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Knowledge exchange through the dynamic interplay of social capital dimensions in supply chains

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Abstract

This paper unpacks the differential effects of social capital and explores how its distinct dimensions and their dynamic interactions play out over the course of buyer-supplier interaction to influence knowledge exchange. Particular attention is directed towards the impact of cognitive social capital and the effects of shared cognition. Data are reported from a comparative case study investigation of four suppliers in the Indonesian automotive sector, using qualitative interview data collected from 131 participants. The results demonstrate that, whereas appropriate structural mechanisms and relational connections may be necessary to facilitate knowledge exchange, they are insufficient: cognitive social capital instead plays a more pivotal role in promoting knowledge exchange leading to new knowledge generation in supply chains. Practitioners need to be aware of such limitations on the efficacy of structural and relational connections alone and of the value of promoting greater cognitive connectivity between supply chain partners to promote relationship development and knowledge exchange.

Keywords: Buyer-supplier relationship, knowledge exchange, social capital, qualitative case study

Introduction

Companies engaged in supply chains not only face increased customer demands and the rapid spread of new technologies, but at the same time also need to reduce production costs, improve efficiency, and produce higher quality products. Inevitably, they need to improve their organizational capability to generate innovation to sustain their position. As the pressure to improve these capabilities increases, knowledge exchange between buyers and suppliers to generate innovation becomes increasingly important (e.g. Roy *et al.*, 2004, Wang *et al.*, 2022). To this purpose, collaboration can be important not only in facilitating the exchange of existing knowledge, but also in creating new knowledge (Powell *et al.*, 1996; Gulati and Gargiulo, 1999, Shen *et al.*, 2021, Solaimani and Veen, 2021). However, the process of knowledge exchange in supply chains is not straightforward. Inter-firm network studies reveal that highly dependent parties may be subject to the influence of companies which control critical contingencies (Provan and Gassenheimer, 1994, Bresnen, 1996). That can have a deleterious effect on knowledge exchange, even where relationships are ostensibly collaborative (Villena *et al.*, 2011).

Research that attempts to unpack the complexities of interaction within supply chains and explore how these complexities moderate processes of knowledge exchange is comparatively rare. Seldom are the conditions moderating knowledge exchange explored in their entirety and in any qualitative depth. For the most part, existing research focuses on organizational-level buyer-supplier interactions, using survey methods to explore the emergence of trust and other relational norms (e.g. Cousins *et al.*, 2006, Lechner *et al.*, 2010, Preston *et al.*, 2017, Al-Hakimi *et al.*, 2022). Such literature understates the complexity of interaction between buyers and suppliers by effectively discounting the complex (social) psychological and social processes

that underpin it, which may promote different collaborative trajectories and outcomes. It also provides both a very shallow and a very narrow view for management practitioners intent on developing their relational contracting capabilities to promote knowledge exchange and innovation. What is needed is more in-depth exploratory research that can throw further light on how companies can harness knowledge flow in supply chains.

To better understand knowledge exchange in the context of buyer-supplier interactions, this paper adopts a social capital perspective. Social capital refers to “the goodwill available to individuals and groups, where goodwill refers to ‘a kind, helpful, or friendly feeling or attitude’” (Kwon and Adler, 2014, p.412). Social capital has been shown to be important in facilitating the social interaction that helps create value, including in a supply chain context (e.g. Villena *et al.*, 2011, Whipple *et al.*, 2015, Hiranrithikorn and Sutduean, 2019, Daghar *et al.*, 2022). At the same time, social capital is a complex and multi-faceted construct (Nahapiet and Ghoshal, 1998) that works differently, depending upon its locus of influence between and within organizations and upon the impact of its distinct constitutive elements (e.g. Aggarwal *et al.*, 2011, Handoko *et al.*, 2018). Existing studies tend, nevertheless, to treat social capital as a unitary (organizational-level) construct, thus simplifying its nature and effects. Moreover, too often, only a partial view of social capital is taken – through concentrating, for example, on structural ties and/or norms of trust between contractual partners (e.g. Kulangara *et al.*, 2016). While these elements are clearly important, the full complexity and richness of social capital and its effects tends to be downplayed and the impact of distinct dimensions, particularly cognitive social capital, is obscured (Zheng, 2008, Daghar *et al.*, 2022). Cognitive social capital, defined as shared understanding and meaning between parties within a network of relationships (Nahapiet and Ghoshal, 1998), has indeed been shown to play an important role in facilitating knowledge exchange and generation (Steinmo and Rasmussen, 2018, Daghar *et al.*, 2021). Further, where research does explore the impact of distinct social capital

dimensions (e.g. Preston *et al.*, 2017), the dynamic interplay of these dimensions in generating new knowledge also tends to be ignored.

This study presents results from a multiple-case analysis of four supplier companies in the Indonesian automotive industry. Exploring knowledge exchange in production activities within the interfirm network of the automotive industry fills a gap in the existing literature, which mostly focuses on the company level (e.g. Daghar *et al.*, 2022). The cases selected were ‘tier 1’ automotive suppliers producing different types of output (components and machines) supplied to original equipment manufacturers which, in turn, supplied a large automotive corporation in the Indonesia automotive industry (AG). Further details of the supply network in which they were embedded is given in the methodology.

