SOURCING IN OR OUT: IMPLICATIONS FOR SOCIAL CAPITAL AND KNOWLEDGE SHARING

ABSTRACT

The sharing of knowledge between a firm and its internal or external service suppliers has become an important element of contemporary sourcing arrangements. Moreover, the knowledge based view (KBV) has long suggested that due to stronger cognitive links within firms, internal compared to external service provision creates better conditions for knowledge sharing. Empirical evidence for this claim is however scarce, and the KBV does not explain the mechanisms for more knowledge sharing in internal sourcing in detail. Moreover, there is now some evidence to suggest that firms' relationships with external sourcing partners are becoming more similar to those with captive centres, which represent a less traditional form of insourcing setting. To scrutinize the possible knowledge sharing advantages of internal sourcing in more depth, we therefore turn to social capital (SC) research. There are some theoretical claims that SC and knowledge sharing are stronger within than between firms, and there is ample evidence that SC facilitates knowledge sharing. Our survey results suggest that the extent of knowledge sharing and SC are indeed stronger in a captive than in an external sourcing mode, and that structural (tie strength), cognitive (shared understanding), and relational (trust) aspects of SC mediate the effect of sourcing mode on the extent of knowledge sharing. By contrast, network stability (a structural aspect) mediated knowledge sharing only indirectly, by reinforcing the other SC aspects. We highlight important contributions to research and practice of IS outsourcing and social capital.

INTRODUCTION

A recent and growing stream of research has been paying attention to knowledge aspects in information systems outsourcing (Chua et al., 2012; Dibbern et al., 2008; Møller-Larsen et al., 2013). Indeed, the sharing of knowledge between a client firm and its internal or external suppliers has become an important feature of contemporary sourcing engagements (Lacity et al. 2010; Vlaar et al. 2008; Leonardi et al. 2008). Several studies have further argued that the ability to share knowledge contributes significantly to sourcing success (e.g. Chua and Pan, 2008; Koh et al., 2004; Kotlarsky and Oshri 2005). Correspondingly, a number of case studies have provided evidence that in practice, intended sourcing outcomes such as cost reduction and service quality are not achieved when service providers and client units do not sufficiently share relevant knowledge. For example, if suppliers find it difficult to understand the idiosyncratic knowledge required to contribute to the receiving unit's product (for example software used in a particular electronic control unit for certain automotive engines), this can impede knowledge sharing and thereby increase transaction costs and quality issues (Dibbern et al., 2008; Zimmermann and Ravishankar, 2011; 2014).

Researchers in the tradition of the knowledge based view (KBV) have also claimed that knowledge sharing is easier within a firm than between firms (e.g. Grant, 1996; Kogut and Zander, 1996; Macher 2006), which suggests that an internal sourcing mode (a form of making in house) is a better option for knowledge sharing compared to an external sourcing mode (buying from an external supplier) (see Willcocks et al., 2004). However, this research is underdeveloped in two ways. Firstly, empirical comparisons of knowledge sharing between internal and external sourcing modes are largely missing. Secondly, research in the tradition of the KBV (e.g. Grant, 1996; Kogut and Zander, 1996; Macher 2006) has provided only a narrow perspective on the mechanisms responsible for differences in knowledge sharing within and between firms, by focusing primarily on cognitive aspects of intra- and inter-firm relationships

(e.g. shared understanding) and shedding little light on how other aspects of relationships between sourcing partners may affect the extent of their knowledge sharing.

To address this shortcoming, we need a more comprehensive and fine-grained lens for studying the relationships within and between firms. Such a lens is offered by social capital theory. Social capital is commonly defined as the resources embedded within, available through and derived from the network of relationships with counterparts (Nahapiet and Ghoshal, 1998: 243). The notion of social capital comprises not only a cognitive dimension but also a structural and a relational dimension of relationships. Importantly, a number of researchers have suggested that social capital is generally stronger within than between firms (Inkpen and Tsang, 2005; Nahapiet and Ghoshal, 1998), and there is now ample evidence that social capital facilitates knowledge sharing (e.g. Hansen, 1999; Reagans and McEvily, 2003; Tsai and Ghoshal, 1998).

