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# Embeddedness of Inter-firm Ties and Knowledge Creation†

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*This study examines consequences for knowledge creation due to differences in embeddedness of inter-firm ties, more specifically, between informal or Arm's Length Relationships (ALRs) and formal collaborations. Qualitative data from 41 respondents across 22 SMEs is used to examine knowledge conversion processes comprising the SECI (Socialisation, Externalisation, Combination, Internalisation) framework of knowledge creation. We show a difference based on embeddedness of ties for how knowledge creation unfolds. Implications for spin off between ties and for firm attention to deliberating and managing a varied portfolio of ties for superior performance, are also drawn.*

**Keywords:** Formal collaborations; Arm's length relationships; Knowledge conversion processes; Knowledge creation

## Introduction

The notion of inter-firm collaboration, and its impact on performance of collaborating firms and on their capabilities, has found significant appeal in extant research (e.g. Feller *et al.*, 2013; Capaldo and Petruzzelli, 2014; Li *et al.*, 2016). Another, albeit smaller body of research has examined informal interactions or arm's length relationships (ALRs) between firms (e.g. McEvily *et al.*, 2014). Such research acknowledges the informal context to be crucial for firm functioning and brings the nature of ties and their embeddedness under purview. The coming together of formal and informal ties in how knowledge ecosystems are configured and affect firm performance has also been reflected upon (e.g. Dahlander and McFarland, 2013; McEvily *et al.*, 2014).

In contrast with collaborations, there are no contracted obligations between parties in ALRs, each acting in its own interest, under no duress from the other. Characteristics of arm's length relationships delineating

them from embedded ties include a lack of trust and social closeness, and their adversarial and 'one off nature' (Larson, 1992; Uzzi, 1997). One common premise that holds across inter firm ties despite any difference in embeddedness is that knowledge, as the primary source of capabilities remains a central motivator. It therefore becomes pertinent to examine if, and how, knowledge creation would be different in collaborative ties relative to ALRs and draw implications of any differences for knowledge creation and for the portfolio of inter-firm ties. Our research questions are therefore two-fold: How does knowledge creation vary based on the strength of inter-organisational ties? and; What is the impact of such variations?

The platform framework deployed in this paper is the socialisation, externalisation, combination and externalisation (SECI) articulation by Nonaka *et al.* (2000). This consolidated theorisation had progressed from earlier works establishing founding ideas to come together in the fully developed SECI framework (Nonaka, 1991, 1994; Nonaka and Takeuchi, 1995; Nonaka and Konno, 1998). These ideas include knowledge sharing, contextual assimilation and distillation, and knowledge transfer. The use of SECI to understand inter-firm interaction and knowledge creation in collaboration networks finds validation in recent research (e.g. Feller *et al.*, 2013; De Silva *et al.*, 2018). Wang (2016) examines data on individual scientists to argue for a healthy mix of weak

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and strong ties in networks for superior value from the portfolio of ties. The study also asserts some interesting variations attributed to the impact strength of ties has on knowledge creation.

However, no research to date has sought to develop a contrasting perspective for knowledge creation in formal (collaborations) versus informal (arm's length) inter-firm relationships to understand effects of the knowledge creation process on the tie, and of the nature of the tie, on knowledge creation. The significance this understanding could have for firms to strategies for gains from both informal and formal relationships, makes this an important gap to address. This is of particular significance in context of SMEs where inter-firm relationships are highlighted as more susceptible to external influences, and stronger drivers of performance and innovation than in larger organisations (Alegre *et al.*, 2013). Sapir *et al.* (2016) have examined knowledge creation and relationships in collaborations from a vantage point of communities of practice. Here social practice specificity creates barriers to sharing and creation across communities. Such specificity is relatively less influenced by individual organisational preferences, impact-response, and rigidities in SMEs than in larger firms (Nikolopoulos and Dana, 2017). While this makes SMEs better suited for examining knowledge creation contrasts between ALRs and collaborations, it does not take away the significance of findings and implications from such contrasts for larger firms. This is because larger firms are also made up of smaller units and increasingly function as a synergistic collective of quasi-independent units, whether subsidiaries, divisions or projects.

The remainder of the paper is organised as follows. In the next section differences in the nature of inter-firm relationships are explained. The domain of knowledge creation is then outlined including a critical view on frameworks and choice of SECI as the platform framework to examine and contrast ALRs with collaborations. Thereafter we present an elaboration on data and methods. Propositions are developed from observations followed by discussion and conclusions that provide a perspective on contributions, implications and generalisability of our insights.