Two of the four case companies supplied components and two manufactured newly-designed, customised machines. While component makers aimed to mass manufacture standard components with a view to achieving production efficiencies, machine makers aimed to produce more bespoke, innovative products, based on custom designs and the application of engineering know-how. Contrasting the more routine work of the component suppliers with the more innovative work of the machine manufacturers allowed insights into work that requires intensive collaboration between buyers and suppliers. It is a context that is less commonly explored, as research often focuses on companies whose supply chain activities are routine (mass-production), involving tight control and comparatively little innovation generation (e.g. Handoko *et al.*, 2018). The setting chosen therefore highlights a tension between the need for collaboration to promote knowledge exchange and the routine types of contractual-control mechanism that often apply in supply chains. Findings from this exploratory research suggest that while appropriate structural and relational connections may be necessary, they are not sufficient to facilitate knowledge exchange. Building cognitive connections is vital in ensuring that social capital effectively supports knowledge exchange

needed for innovation and this remains a key challenge for businesses aiming to improve their relational contracting capabilities to promote knowledge exchange and innovation.

Theoretical Background

The critical role of knowledge exchange in helping companies generate innovation within inter-firm networks has been widely recognized (Nooteboom, 2000, Hippel, 1998, Wang *et al.*, 2022). Having said this, supply chains are governed by formal mechanisms which can inhibit the flow of knowledge from one company to another (Spekman *et al.*, 2002). Supply chain participants may be reluctant to share information with their suppliers or buyers, hoping to avoid opportunistic behavior for commercial gain on the part of their partners (Grant and Preston, 2019). Prior studies suggest that relational governance in supply chains may provide the framework for greater collaboration, flexibility and knowledge exchange, and thus provide a corrective to formal contractual systems (Poppo and Zenger, 2002, Carey and Lawson, 2011, Aben *et al.*, 2021). However, recent research has demonstrated that this depends on circumstances and that relational governance is not necessarily beneficial in facilitating knowledge exchange (e.g. Handoko *et al.*, 2018). Research on the conditions enabling knowledge exchange between supply chain partners has therefore delved more deeply into examining the effects of key factors influencing the relational attributes of interaction. Social capital provides one such framework that has been demonstrated as being important in enabling knowledge exchange between supply chain partners.

There has been a good deal of evidence that social capital can help participating firms in supply chains gain value from their interactions with partners (e.g. Edelman *et al.*, 2004, Villena *et al.*, 2011, Hiranrithikorn and Sutduean, 2019, Pant *et al.*, 2022). Nahapiet and Ghoshal's (1998) framework has been enormously influential in informing approaches that view social capital

as important in facilitating the creation of intellectual capital. They define social capital as “[t]he sum of the actual and potential resources embedded within, available through and derived from the network of relationships possessed by an individual or social unit” (p.243). The framework distinguishes between three dimensions of social capital that interrelate to affect flows of knowledge. First, structural, which refers to the configuration of network ties and patterns of connectivity between network actors. Second, relational, which refers to the normative basis of exchange relationships and the obligations and expectations generated. Third, cognitive, which refers to “those resources providing shared representations, interpretations and systems of meaning” (Nahapiet and Ghoshal, 1998, p.244).

Existing research often draws upon the social capital framework selectively – focusing on the effects of particular dimensions. Rarely are attempts made to explore interrelationships between dimensions or to consider how these might evolve as interaction develops. Most existing studies in supply chain contexts focus almost entirely upon the impact of structural connections and/or relational norms (Capaldo, 2007; Kulungara *et al.*, 2016; Pant *et al.*, 2022). Compared to other dimensions, cognitive social capital is rarely directly investigated, despite its significant contribution to complex knowledge sharing (Daghar *et al.*, 2021). This is probably due to its more complex manifestations (e.g. frame of reference, causal maps, mental models), which might make the identification of clear underlying patterns and influences more difficult (Zheng, 2008). If so, then this provides good reason for exploring in greater depth how cognitive social capital interrelates with other dimensions to effect knowledge exchange in buyer-supplier relationships. Indeed, a recent study by Daghar *et al.* (2022) has explored cognitive social capital in supply chains in the context of the COVID-19 pandemic. However, that study focuses only on buyers, suggesting that buyers need to develop cognitive capital to improve supply chain resilience. There is still a gap in our understanding of how cognitive

social capital may be reciprocated by suppliers and how it interrelates with other social capital dimensions in the buyer-supplier relationship.

In an organizational context, cognitive social capital can be identified when individuals develop shared cognition to manage information in a way that enables subsequent understanding and action at organizational and group levels (Nonaka, 1994, Johnson *et al.*, 2013, Daghar *et al.*, 2022). Existing literature emphasizes the importance of two types of shared cognition: task-related (knowledge of key task components) and team-related (team members' knowledge, skills, and abilities) mental models (e.g. Thayer *et al.*, 2018). Both of these are deliberative and reflective. However, Healey *et al.* (2015) argue that teams also need to share task- and team-related cognition at a more *reflexive* (unconscious) level in order to achieve team performance. They point out that having a similar reflective mental model does not necessarily mean there is similarity at a deeper, reflexive level. Thus, shared cognition operates at two levels: a reflective, deliberative, conscious level (C-system); and a reflexive, spontaneous, unconscious level (X-system). The net effect is that there are four types of cognitive concordance: (1) *Illusory-concordance* (where there is similarity at C-system level but not at X-system level); (2) *Surface-discordance* (similarity at X-system but not at C-system); (3) *Full-discordance* (dissimilarity at both levels); and (4) *Full-concordance* (similarity at both levels). The expectation is that, for generating new knowledge, illusory-concordance will be more beneficial than surface-discordance, as team members become more consciously proactive and self-aware to overcome challenges during knowledge exchange (Healey *et al.*, 2015).

