ is the independent variable, $\beta_0$ is the constant, $\beta_1$ is the primary term coefficient of the independent variable $X$, and $\beta_2$ is the secondary term coefficient of the independent variable $X$, the same below). According to model 7, $\beta_1 = 0.383$, $\beta_2 = -0.169$, and curve slope ($k$) = 0.383-0.338 $X$. In
this study, after standardization, the X value is distributed between -2 and 2. When X takes the lowest value of -2, k is positive and significant, and when X takes the highest value of 2, k is negative and significant, meeting the second condition. (3) According to model 7, the inflection value of X is \(-\beta_1/2\beta_2 = 1.133\), which is within the value range of X, meeting the third condition. Therefore, there is an inverted U-shaped relationship between contract completeness and tacit knowledge acquisition, and hypothesis H4 is verified.

5. Discussion and conclusion

This study discusses the effect of contract completeness on tacit knowledge acquisition from the perspectives of sensemaking and TCE. The results reveal that contract completeness has a positive effect on shared goals and shared goals have a positive effect on tacit knowledge acquisition. However, a highly complete contract weakens the positive effect of shared goals on tacit knowledge acquisition. Therefore, contract completeness has an inverted U-shaped effect on tacit knowledge acquisition. By revealing a curvilinear relationship between contract completeness and tacit knowledge acquisition, this study deepens the current understanding of why firms should be cautious about managing R&D alliances for tacit knowledge acquisition using a complete contract.

5.1 Theoretical implications

This study contributes to the literature in two ways. First, it contributes to research on contract governance and knowledge acquisition by presenting empirical evidence that
moderate contract completeness is optimal for tacit knowledge acquisition in R&D alliances. However, prior research shows that contract completeness benefits the acquisition of explicit knowledge or knowledge in general (Zhang and Zhou, 2013; Jen et al., 2019). This study extends the finding by revealing that a highly complete contract may be detrimental for tacit knowledge acquisition. Our result indicates that contract completeness has an inverted U-shaped relationship with tacit knowledge acquisition. This finding provides a valuable extension of the existing research on alliance knowledge management by elucidating previously neglected issues concerning alliance tacit knowledge acquisition in terms of contract governance (Zhang and Zhou, 2013).

Second, this study empirically investigates the dual roles of contracts by integrating the sensemaking and TCE perspectives. Our study indicates that the role of contracts should be viewed not only as a safeguard to mitigate opportunism but also as a socio-psychological process of sensemaking (Vlaar et al., 2006). By combining the two different views of contract governance, we provide a more accurate and deeper understanding of the mechanism underlying how contract governance affects tacit knowledge acquisition and empirical evidence via the interactive effects of contract completeness with shared goals. Furthermore, this study supports the proposition that it is imperative to integrate the insights from rational and psychological views to understand the role of contracts in R&D alliances (Weber and Mayer, 2008; Lumineau and Malhotra, 2011; Schilke and Lumineau, 2018).

5.2 Managerial implications

This study also provides guidelines for managing tacit knowledge acquisition in R&D alliances. First, the findings reveal that a highly complete contract may have a downside and
not be the best choice for managing tacit knowledge acquisition, even though detailed contractual descriptions are common and favoured in practice. Therefore, we suggest that firms use a moderately complete contract to establish a smooth channel for tacit knowledge exchange, which is beneficial for them to acquire tacit knowledge from partners. Managers should avoid prescribing activities and procedures in detail when using contracts to manage tacit knowledge transfer in R&D alliances.

Second, when using contracts to manage R&D alliances, managers need to consider both the rational and psychological factors of partners when negotiating and designing a contract. Shared goals are important psychological factors that play a key role in the process of tacit knowledge acquisition in alliances. Contracts should be designed to help partners understand each other and create shared goals, which can promote long-term and effective cooperation among firms and encourage them to share tacit knowledge. However, managers should be aware that a highly complete contract may also cause some negative rigidity effects and cognitive conflict, which go against tacit knowledge acquisition.

5.3 Limitations and future research directions

This study contains several limitations that suggest directions for further research. First, the cross-sectional nature of the data prevents the study from establishing causal relationships. An alternative specification might suggest that tacit knowledge acquisition influences the choice and evolution of contract governance. In addition, in order to further explain how the effects of contract completeness unfold over the course of collaboration, a longitudinal approach is necessary to uncover the dynamics of governance mechanisms and tacit knowledge acquisition. Second, this study identifies tacit knowledge acquisition only as the
outcome construct. Future studies may consider the other dimensions of knowledge acquisition (i.e., knowledge comprehensiveness and quantity) or different types of tacit knowledge acquisition (i.e., technology, market and management knowledge) and examine whether the impact of contract completeness is different. Third, this study examines the impact of the contract completeness instead of its actual enforcement. Although contract completeness matters in alliance relationship governance, the actual enforcement of contracts also plays a critical role (Bai et al., 2016). Further studies accounting for the enforcement of contracts could provide novel insights into the relationships between contract governance and alliance knowledge acquisition.

References