## Inter-firm relationships and knowledge creation

### *The contrasts: Portfolio of inter-firm relationships*

Strategic management's transition from endorsing the previously dominant industrial organisation perspective to core capabilities and resource-based theories have had a marked impact on research on inter-firm relations (e.g., Bromiley and Rau, 2014; Gupta and Polonsky, 2014). A

previous emphasis on arm's length ties, primarily due to their low switching costs, minimal risk and bargaining advantages, has been superseded by more embedded collaborative approaches. The latter emphasise innovation and performance benefits of collaborations, particularly the ability to foster resources and lower risk through greater tie-in of stakes between firms and also within firms. Uzzi (1997), building on the work of Granovetter (1985), highlights the benefits of managing a portfolio of both close and arm's length ties, stating that trust, fine-grained information transfer and joint-problem solving arrangements through collaborations improve performance, whilst ALRs serve to provide new and novel information, and to some extent moderate the effects of exogenous shocks. Research has also examined growing interdependencies, particularly in the multi-national context, to argue ALRs as a source of competitive advantage that can no longer be ignored (e.g., Dunning, 2015). ALRs thus seem to be very much back in vogue and the contrast in how they manifest relative to collaborations is a domain that demands more attention. A precision in definition for ALRs has not been attempted so far and the terminology has been quite diverse while referring to the same phenomenon. A review of literature suggests several definitions and also varying terms that are in the ambits of arm's length relationships. We have noted upfront that these tend to be characterised by reduced levels of trust, social closeness and also, a typically 'one-off' attribute.

Larson (1992) articulated Arm's length market exchanges as price-based adversarial links featuring low levels of cooperation, integration, and trust. The view of lower levels of integration in relationship and risk averseness links with more expressions in research like that of a relationship lacking trust, flexibility and lacking norms or social content and closeness (Uzzi, 1997; Uzzi and Lancaster, 2003). While some research has sought to inform effective management of a varied portfolio of inter-firm relationships including less embedded ties, majority of research in the area has focused on performance benefits of collaboration and associated challenges (e.g., Cao and Zhang, 2011; Nyaga and Whipple, 2011; Downing and Shanley, 2017). This paper contributes towards the former to help address the imbalance in research emphasis.

### *Knowledge creation in interfaces and the SECI*

A considerable volume of research in knowledge management has deployed the SECI model since its articulation (Nonaka *et al.*, 2000). Criticisms have been noted and responded to, with the framework standing the test of applications in a range of contexts (Nonaka and von Krogh, 2009; Engeström and Sannino, 2012, p. 2). Work on examining knowledge creation has emphasised

that it needs to be infused with some variety to make the knowledge spiral running through knowledge conversion modes, to progress more effectively, that is, to churn out more valuable knowledge (e.g., Smith *et al.*, 2005). Therefore, if there were a variation in nature of knowledge conversion between different ‘forms’ of inter-firm relationships say by virtue of embeddedness (ALRs and collaborations), this would by extension, make for a source of such variety across the portfolio of ties a firm has. Of course, another source of variety can also be from ties with different firms. Overall, understanding of benefits from such variety supports sensemaking by firms to calibrate their portfolio, and introspect how they manage knowledge creation and embeddedness of inter-firm relationships.

While this paper commits to using SECI as a platform to examine variations in knowledge creation in formal collaborative relationships and ALRs, several alternate theorisations relate to the phenomenon of knowledge creation. These have been followed by empirical and conceptual research to understand their manifestation and to discuss associated moderating and mediating influences (e.g., Norman, 1978; Kolb, 1984; Nonaka and Takeuchi, 1995; Nonaka *et al.*, 2000; Chang *et al.*, 2014). Several of these are less about outlining knowledge creation as a sequential process. They do build alternate perspectives in discussing styles of knowledge creation to bring forth how different learning activities co-exist and can be less or more emphasised. Whilst knowledge creation in embedded relationships is a fairly well-established phenomenon (Inkpen, 1996), whether knowledge can be created in arm’s length relationships, and the nature of this process, remains under-researched if not elusive.

Argote and Ingram (2000) speak of various knowledge networks and reservoirs, performance being contingent on compatibility in different settings. Context and applicability have been serious contenders to deal with here. The importance of understanding ALRs from this perspective is underlined given the emphasis that personal connections and informal links are central to developing inter-firm ties (Pattinson *et al.*, 2016). The advantage in using the SECI knowledge creation framework is that this ‘context concern’ is quite central in its articulation of ‘Ba’: a dynamic, knowledge creating place which can span temporary meetings, individuals and email groups (Nonaka and Toyama, 2003). More importantly, there is evidence to suggest that ‘Ba’ is quite effective as a construct at an inter-organisational level (Bartolacci *et al.*, 2016). Furthermore, the need for ‘stability’ of networks, knowledge reservoirs and also of contexts stands at loggerheads with the overall idea of Arm’s length networks – by nature, typically one-off (no expectation for more interactions), socially distant, with trust not a being an over-riding variable of concern. ‘Ba’ is stipulated as

constantly shifting and ‘in the here and now’ (Nonaka and Toyama, 2003, p. 5) and therefore, suiting the interface between firms in such informal, weakly normed, socially distant interactions. The community of practice idea as knowledge-based social structures’ does not hold too strongly – ALRs are a socially de-normed space, making the deployment of SECI to examine knowledge in arm’s length networks rather apt.

Some other knowledge management frameworks merit a reflection to further validate the use of SECI from amongst a range of available frameworks. For instance, the knowledge process framework by Bukowitz and Williams (1999) has external sources in perspective and deals with the ‘why’ and ‘when’ of processes. It however does not deal with the ‘how’. The framework is more about specific strategic needs as triggers for knowledge initiatives and less workable when the agenda is to understand how knowledge transfer and creation manifest in given settings. Other models like process model by Botha (2008) and the KM matrix by Gamble and Blackwell (2001) do not deal with the ‘how’ of knowledge creation. They are quite organisational centric with a lower appeal to be deployed in the inter-organisational relationship settings (Wenger *et al.*, 2002) of fundamental importance to the understanding this paper dwells into.