Most quantitative research in supply chain contexts has been unable to unpack the concept of social capital and its constituent dimensions, to explore at this level of detail how it empirically affects firm-to-firm interaction and how it dynamically develops over the course of interaction. While some qualitative research has started to do that (e.g. Canto *et al.*, 2021; Preston *et al.*,

2017; Johnson *et al.*, 2013; Daghar *et al.*, 2022), more work is still needed on understanding how, at any particular level of interaction, cognitive social capital interacts with other dimensions, and how, in turn, these interactions dynamically afford knowledge exchange. These are the key research questions driving the current study, which, by focusing upon the mechanism of shared cognition, aims to contribute towards a better understanding of the dynamic effects of social capital on knowledge exchange in supply chains.

Research Method

The present research focused on manufacturing activities that not only involved shop-floor production processes but also meetings held within the suppliers' organization and between them and their buyers/suppliers. This study applied a case study method within four automotive suppliers in Indonesia to capture the complexities of knowledge exchange during manufacturing processes in a more holistic way (Bryman, 2008). Multiple-case analysis is a particularly fruitful approach as it avoids over-reliance on idiosyncratic cases and provides the variety necessary for generating between-case analytical generalizations (Yin, 2009).

Case Selection

Cases were selected from a population of Indonesian automotive component suppliers. There are three existing categories of tier-1 supplier in the Indonesian automotive industry: engineering services, sub-assembly, and auto-parts companies (cf. Dicken 2003). According to the Directorate General for International Industrial Cooperation at the Ministry of

Industry of the Republic of Indonesia¹, there were around 345 tier-1 automotive supplier companies supplying 60 original equipment manufacturers (OEMs) of cars and motorcycles in Indonesia. The present research selected tier-1 auto-parts (component makers) and engineering services (machine makers). The main reason for that was that both categories manufacture products supplied for the next process in the supply chain (either to assemblers or sub-assembly suppliers), and product design was also involved (not merely product assembly, as carried out by the sub-assembly group). There were four suppliers chosen for investigation: two component-makers (CO1 and CO2) and two machine-makers (MA1 and MA2). They were chosen as their key customers were Indonesia's largest automotive OEMs, which accounted for around 90 percent of the OEM's market share in total, and which were affiliated with the largest Indonesian automotive group, AG. Furthermore, between four and ten case studies is normally considered appropriate for case study research (Eisenhardt, 1989; Yin, 2009). Component makers tend to mass-produce automotive components, working primarily to a buyer's standard design, operating in rigid systems of governance, and focusing more on achieving production efficiencies. Machine makers, on the other hand, produce customized machines, operate in less rigid governance systems and focus more on product innovation. By recognizing such sharp distinctions, it is possible to gain a better understanding of knowledge exchange by allowing for differences between types of production activity and supply chain mechanism (cf. Yin, 2009).

A second main source of variation between the cases was in their relative supply chain positions. The Indonesian automotive component industry consists of both large corporations and privately-owned companies. Companies were therefore chosen that represented each type of firm: (1) CO1 and MA1 were subsidiaries of AG, a large automotive group in Indonesia and

¹ Presented in the Automotive and Machinery Working Group on the EU-Indonesia Business Dialogue (EIBD) Conference, 30 November 2010

main customer to each; and (2) CO2 and MA2 represented local, independent privately-owned companies (non-AG). This gave some variation in levels of formal interdependence and commercial dependence in buyer-supplier relationships and allowed exploration of how network position influenced buyer-supplier interactions. Table 1 contains further information about the companies.

[Table 1 here]

Data Collection

Fieldwork occurred over a two-year period (2012 and 2013) in Indonesia and involved two-levels of participant: management (senior managers involved in negotiating supply chain contracts and middle managers responsible for their delivery); and shop-floor (operators/technicians). Participants were selected according to their roles in production-related activities, including maintenance, delivery, and marketing. Marketing staff, unusually, played an important operational role in managing communications between the companies and their buyers, including when problems arose between the parties. This was evidenced particularly in the two component-maker cases, where the marketing staff commonly discussed technical problems that occurred in the manufacturing process that caused delays in product delivery to the buyer. This breadth of respondent selection allowed the researcher not only to capture fully the scope and richness of knowledge exchange across levels within and between the companies concerned, but also to take into account different perspectives on knowledge generation.

Data were collected primarily from qualitative semi-structured interviews and, for triangulation purposes, were supported by observations, focus groups and company documentation

(Bryman, 2008, Yin, 2009). The interview focused upon social capital and knowledge exchange constructs derived from the literature. A total of 131 people were interviewed, with 55 (42%) being managerial level, 55 (42%) non-managers (operators/technicians), 11 (8%) representing suppliers and buyers, and 10 (8%) others (e.g. automotive experts). An interview protocol² was developed that was flexible enough to capture the conditions faced by each company (Eisenhardt, 1989). Pilot interviews with two senior managers of two focal companies (i.e. CO2 and MA1) were undertaken before the main interview sessions, each of which lasted around 60 minutes. Emerging themes were identified in the pilot interviews and the interview protocol was amended accordingly. The main interviews were conducted at the companies' sites and lasted between 45-120 minutes. Data reliability was ensured through the recording of interviews and transcribing of detailed field notes (Creswell, 2007), which were subsequently edited and checked for accuracy. Direct observations during production processes and meetings were obtained, giving insights into how social interaction and knowledge exchange evolved during manufacturing-related processes. Two focus groups were held *in situ* – with supervisors and operators, respectively – to explore specific issues arising from the interview and to confirm the interview data (Bryman, 2008). Each focus group included seven participants, and one researcher acted as facilitator. The discussion began with the researcher asking each participant their position, responsibility, and period of tenure in the company. There followed an introductory question about the general perception of interaction with internal and external parties. The main questions then addressed detailed issues of interaction, such as routine communication during and after work hours, the significance and results of interaction when solving problems, and barriers each participant faced in communication. Probing was carried out depending upon the interaction of the group.