The deployment of the SECI has been carefully evaluated in light of some strong critique also. The most notable of these in our reading is probably by Gourlay (2006). The critique is that SECI is based on a simplified approach of knowledge as justified belief and it does not seek to deal with behaviours but in effect only conversion processes and transitions between them. Reflective and non-reflective tendencies as behaviours that shape different experiential learning is missing from the model. We agree, but at the same time argue that through the idea of ‘Ba’ SECI offers, in its articulation, a range of ‘continuously creative generative mechanisms that explain the potentialities and tendencies that either hinder or stimulate knowledge creation activities’ (Nonaka and Toyama 2003, p. 6). In the arm’s length relationships arena, there is likely to be very little non-reflective component to distinguish. This is because it is not about routine aspects (non-reflective) and thus, by design more reflective in an environment where knowledge exchange is less a function of regular networks.

‘Ba’ (context) can work with varying intensity in different conversion processes (S, E, C and I) making for a ‘skew’ in the SECI, namely, relative difference in emphasis for each of the knowledge creation phases of the SECI. Lampel *et al.* (2003) present the idea of such a ‘skew’, suggesting an impact on the knowledge conversion processes based on how a given context may pre-dispose some to be more pronounced relative to others.

### *Dispositions in knowledge conversion processes*

Knowledge conversion processes comprising the knowledge creation spiral may be disposed differently given the nature of interfirm ties, and beyond just being marked by a skew in emphasis as discussed. 'Exploration and Exploitation' as the well-known fundamental conceptual moorings of organisational learning research can also be pitched as markers of potential variation in approaching knowledge conversion processes (March, 1991). This perspective allows us to go deeper into understanding variation in knowledge creation and its implications.

Simply put, and rather well known to scholars and practitioners alike, exploration is about reaching out for future possibilities, and exploitation is about drawing on past certainties (March, 1991). Clearly there is some tension between the two, despite the potential for both to co-exist. Of interest to a significant body of research in the area is the 'relative' propensity to subscribe more to one than the other (Auh and Menguc, 2005; Swift, 2016). This is where we situate our uptake, arguing and evidencing such relative propensity for different knowledge conversion processes as we examine the knowledge creation spiral. How a certain mode of conversion is disposed in this context depending on the nature and embeddedness of ties (collaboration vs. arm's length) provides a strong contribution to understanding how knowledge creation takes place in the interorganisational space. By extension, it promises to be crucial in informing interventions to evaluate and calibrate the knowledge creation process towards a desired approach and aspired for outcomes.

### *Sample and method*

In-depth interviews with 41 respondents from 22 small and medium enterprise (SME) firms in the North East of the United Kingdom comprise the data used for this study. The unit of analysis is the organisation and senior personnel are one of the best data sources to study organisations. This approach is consistent with several high impact SME studies (e.g., Lynch-Wood and Williamson, 2014; Kitching *et al.*, 2015). A relatively large sample from an inductive – qualitative perspective was required to capture a variety of contexts and, thence, perspectives on collaboration. For example, manufacturers specialising in off-the-shelf consumer products may have less collaboration opportunities than bespoke B2B manufacturers. The study's sample size is also consistent with several other extant qualitative studies (e.g., Grant, 2003; Zhou and Li, 2012). The firms in the sample comprise industry sectors across manufacturing to varied services and specialisations in the information technology arena. The authors used purposive sampling to select

participants, choosing individuals with broad, rich knowledge of their organisation's collaboration and knowledge activities. Therefore, the respondents comprise middle–senior level personnel like engineers, designers and core management professionals at these firms. The FAME database was used to search for such individuals working in North East-based, manufacturing firms with 10–250 employees and an annual turnover below £50 million. The researchers emailed prospects requesting voluntary participation followed by a phone call, to interested individuals, providing further information and to schedule an interview. Participants were also identified via referrals as often participants would recommend speaking to their colleagues. The number and roles of respondents interviewed are provided in Table 1.

Respondents were asked to reflect on inter-firm ties along a series of questions that evolved in terms of the sequence in which they were put to progress the narrative. Essentially: How the relationship came into being?; How did the interactions between firms take place?; How they harnessed the knowledge that came through? and; How they were able to use it for their needs? The first two questions helped categorise and describe the nature of relationships namely, arm's length or collaborative. The last three questions helped describe how knowledge creation transpired along sub-themes of 'Ba' (context), the conversion modes and disposition towards exploration and exploitation.

How respondents engaged in a given ALR or collaboration provided cues towards knowledge conversion modes comprising the SECI. Observations cited from data in the next section show that specific instances of relationships are rather unique, but at the same time permit interpretations, which would not be possible without qualitative data from in-depth interviews. The settings of SMEs provide for more boundary spanning than in larger corporate organisations, thereby making the experience of inter-firm relationships more realisable at the level of respondents who provided the data.

Data was analysed using directed content analysis. The authors chose this method because the method accommodates the development of *a priori* and *ex post* themes (Hsieh and Shannon, 2005). Open-ended questions were asked first, followed by more targeted questions addressing *a priori* categories (i.e., arm's length and collaborative relationships). The second author conducted, recorded, and transcribed the interviews.