² The interview protocol is available upon request

Data Analysis

Data analysis proceeded with the coding of transcripts, field notes and other sources of data (Strauss and Corbin, 1990), and this involved breaking down the data meaningfully, while retaining the relationship between their constituent elements (Miles and Huberman, 1994). NVivo software was used to process the large amount of data collected. Within-case and cross-case analysis were chosen as the means of developing the multiple-case study approach (Eisenhardt, 1989).

There were four stages of within-case analysis. The first involved identifying routine and non-routine activities in each company's production division. At this stage, we examined the complexities of relationships between the focal cases and their buyers and/or suppliers developed during design and manufacturing processes. Figure 1 outlines the standard model of buyer-supplier relationships.

[Figure 1 here]

Relationships were commonly characterized by formal contracts between the focal company and its buyers (i.e. OEMs as the key buyers) and suppliers (either local or overseas), although some (e.g. MA1, MA2) had developed more organically due to good prior relationships between the parties. Informal interactions developed during production between supply chain partners were identified (depicted here by dotted lines). Through identification of these informal interactions, we were able to ascertain the propensity of each participant to share their knowledge with others, both within and between their organization, as well as any reluctance to share. In addition to buyers and suppliers, the focal companies also developed relationships

with their competitors or the OEMs' other suppliers (for instance, in making an agreement on product pricing or finding the sources of raw materials). They also engaged with other networks, such as industrial associations (in discussing new regulations) and academic institutions (in hiring talent).

The second stage involved making sense of how supply chain members interacted, with the focus being on levels of formality (structured meetings or informal conversation) and the scope of interaction (whether within or between hierarchical levels and divisions). The third stage involved identification of activities, either structured or more spontaneous, that potentially led to knowledge exchange. The last stage examined social capital dimensions and how they interrelated with each other to influence knowledge exchange. The cases were then cross-analyzed as described in the following section.

Cross-Case Analysis Findings

The Interplay of Social Capital Dimensions

The two component-making cases, CO1 and CO2, were both embedded in tightly-controlled supply chains. Nevertheless, in CO1, interaction was much more frequent and informal. CO1 was also engaged in more non-routine activity (joint projects) with its key buyers, which required greater knowledge exchange with a wider range of people across divisions and hierarchies. These processes were enabled by structural social capital available to CO1, which, in turn, facilitated the development of relational norms and powerful cognitive connections based on shared attitudes and goals.

Internal conditions were not perfect in CO1, as there were internal conflicts due to status differences, as well as pressures to achieve challenging work targets. However, group bonding

amongst operators to cope with mounting work pressures, combined with active mediation by foremen helped overcome internal conflicts and remove impediments to the flow of knowledge between levels and groups. As such, structural and relational conditions were supportive.

“I often walk around, talk to them (i.e. operators) ... When they face a problem, we must provide the solution or help them immediately... by having that closeness it can help us in the work, to make improvements” (Foreman)

Moreover, a shared understanding of the company system and culture amongst CO1 employees helped build positive shared cognition across functions and levels and these were regarded by those interviewed as critical in reducing conflicts and encouraging continuous improvement. The net effect was that these cognitive connections reinforced existing strong structural and cultural connections. Effects on overall company performance were positive and CO1 was, as a result, considered to be one of AG’s highest-ranking suppliers.

At CO2, on the other hand, where work was more routine, the relationship with its key buyer was characterized by strict governance. The result was a formal, arms-length relationship and one-way communication, which led to limited knowledge exchange.

“No routine visits [from the buyer] ... there is no [knowledge] exchange. They [only] question why this why, why.” (Maintenance Manager)

Moreover, while CO2 was itself strictly controlled by its buyers, it applied much looser control to its own suppliers, some of which had familial relationships with the company’s owner. These circumstances inevitably created difficulties for CO2 in handling poor performance by its suppliers and also led to some confusion amongst its employees about how to handle suppliers. Such an unclear management system and the perceived differential treatment of family and non-family members led to frustration amongst employees and promoted a culture of distrust

and blame-placing. As a result, managers made no serious effort to build relational and cognitive connections, and left workers struggling to cope with work problems themselves.

As pressures emanating from management increased, bonding between foremen and operators was reinforced. However, this only led to collective action *against* management and further reinforced a culture of distrust and indifference, as illustrated by this manager:

“...they (operators) didn’t say anything, [but] suddenly, [the die] had already been adjusted... Most of them were silent...” (Engineering Head)

Ultimately, this impacted negatively upon company performance, particularly through increases in the quantity of rejects during production.

In the machine-making cases, both MA1 and MA2 produced mainly customized products. However, the richness of interaction was much higher in MA1 than in MA2. In MA1, engineering and production teams worked together and production teams were encouraged to deal directly with buyers who were mostly AG subsidiaries. At the same time, suppliers also perceived a strong bonding with MA1 staff, which could promote effective knowledge flows between them.

“We are close to their (MA1) people... [because of] our relationship; we have known each other a long time...” (Supplier)

MA1 technicians drew upon their collective group knowledge (cf. Orr, 1996, Contu & Willmott, 2006) and the complexity of their work was regarded as both challenging and enjoyable. Relations were considered good within the organization, and a supportive culture facilitated knowledge exchange.

“Here, we are not stingy about sharing knowledge... Because that’s the way it should be. If we keep [our knowledge to ourselves], [then] it’ll be troublesome...” (Section Head)

Managers' engagement with technicians was direct and helped reinforce shared understanding of engineering issues. This not only nurtured further bonding, but also accelerated problem handling, which was essential given the tight manufacturing deadlines.

At MA2, in contrast, social capital development was obstructed by a very silo-based structure across production divisions that constrained interaction. Engineering and production teams in MA2 were managed separately and it was mainly the owners and marketing manager who communicated directly with customers. The production team was simply given instructions and had minimal involvement in design development. Technicians and operators received only their section of the project blueprint and this led to problems in coordination across divisions.

"The machine's basic process is that [we] don't understand... we merely work according to the drawing... what the purpose is, we have no idea..." (Machining Leader)

The result was a lack of clarity in customer requirements, a trial-and-error approach, which led to further complications in production and a number of failures – especially when the newly designed machines were installed on site.

"There are miscommunications from the customer to us... almost 80 per cent [of the works] are error..." (Assembly Supervisor)

Technicians reported that they simply complied with customers' requests rather than tried to build common understanding, as senior management pressured them to meet customer demands. They expressed their distrust of management by sticking to procedure, keeping important information to themselves and blaming others for errors.

The net effects were repeated mistakes that caused poor performance and the company often ended up bearing the costs of additional work. The trial-and-error that occurred during

production was regarded by top management as a main cause of the company's lack of profitability.

The next section adopts the framework of Healey *et al.* (2015) to explore how the cognitive dimension, through the mechanism of shared cognition, dynamically impacted knowledge exchange.

The Effect of Cognitive Dimension on Knowledge Exchange

The situation of *full concordance*, was most clearly illustrated in cases CO1 (management-level) and MA1 (management and shop-floor levels), where clear internal management systems and strong company cultures helped organizational members develop shared goals (task-related C-system) and ways to achieve them together (team-related C-system), as illustrated in these quotes.

"Everyone has already understood that this [system] is better for production, because by not [putting] too much effort, the output will definitely increase" (CO1 Project Manager)

"We're not only working for ourselves, [but] also for our friends in another section... [if we see that] their progress is still slow, we ask them whether we can help..." (MA1 Project Leader)

There was consistency too in how tasks were subconsciously perceived (X-system): for example, in MA1, engineers openly expressed their enjoyment at solving complex problems together (cf. Orr, 1996). Not only was there evidence here of an implicit shared need for achievement (shared subconscious goal), but also a sense of togetherness and trust when facing a challenging task (shared implicit attitude). As cognitive connections were reinforced, the relational dimension also developed further. This was apparent in decisions not to use formal contracts for additional work, but simply to incorporate the work within existing work streams.

The engineers thus managed to overcome a structural barrier as they engaged in more intense knowledge exchange and developed relational ways of working based upon shared cognition.

With regard to other patterns of concordance/discordance, the picture presented is more complex. In CO1 and CO2, we see clear examples of both *illusory concordance* and *surface discordance*. In CO1 (shop-floor-level), despite full concordance at management level, the perceived gap between management and shop-floor staff inhibited knowledge exchange. While shop-floor staff understood their work targets and how to achieve them (*illusory concordance* at task-related C-system level), there was a clear lack of shared vision with the management-level and this created *surface discordance*. Indeed, shop-floor participants explicitly felt that they were in a powerless position in the hierarchy, and were motivated more by feelings of togetherness with their peers. Continuous improvement suggestions were consciously held back if they felt they would conflict with group interests.

“...the improvement idea shouldn't be one that can be troublesome to our colleagues” (CO1 Operator)

While production targets were met, there was inevitably a detrimental effect on the company fully achieving its improvement targets.

To overcome this problem, supervisors and foremen acted as mediators in an effort to reduce any potentially more serious problems, and this did go some way to helping ensure that goals continued to be aligned. However, the key to CO1's ability to overcome potential problems were the shared attitudes and values amongst production staff (X-system). Shared values created a sense of unity and ensured that a willingness to help each other and a strong drive to maintain group harmony, combined with respect for seniors, enabled them to cope with work pressures and achieve performance targets.

Conversely, a gap in values and vision signified *surface discordance* in CO2 (lower level). However, in this case, profound problems and conflicts within management, combined with a lack of effective management systems, meant a lack of shared goals (C-system level) and shared attitudes (X-system level) that together signified *full discordance* at the management-level.

“...colleagues in all departments defend their own section... when there's a problem [they] pay no attention, don't care...” (CO2 Section Head)

Family ownership and control of the business, combined with the different approaches taken to the company's buyers and suppliers, had created considerable confusion, defensiveness and frustration within management. The resultant lack of shared goals (low C-system) resulted in many unresolved work problems, even though coordination meetings took place regularly between managers across divisions. In some meetings observed, interaction between managers appeared formal and rigid. Distrust within management was widespread and blame-placing rife, and this made it impossible for shared positive attitudes to develop (low X-system).