The authors read the transcripts and highlighted any passages that generated an emotional response on first impression. This practice enhances the trustworthiness of the findings (Hsieh and Shannon, 2005). Subsequently, the transcripts were re-read and all highlighted passages pertaining to the *a priori* categories were coded. All text that could not be categorised using the initial coding scheme were assigned new codes.

**Table 1** Respondents per Firm

<i>Firm Number</i>	<i>Respondent</i>	<i>Firm Number</i>	<i>Respondent</i>
1	1 x Engineering Manager 1 x Marketing Manager	11	1 x CEO 1 x Engineering Manager
2	1 x Marketing Development Manager 1 x Design Engineer	12	1 x CEO 1 x Senior Designer
3	1 x CEO 1 x Technical Director	13	1 x Technical Director 1 x Managing Director
4	1 x Area Sales Manager 1 x Design Engineer	14	1 x Engineering Manager 1 x Marketing Manager
5	1 x Managing Director 1 x Project Manager	15	1 x Managing Director 1 x Area Sales Manager
6	1 x Head of Design/Former MD 1 x Design Technologist	16	1 x Managing Director 1 x Marketing Development Manager
7	1 x Managing Director 1 x Technical Director & Engineer	17	1 x Design Engineer 1 x Project Manager
8	1 x Managing Director 1 x Works Manager 1 x IT Development Manager	18	1 x Managing Director 1 x Electronics Engineer
9	1 x Managing Director 1 x Electronics Engineer	19	1 x Managing Director 1 x Technical Director
10	1 x Managing Director 1 x Senior Designer	20	1 x Managing Director 1 x Managing Director
		21	1 x Managing Director
		22	1 x Managing Director

For coding and associated reliability assessment a total of four coders were used including the two authors. The other two coders were research students, made familiar with the study and concepts. First, the two authors carried out the coding extraction independently and labelled comments to the codes (See Table 2). The coding sheets were compared, and minor differences resolved. The two additional coders were then asked to re-label the expressions across the themes on each comment. Reliability was observed at 90% for them agreeing between themselves, and at 85% for an agreement with authors' coding. These, 85% of 60 comments, namely, 51 comments were taken forward as reliable data to demonstrated experience with ALR and collaborations in relation to different knowledge conversion processes: 14 and three observations for Socialisation in collaborations and ALRs respectively; eight and five for Externalisation in collaborations and ALRs respectively; four and five for Combination, and six and six for Internalisation in collaborations and ALRs respectively.

Code incidence reporting and independent audits of coding (outlined above) are effective ways to ensure trustworthiness within directed content analysis (Hsieh and Shannon, 2005). Furthermore, member checks were conducted with research participants to ensure the transcripts and analysis authentically represented respondents' accounts. All participants were contacted for comment, but no amendments were requested. The number of *ex post* codes generated further enhances the trustworthiness of the findings, as directed content analysis can sometimes blind researchers to new codes. Table 2 shows the final themes and code categories.

Within the scope of our data this approach aligns with imparting robustness adopted for qualitative research in extant studies (Zellweger and Sieger, 2012).

As a final note on data and methods, one important aspect is that we cannot use personal characteristics to inform interpretation because of the organisation being the unit of analysis. This implies that elements like personality or tone of voice did not inform our analysis. However, it is a limitation that we acknowledge as such characteristics will often have some reflection in what is narrated.

## Observations and propositions

### *Knowledge creation as a function of how embedded inter-firm ties are*

The knowledge conversion mode of socialisation is considered relatively more dominant than other modes when it comes to SMEs. Typically, observations drawn by an individual from socialisation with members from another SMEs are readily taken forward within the firm (Lepoutre and Heene, 2006). Emphasis in the classical articulation of socialisation is also about observing and imitating the 'master craftsman' that is in harmony with such inter-firm socialisation (Nonaka, 1994). In our data, we find that for collaborative ventures in particular, there are strong instances of socialisation. This is a useful starting point as we work forward across respondent comments to examine the case for a contrast between ALRs and collaborations.

**Table 2** Themes and Code categories

Higher Order Themes	Themes	Codes
<b>Knowledge Creation Processes</b>	<b>Socialisation</b>	Code: Observing
		Code: Mentoring
		Code: Demonstrating
		Code: Hands-on Experience
		Code: Shared Experience
	<b>Externalisation</b>	Code: Translating
		Code: Broadcasting
		Code: Codifying
		Code: Articulating
		Code: Explicit Knowledge Acquisition
	<b>Combination</b>	Code: Explicit Knowledge Integration
		Code: Explicit Knowledge Dissemination
		Code: Explicit Knowledge Processing
	<b>Internalisation</b>	Code: Broadening experience
		Code: Applying prior Experience
		Code: Reframing experience
		Code: Learning by doing
	<b>Arm's Length Relationship</b>	Code: Limited commitment
		Code: Limited Trust
		Code: Tenuous future contact
	<b>Collaborative Relationship</b>	Code: One-off Encounter
		Code: Significant commitment
		Code: Significant Trust
		Code: Significant investment
	<b>Exploration</b>	Code: Close interaction
		Code: Product development activity
		Code: Process development activity
	<b>Exploitation</b>	Code: Business Model Development Activity
		Code: Market research activity
		Code: Temporary Resource Sharing
		Code: Favours
	<b>Ba (context)</b>	Code: Testing Activity
		Code: Sales Activity
		Code: Distribution Activity
		Code: Shared Physical Space
		Code: Shared Mental Space
		Code: Shared Virtual Space
		Code: Continuous Self-Refinement

For instance, an electronics engineer from one of the SME's provided a typical illustration of socialisation in a collaborative interface:

*We knew we were going to get the motor controllers from them ... so we approached them saying 'this is what we need', and after they supplied it, we needed help setting them up. So, they came in and went through it all, but also, they talked us through what they were doing with us ... it wasn't an informal training session ... it was more buddying-up. We had two of their guys and two of our guys, they were the ones doing it and we would be watching so we could do it in future.*

A less pronounced expression in arm's length relationships was found for extent and effectiveness of socialisation. Observations showing ALR from a socialisation perspective evidence the assertion:

*I was attending a conference in South Africa and I'd seen this website developed by one of the other attendees. I'd then heard it was built in 1 day, but it looked really good. Now, I'd known about Wordpress [Web development platform] but found it hard to customise exactly how I wanted. I asked this lady about it and she demonstrated how it was built in this special theme. Like really went through the back-end development with me ... Yes, I've [since] used the same theme for my own project. I found, after 25 minutes observing her and having a play around myself, I'd got the hang of it ... It's embarrassing because I've not really been in touch with her since.*

Research dealing with knowledge transfer suggests that knowledge sharing occurs more readily in cases of spatial proximity, and product and market similarities (Davenport, 2005). Research has however yet to distinguish between formal and informal

inter-organisational relationships from this perspective. In general studies indicate that socialisation and developing and leveraging networks is pivotal for mutual respect and trust in an environment where opportunism and risk needs moderation (Yam and Chan, 2015). Trust and commitment as desired outcomes from socialisation come through in respondent comments in relation to collaborative ventures, for instance:

*Right at the beginning I think we were looking to establish a rapport and that's why there were these getting together meetings, sometimes the outcome from these initial meetings was hardly much in terms of advancing the project activities or adding new thought, but the importance of these I cannot over emphasise in setting a good tie-in and comfort zone.*

The evidence from data and assertions from extant research support the idea that socialisation is more pronounced in collaborative relationships than in ALRs. The tacit to tacit exchanges here are relatively more focused at building relationship and trust in collaborations. We therefore suggest the following proposition:

**Proposition 1.** Socialisation KCP (knowledge conversion process) will be stronger in collaborations than in ALRs given more pronounced needs of building relationship and trust.

In their testing of the SECI model Feller *et al.* (2013) emphasise socialisation as the strongest capability enhancing conversion process in collaborations. In sync, they find evidence, but to a lesser extent, that externalisation also improves capabilities to 'manage R&D alliances', their main dependent variable. Given that the link between conversion modes will also be a determinant of their strength, it seems pertinent to argue that the likelihood of externalisation may also be stronger in collaborations than in ALRs. This is because the throughput from socialisation in terms of tacit-tacit conversion is more embedded in the context of clearer objectives in a collaboration, and by extension, better geared towards inputting forward into externalisation. In our data, externalisation KCP is highlighted to be occurring relatively strongly within embedded (collaborative) relationships:

*Some companies have supplied us with inconsistent and inaccurate information about how they operate. So, the product they've supplied us with has been substandard. On one of the HTRV (check) units, locking units for a rotating handle. We designed it around it to what we thought were their tolerances, but we later had to revise this because we were given incorrect information by our supplier.*

The above example highlights how a client articulated their tacit knowledge so it 'can be shared by others' (Nonaka and Toyoma, 2003 p. 5). Here, the client is drawing upon their existing tacit knowledge regarding the nature of their operations, which is then communicated. There is also evidence for externalisation in arm's length relationships. Immediate performance connotations were lower in all such cases relative to collaborative relationships:

*We use an open system called EPICORE, it has an online community based in forums, Google groups, LinkedIn etc., we go through and post online when we've found a solution to a problem ... we try to help other people out.*

The need of strong externalisation in collaborations is due to the risk of 'not making explicit appropriately'. This can have upfront performance implications in collaborations because they have more objective performance metrics. This allows us to present the following proposition:

**Proposition 2.** Externalisation KCP will tend to be stronger in collaboration than in ALRs because of more immediate performance consequences for the former.

However, relatively weak externalisation in ALRs will not be without consequences. For instance, there may be long-term consequences if the output is not a product of good coordination and distillation from tacit exchanges and gets embedded as a 'rogue' non-performing or incorrect artefact in the knowledge repository – to be then taken forward to combination in the knowledge creation process.