Not surprisingly, relations between management and shop-floor staff were poor at CO2. The consequences were frustration amongst operators, a tendency to slow down production and keeping silent when problems were discovered. This not only led to higher production costs, but also affected deliveries to buyers. As at CO1, however, there was solidarity within the CO2 workforce and shared implicit attitudes (X-system) enabled some improvement activities, *despite* the problems at the company. The result was *surface discordance* at lower level: despite the lack of shared conscious goal (weak C-system), team members still strove to accomplish their tasks by building upon their strong group affiliation and shared subconscious goals which that had given rise to (strong X-system).

“If we don’t feel too comfortable working... we search for better ways [together]” (CO2 Operator)

Along with these cognitive connections to cope with work pressures, trust and bonding between members also developed further, in turn strengthening their relational social capital. In CO2, although structural mediation was not consciously attempted by the company, foremen did still play an important informal role as mediators, helping operators to undertake their tasks. By subscribing to a less top-down process to handle work pressures, foremen effectively enabled operators to engage in more reflexive thinking to deploy their cognitive social capital to their mutual benefit.

Whereas MA1 could be described as being characterized as experiencing *full concordance* at both levels, MA2 was experiencing *full discordance* at both levels. Strict internal hierarchical mechanisms of control inhibited the knowledge flow needed between divisions to enable the company to handle complex machine works.

“...the engineering is given a design concept by the customer and we must follow it... we are not free to design... It’s difficult...” (MA2 Engineering Manager)

The resultant blame culture within management had cascaded to lower levels and integration between departments was poor. Shop-floor staff defaulted to simply following orders and they were punished if they made errors in production. This meant very little knowledge exchange when it came to trying to find solutions to technical problems. In contrast with CO1 and CO2, there was no compensating bonding and shared attitudes at shop-floor-level.

“If there is a problem, everyone avoids [meeting others]... pretending to be busy here and there... blaming each other... Save your own self” (MA2 Operator)

Consequently, there was *full discordance* with no shared mental model within or between divisions, either at a reflective or a reflexive level. Tight control exerted over the workforce

simply suppressed technicians' passion for engineering and this further inhibited knowledge exchange. The result was inadequate problem-solving that, in turn, negatively affected company performance. As with CO2, the lack of positive cognitive social capital in MA2 and the absence of supportive internal integrating systems inhibited the ability of operational teams to develop structural and relational connections to handle their tasks effectively.

Discussion

This study examines how cognitive social capital interacted with other dimensions, and how those interactions dynamically afforded knowledge exchange in supply chains. The elements identified across the cases and how the findings show they were inter-related are captured and summarized in Figure 2.

[Figure 2 here]

Overall, knowledge exchange was much more in evidence in CO1 and MA1 than in CO2 and MA2 and this, in turn, was reliant on the development of cognitive connections with their customers and suppliers that built upon pre-existing structural connections (and relational norms) already established between them and their parent companies. In contrast, knowledge flows between CO2 and MA2 and their customers and suppliers were poorly facilitated: cognitive connections within the organization were not well developed; and structural connections and relational norms at times impeded, rather than facilitated, knowledge generation. Moreover, relational bonding between operational teams in CO2 and MA2 represented more of a coping strategy by members of those teams to deal with resultant technical problems than a proactive attempt to promote interaction that encouraged knowledge exchange.

As such, the results demonstrate the importance of cognitive connections in buyer-supplier relationships in facilitating knowledge exchange which, in turn, further reinforced relational/structural connections (e.g. Lechner *et al.*, 2010, Preston *et al.*, 2017). Structural social capital may have acted as a pre-requisite for the development of relational norms and provided conditions in which cognitive social capital could potentially flourish. However, structural social capital (and any relational norms that arose from that) alone appeared unable to create the conditions that would lead to knowledge exchange without the harnessing of that structural/relational capability through the development of strong existing or emergent cognitive connections. Furthermore, structural and relational connectivity could always be developed more informally, provided there was a basis for that in some level of shared cognition (at a C-system level at least) around goals.

Of particular importance, here were the moderating effects of both internal management structures/systems and company culture. In CO1 and MA1, managers were more attuned to the company's established structure/systems and were given more leeway to act autonomously. Consequently, internal structural conditions reinforced the positive effects of social capital through encouraging strong and supportive internal and external relational ties and shared cognitive understandings. In the case where a gap had developed between management and workforce (CO1), the bridging of that structural hole was achieved through the use of foremen as mediators. This active step demonstrated further the importance of clear and coherent internal structure/systems. The reliance on a more relational form of contractual governance was thus supported by more fluid internal communications across groups and levels, manifested through more informal interaction between operational teams based on shared cognition.

In CO2 and MA2 cases, on the other hand, there was not only a greater distance between customers and workers, but also between workers and management and within the workforce

itself. This lack of shared cognition and absence of supportive relations across different functions and levels inhibited the ability of both operational teams to develop structural and relational connections to handle their tasks effectively further down the line. In that case, structural ties and relational governance were simply not enough to encourage knowledge exchange through more reciprocal interaction. Moreover, as MA2 demonstrated, strong relational connections in fact created further barriers to knowledge exchange. At best, any internal social capital generated was misaligned with the aims of the wider inter-firm collaboration; at worst, it helped create internal within-group solidarity that was mobilized against attempts to cascade organizational goals and values to lower organizational levels. This last point reinforces the idea that social capital can have both enabling and inhibiting effects on knowledge exchange and that much depends upon its locus of influence within the supply chain. While in many ways beneficial, after a point, strong structural ties and relational norms can become detrimental to the extent that they promote the kind of (negative) interaction that effectively discourages knowledge exchange (cf. Lechner *et al.*, 2010).