Combination as a knowledge conversion process has almost equal instances reported in both collaboration and ALR data. Nonaka (1994) described combination as the process of combining different sets of explicit knowledge, often in a social setting, and then converted into new knowledge by virtue of re-contextualisation, adding to or categorising or sorting the knowledge. Comments in the embedded collaborative context provides a perspective on this, for instance:

*Firms might say 'you could do this process this way'. For example, changing calculations to get more accurate readings. Taking into account new things ('you should record this parameter as well; you should note down who built it; who tested it'). Continental conducted a quality audit on us and stated, 'your process should probably include these things'. We've since changed the processes and we adopted some of the quality procedures.*

The quote below is in an ALR context to contrast, and quite typical of combination KCP in ALRs. It highlights



an instance of combination, where the engineering manager communicates explicit knowledge to a prospective client. This was via exhibits, verbal communication, flyers, and other showcase PR materials. The latter then communicated a market opportunity or problem:

*Another prospective customer approached us at a trade show. They were asking us about our weather tight doors, they were using a Chinese door that wasn't fit for purpose and they required a something a little more robust. So, we sketched up a few designs, exchanged some emails, but the client lost interest. But this is an ongoing product we sell, despite the fact that the initial customer who inquired about it never actually purchased it.*

In embedded collaborative contexts, combination seemed to be highly exploitative and incremental, working towards a fit. In ALRs, it is more explorative and could induce radical inputs. A huge volume of research relates innovation and collaboration, and there is research that examines the enabling effect SECI model of knowledge creation on innovation. The former posits that higher the embeddedness the lower will be the tendency to innovate out to 'new combinations', that is, explore (e.g., Carnabuci and Operti, 2013). The latter suggests, albeit less emphatically, that combination is more about exploitation by the nature of assimilation it carries out of inbound explicit knowledge (Richtner *et al.*, 2014). This provides a vantage point for us to argue that combination as a knowledge conversion process is geared towards more exploitation in collaboration and is relatively more about exploration in ALRs. However, this also comes with an essential caveat – there is organisational level sense making of past performance from exploration and exploitation respectively (Jha and Lampel, 2014). This will moderate how varied organisations will be- between exploration and exploitation for combination KCP despite the prior disposition brought upon by the embeddedness of the inter-firm relationship that they are in. In light of evidence on this front we suggest the following proposition:

**Proposition 3.** Combination KCP will be geared towards more exploration in the case of ALRs, and towards more exploitation in collaborations, moderated by past performance in both cases.

Turning explicit knowledge, post combination KCP into tacit knowledge, that is, internalisation of 'knowing by doing' is often the basis for new routines (Nonaka and Toyama, 2003). In our data several instances of process change were highlighted as being induced by explicit knowledge transfer between embedded ties; excerpt from a detailed narrative of such collaboration induced internalisation – knowing by doing, is as follows:

*What we do on one project, we try and carry over to another. We don't want to make the same mistake twice ... If we want to change revisions within notes or parts, we can take a note of that. We started using this [change notes] ... many of our guys had experience using this at previous organisations. It was a big job and it would have been tricky to manage without it ... We've since adopted this on other projects since the initial request ... They [collaborating firm] wanted it because their products are in the field for quite a long time. We [respondent's firm] adopted it because we'd done quite a lot of upfront effort implementing, and it could benefit other projects.*

Nonaka (1991 p. 99) observed "as explicit knowledge is shared throughout the organisation, other employees begin to internalise it – that is, they use it to broaden, extend, and reframe their own tacit knowledge". Reviewing the respondent comment above, we find that upon receiving this (explicit) knowledge, the team went back and sketched up a few designs, integrating this new information into a re-framed artefact. In the case of collaborations or embedded ties, there is thus evidence of greater exploration in internalisation KCP relative to combination KCP. The exploration is in part within the confines of inbound knowledge from combination but still arguably more than in combination KCP itself. In comparison for internalisation, the process becomes more flexibly disposed from a performance point of view, and less from the inter-firm relationship building perspective.

Much like in embedded ties, it is argued that reflection can occur through unstructured social interaction (Høyrup, 2004). This would insinuate that ALRs do stimulate reflection and facilitate internalisation. Data show that internalisation KCP may need to be more exploitative relative to combination KCP in ALRs. The logic again stems from a relatively weak contextual (Ba) embeddedness in ALRs relative to collaborations, which should be converging, or needs to, if knowledge is not to become contextually weak in linkage leading to breaking down of the knowledge creation spiral in an ALR. The context (Ba) essentially also works as a defined channel through which knowledge passes through one KCP to another. For internalisation in ALRs, this thus brings forth the need of extraction/distillation for tacit transformation within the already very broad remit of explicit knowledge coming through from the combination KCP into internalisation, or there may be too much contextual fragmentation in absence of a convergence/funnelling effect. This thus increases the need for exploitation in internalisation for ALRs. Several quotes from an ALR context provides a view on this, for instance:

*We had numerous interactions on what we could do with the packaging design at different forums that we*

had documented ... it was a waste ... we did not make a call for what we and how we wanted to adapt to our work ... next year the budget of visits to industry forums was cut and then we made a conscious effort to up our act at this lack of application.

This evidence allows us to present the next proposition as follows:

**Proposition 4.** For the knowledge spiral to sustain itself, in comparison with combination KCP, internalisation will be geared towards more exploitation in the case of ALRs, and towards more exploration in collaborations.