As well as internal management systems, corporate culture also played a vitally important moderating role in helping companies build a shared learning history and create shared values, which, overtime, would help develop shared cognition at a reflexive level. Companies that were able to harness cultural values in this way were more able to rely upon a full-concordance model amongst organizational members. In CO1 and MA1, for instance, organizational members tended to buy in more to shared values than did the various groups in CO2 and MA2. The result was a stronger sharing of mental models (at both C-system and X-system levels) which in turn had positive effects on knowledge exchange. This suggests how critical the role of cognitive social capital was in helping the development of shared goals between supply chain members, through which shared values could evolve through subsequent social interaction – in turn, promoting stronger relational ties.

Achieving *full-concordance* at both C-system and X-system levels (or at least some partial *illusory concordance* at the C-system level) was thus helped by a supportive internal management system and strong culture. Full-concordance was clearly beneficial in both the direct positive effect it had on knowledge exchange; but also in its indirect effects in promoting the activation of structural social capital (e.g. new network connections) and relational social capital (trust building and shared norms). However, the findings also suggested that there were ways in which, when the C-system was weak, the X-system could have some compensating positive effects in ensuring that members shared a consistent attitude and approach to help them accomplish work targets together (CO2). The lack of X-system connections in this situation could, on the other hand, inhibit interaction entirely and disrupt knowledge exchange (MA2).

At the same time, the development of internal systems that worked to improve integration across levels and between divisions (such as the use of a mediator role in CO1 and MA1) could help promote *illusory-concordance* through a shared C-system (e.g. shared understanding of how to achieve targets). This also provides evidence in line with Healey *et al.*'s (2015) observation that an organizational situation characterized by *illusory-concordance* (e.g. through supportive management system) may have greater capacity to generate knowledge than an organization experiencing *surface-discordance*. Both CO1 and MA1 also developed systems that allowed certain positions to interact with external people in handling projects. In this way, they were able to go further – extending their networks to generate innovation.

Conclusion

This study contributes to literature on relationships between dimensions of social capital in supply chains (e.g. Handoko *et al.*, 2018, Preston *et al.*, 2017). In particular, it has explored the

dynamic interplay between social capital dimensions and knowledge exchange, on the one hand, and organizational and contractual circumstances in supply chains, on the other. In doing so, it has teased out further some of the complex, dynamic iterations between social capital dimensions in Nahapiet and Ghoshal's (1998) framework and particularly emphasized the importance of shared cognition. In doing so, it has contributed a more holistic and dynamic way of thinking about the complexities of social capital development and its implications for knowledge exchange leading to innovation.

Through developing an in-depth analysis of knowledge exchange within automotive supply chains, this paper has shown how, where social capital dimensions are individually strong, mutually reinforcing and/or reconcilable across levels (vertical) or groups (lateral) – principally through the effects of shared cognition – then knowledge exchange is more likely to be in evidence. Where social capital dimensions are individually weak, mutually inconsistent and/or irreconcilable across levels or groups – due particularly to barriers in developing shared cognition – then knowledge exchange is much more likely to be inhibited. The building of close cognitive connections is therefore critical in ensuring the effective mobilization of structural and relational connections. In other words, appropriate structural and relational connections may be necessary to promote knowledge exchange, but they are not sufficient for facilitating effective knowledge exchange. Cognitive connections appear to have a more unambiguously beneficial effect, both in realizing the benefits of structural/relational connections and in helping reinforce and develop (or avoid weakening) their effects.

The research also has implications for supply chain managers aiming to promote more effective knowledge exchange through developing their company's relational contracting capabilities. Effectively harnessing social capital depends not only on mobilizing new or pre-existing structural arrangements and relational connections, but also in ensuring that staff – particularly those at operational level – are supported in developing close working relationships both

internally and externally with their supply chain counterparts that enable close cognitive connections to develop and flourish. As such, managers need to pay particular attention not only to formal governance modes, or even high level relational connections, but also to more informal mechanisms at operational level that help ensure that shared cognitive is effectively developed and deployed.

Internal company management structures/systems and cultural attributes that moderate the emergence and influence of shared cognition can help enormously in doing so, by helping bind together employees both within and between firms, thus promoting the unity and continuous interaction that generates a virtuous circle of reinforcement of social capital through shared cognition. In contrast, the absence of a more proactive approach to developing shared cognitive connections (through for example, culture management initiatives) is likely to undermine the value of established structural connections and relational norms. In the most severe cases, it can even promote a vicious circle of interaction that increasingly constrains the sharing and exchange of knowledge. Either way, it is important that managers take a more in-depth and dynamic view on the full effects of social capital over the course of interaction to understand how it shapes relationship development and knowledge exchange.