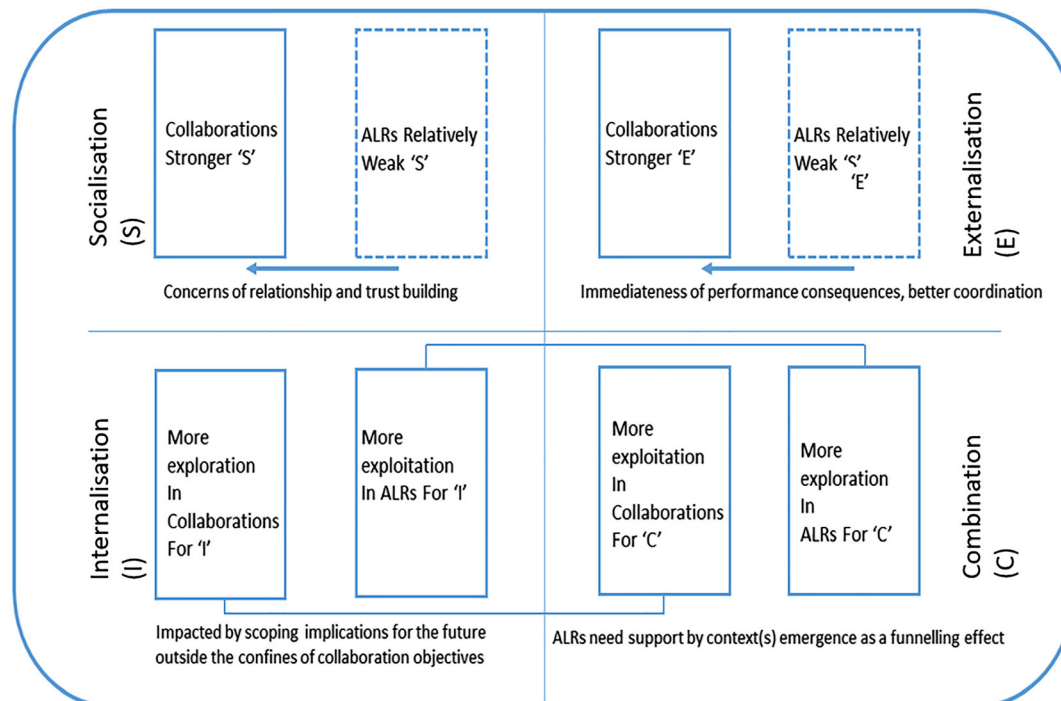
Harryson *et al.* (2008) speak of transition from more exploration to more exploitative orientation in context of boundaries of knowledge and embeddedness in collaborations – where a donor firm and recipient firm transfer perspective is deployed. There are implications for the exploration – exploitation balance that is widely considered to fundamental to the organisational capability of ambidexterity (Wei *et al.*, 2014; Zimmermann *et al.*, 2015). This is important in dealing with knowledge as a resource from the point of view of search, sharing and therefore with implications for how it is created.

Dispositions of each knowledge conversion process in context of the nature of inter-firm ties provides a

nuanced understanding how exploration and exploitation manifest in the knowledge creation schema. A framework contrasting knowledge creation in collaborations *vis-à-vis* in ALRs can be derived from the first four propositions (See Figure 1). This framework leads on to a further interpretative synthesis noting some key characteristic beyond how the knowledge creation process differs – potentially to affect the nature of ties themselves.

*Salient characteristics of knowledge creation in ALRs and collaborations*

Concerns of relationship and trust building are crucial in collaborations and the socialisation KCP seems to serve this concern. In contrast, for ALRs, an upfront weaker requirement for trust and relationship, could make socialisation potentially more disposed towards direct value from knowledge transfer itself rather than deliver to trust building. Support for follow up on such arm’s length exchanges is important to take the knowledge spiral further for ALRs. For instance, externalisation as the next phase of the SECI could take shape in an exploratory space for organisational members to contextualise inbound knowledge from the prior phase. For instance, through a virtual portal dedicated to capturing socialisation and being open to a wider set of organisational members to draw upon. Such initiatives and systems being useful is noted in the data, particularly so in context of ALRs. There



Extending and adapting the SECI model (Nonaka, Toyama and Konno, 2000) to illustrate Knowledge Creation in the inter-firm ties context

**Figure 1** Knowledge creation: a contrast between ALRs and collaboration

was also a need expressed about formation of context to converge the knowledge creation process. We therefore present the following proposition:

**Proposition 5.** Context needs to be formed for the knowledge creation spiral to progress in ALRs, and multiple spirals each with a different Ba could also come forth. In contrast, context is more stable in collaborations.

The exploratory premise of ALRs could continue through such systemic support and facilitation into the knowledge conversion mode of combination. As purposive combination occurs, it is likely to remain more explorative without support for convergence. Funnelling of context would make the knowledge creation spiral to work effectively in ALRs. Exploitation is likely to be higher for ALRs in the internalisation knowledge conversion mode once such convergence and firming up of context is facilitated. More defined emergence of context would make it likely that ALRs spin off into formalised ties, that is into collaborations going forward. Evolution of ALRs into formal ties, namely, collaborations has been noted in research (Hoyt and Huq, 2000). This study conjectures that this may be possible through how knowledge creation transpires and is facilitated in ALRs. The following proposition captures this perspective:

**Proposition 6a.** ALRs could transition into collaborations if the context for knowledge creation gets strongly defined over the knowledge creation spiral.