This study has some limitations. The research has only explored the themes in an exploratory, qualitative way in a particular industrial and socio-economic context. There is therefore more research needed to understand the effects on knowledge exchange of the dynamics of social capital development. For example, work might begin to attempt to quantify the effects more systematically and test specific hypotheses based upon the various suggested causal connections derived from this exploratory research. There is also more to be learned through examining such processes and their consequences in a wider range of industrial, cultural and institutional contexts. The automotive sector is important, but there are many other types of supply chain situation where *a priori* one might expect outcomes to vary. Cultural norms and

expectations regarding knowledge exchange and related forms of interaction within supply chains are also likely to be shaped significantly by cultural and institutional differences (Hofstede, 2001, Whitley, 1999). Nevertheless, it is apparent from this research that the effects of social capital on knowledge exchange are not as straightforward as one might imagine, and that there is a good deal to learn still about the complexities and dynamics of social capital processes in affecting knowledge exchange in contexts such as supply chains.

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Table 1
Company Information

	CO1	CO2	MA1	MA2
Company type	AG component maker	Non-AG component maker	AG machine maker	Non-AG machine maker
Year of establishment	1976	1985	2005	1999
Number of employees (2012)	2400	800	100	100
Sales revenue (2012)	USD260 million	USD16 million	USD7 million	USD4 million
Customers	85% original equipment manufacturers; 15% replacement parts customers	94% AG subsidiary	85% AG subsidiaries	30% automotive industry, 70% other industries
Dependencies	Highly dependent on two key customers for business, and several key suppliers	Highly dependent on one key customer for business, and several key suppliers	Highly dependent on several key customers for business, and several key suppliers	Highly dependent on several key customers for business, and several key suppliers

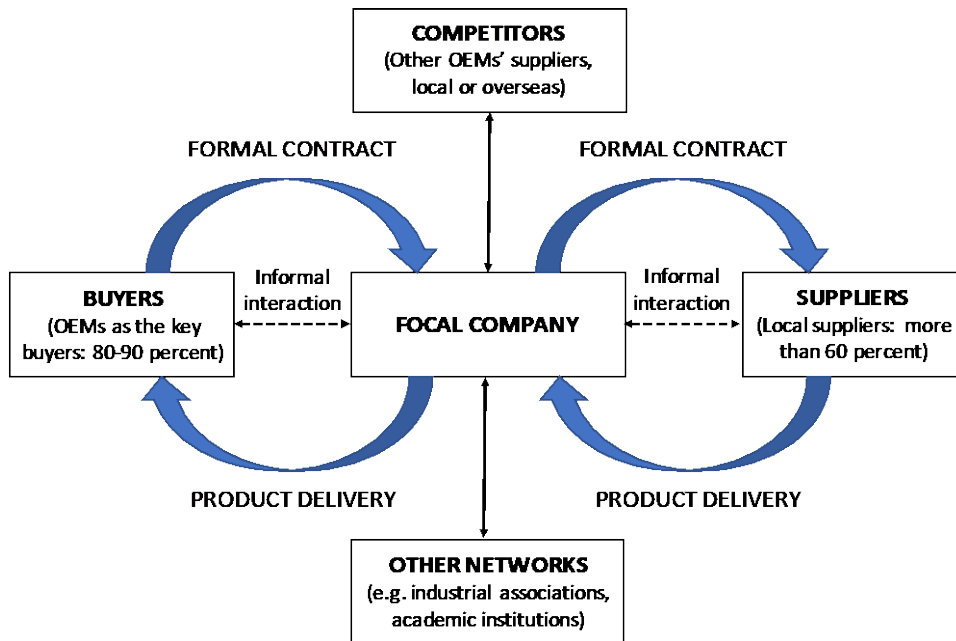


Figure 1. The Standard Model of Buyer-Supplier Relationship

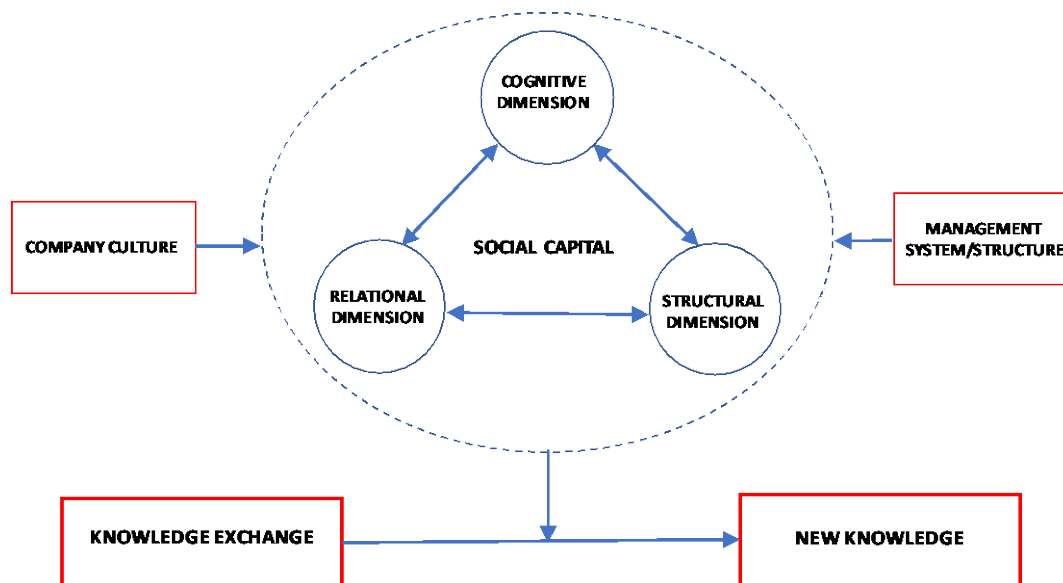


Figure 2. The Dynamic Interplay of Social Capital Dimensions