In collaborations, the combination KCP is where performance emphasis is likely to be very strong. This is given a need for outcomes to align with specified collaborations objectives and thereby exploitation (relative to exploration) is likely to dominate. In other words, working ‘within confines’ would be relatively more dominant. As the knowledge creation spiral moves on from combination to internalisation in collaborations, implications could be drawn from process experience and outcomes of collaborative ventures or a part thereof. These may shape more tacit exchanges for reflection. The exploration of implications in collaborations during internalisation – to look beyond for potential opportunities from the venture could spin off into ALRs, giving us the following proposition:

**Proposition 6b.** Collaborations could create spin offs during internalisation KCP to shape future ALRs. This could typically be because of less confinement by collaboration objectives at this stage.

## Discussion and conclusions

The first four research led propositions suggest that there is a difference in relative emphasis on knowledge conversion modes comprising the SECI – between collaborations and ALRs. They also provide a perspective on disposition towards exploration and exploitation in context of embeddedness of ties. Extant research has examined which forms of knowledge have stronger throughput for innovation performance. The verdict is in favour of tacit knowledge, while explicit knowledge is argued to be disposed more towards operational issues (Pérez-Luño *et al.*, 2019). The lower formalisation potential of tacit knowledge suggests that it might find more prevalence in weakly normed ALRs. Our propositions suggest that tacit to explicit conversion is stronger in collaborations than in ALRs. By extension, the pressure to codify tacit knowledge may be stronger in collaborations. Does this then make collaborations ‘relatively’ less conducive to innovation? This would be a rather strong statement to make as it is not about the extent of tacit knowledge but about conversion of knowledge forms that we have conjectured about.

Overall, from the evidence we present there is not much to call in terms of whether ALRs or collaborations are relatively better at facilitating innovation. ALRs however do offer more complexity in how knowledge is brought together, especially as would be in a larger informal, de-normed space where tacit knowledge is likely to be more in prevalence. There is an argument therefore for infusing the portfolio of ties a firm has with ALRs more deliberately – for variety in ties that can then feed forward into superior innovation performance.

We can also provide some reflections to inform such a portfolio and its management, from a knowledge search and absorptive capacity perspective. ALRs are typically not deliberated and have more of a ‘came to pass’ nature. Here, it is the ‘perceived to be’ relevant rather than ‘searched for’ knowledge that finds its way into the creation spiral. Organisational strategy for innovation however will find such less prescribed spaces a useful blend alongside the goal-oriented collaborations. For us, absorptive capacity stands recalibrated – a different vantage point, as organisational ability to ‘integrate and organise’ a portfolio of varied inter-firm ties towards innovation goals (Sullivan *et al.*, 2006). We include and elaborate on the dimensions of variety in nature and embeddedness of ties to expand this view. In the latter propositions, the mutual spin-off potential (between ALRs and collaborations) and to some extent cues for how this can be facilitated may prove useful for organisational strategists prospecting from existing inter-firm ties.

The evidence presented may help calibrate towards a desired ambidextrous orientation (balancing exploration and exploitation) for effective knowledge creation from

a portfolio of inter-firm ties. Organisational attention toward recognising such variation, calibrating towards a desired balance, and facilitating the knowledge creation spiral differently for different levels of embeddedness of a tie, is likely to be very useful. For instance, firming up of ALRs into collaborations as the context is converged through combination KCP, and vice-a-versa- softening of the collaboration in closure during internalisation KCP to reflect on opportunities.

The recognition that crucial resources like knowledge can span firm boundaries and find root within inter-organisational processes and routines, has strongly established the importance of networks within strategy (Dyer and Singh, 1998). While the appeal of these assertions is wider than SMEs, recent research shows that SMEs may be ideally positioned to fully leverage inter-firm ties, and are more adaptable in how they calibrate them (Gardet and Fraiha, 2012; Colombo *et al.*, 2014).

Furthermore, successful diffusion of the open innovation paradigm in management research has prompted increased attention towards external channels for knowledge directed at problem solving (e.g., West and Bogers, 2014). Facilitating ALR's for a wider and varied portfolio of inter-firm ties may be a useful strategy to explore from this perspective for balancing relatively set pieces (collaborations) with more open ones (ALRs), and also leverage the mutual spin off option that can arise.

Our findings maybe generalisable to some extent for larger organisations. This is because there is a widely acknowledged shift in organisational structures and forms over the last few decades. A major part of this shift comprises increasingly cellular units coming to the fore. The bigger entity of the corporation tends to comprise of increasingly significant smaller units whether it be subsidiaries, project-based units or even functional units, often responsible for their own performance as sub-organisations. Collaborations and ALRs arise between them as well – the lens through smaller units where individual experiences can capture ALR and collaboration experiences becomes rather useful. How an inter-firm/unit ties portfolio can be dealt with from a strategic choice perspective, and how ALRs and collaborations can be worked at in tandem in a portfolio, should draw further research and practice interest. The variation in knowledge creation can be examined from a perspective on other contrasts that may mark inter-firm ties. Embeddedness of inter-firm ties is just one contrast that this paper focuses upon – there could be knowledge creation contrasts between horizontal and vertical ties, or by virtue of the nature of industry, firm size, cultural and governance characteristics, to name a few. The study sample did have some variation along these dimensions but not enough to draw significant interpretations beyond the presented contrasts. This paper puts a marker down for a very topical agenda given that networking outside boundaries for

value is unequivocally central to strategic thinking in contemporary times.

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