When comparing within- and between-firm knowledge sharing, it is however important to take into account the particular organisational context, and the various elements that can make an internal sourcing setting equally challenging to an external-sourcing setting. In certain forms of organisation, firm-internal boundaries may inhibit social capital and knowledge sharing within firms (Inkpen and Tsang, 2005). With regard to IS sourcing, it is therefore particularly relevant to examine the increasingly common case of captive centres (also called global in-house centres), wherein sourcing firms make products or services using a separate organisational unit, often in an offshore location (NASSCOM, 2015; Penter et al., 2009; Oshri, 2011). While the captive centre is considered a make option, implying fewer boundaries between the sourcing unit and the internal provider compared to an external supplier, its clear organisational distinction from the parent firm can create challenges to building relationships and sharing knowledge. A captive sourcing mode may therefore face barriers to knowledge sharing similar to those of the external sourcing mode (e.g. Levina and Vaast, 2008).

Conversely, the barriers for social capital and knowledge sharing between client firms and their *external* suppliers may be diminishing. In practice, there seems to be a trend towards less confrontation and more cooperation between firms (see Kedia and Mukherjee, 2009), and firms are increasingly disposed to taking a partnership approach to external IS sourcing. For example, Willcocks et al. (2004) describe an 'Enterprise partnering' sourcing option, whereby client and supplier firm take joint ownership of a new service-providing organisation. Joint governing boards can here serve to build social capital, which helps to leverage the potential to create knowledge. Moreover, IT suppliers have developed sophisticated methods for exchanging knowledge with their clients, driven by the need to exchange such knowledge as part of their daily business (Kotlarsky et al., 2014; Oshri et al., 2007)[i]. These developments make the current knowledge sharing advantages of captive sourcing settings yet more debatable.

Given these ambiguities concerning the effect of sourcing modes on knowledge sharing, and the indications that knowledge sharing affects outsourcing success (e.g. Lacity et al. 2010), it has become rather imperative to establish whether and why the extent of knowledge sharing may still be greater in a captive setting than an external sourcing mode. We hence seek to shed light on the role of social capital in the relationship between sourcing mode (i.e. captive centre versus external supplier) and the extent of knowledge sharing. We develop a conceptual model (presented in Figure 1) to argue that the choice of sourcing mode affects the extent of knowledge sharing between providing and receiving units, and that structural, cognitive and relational aspects of social capital mediate this effect. Our hypotheses were tested in a survey of 150 large UK and US firms that engage in contracting work from both captive and external service suppliers.

Our research contributes to the IS outsourcing and the social capital literature, as well as the practice of conducting information technology outsourcing. We find that even in the case of the captive centre, a less traditional organisational insourcing arrangement, firm boundaries

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are crucial for knowledge sharing. We complement previous research on knowledge sharing and firm boundaries by demonstrating that the effect of the sourcing mode on the extent of knowledge sharing is mediated by aspects of social capital. We demonstrate that not only cognitive, but also structural and relational aspects of social capital are fundamental for this effect. We thereby go beyond KBV based arguments and provide stronger reasons the knowledge sharing advantages of within-firm service provision. Furthermore, we advance previous attempts in the social capital literature (Inkpen and Tsang, 2005) to distinguish between different organisational forms with regard to their impact on social capital and knowledge sharing.

We now expand on the theoretical reasoning that underlies our hypotheses. After briefly introducing the two sourcing modes in question, we develop our first hypothesis based onthe KBV regarding knowledge sharing and firm boundaries. We then develop our second hypothesis on the basis of research on social capital in relation to firm boundaries and in relation to knowledge sharing. We then present the methods and results of our quantitative survey and discuss the contributions of our study. We conclude by highlighting the study limitations and directions for future research.

Figure 1 Sourcing mode, social capital aspects, and extent of knowledge sharing
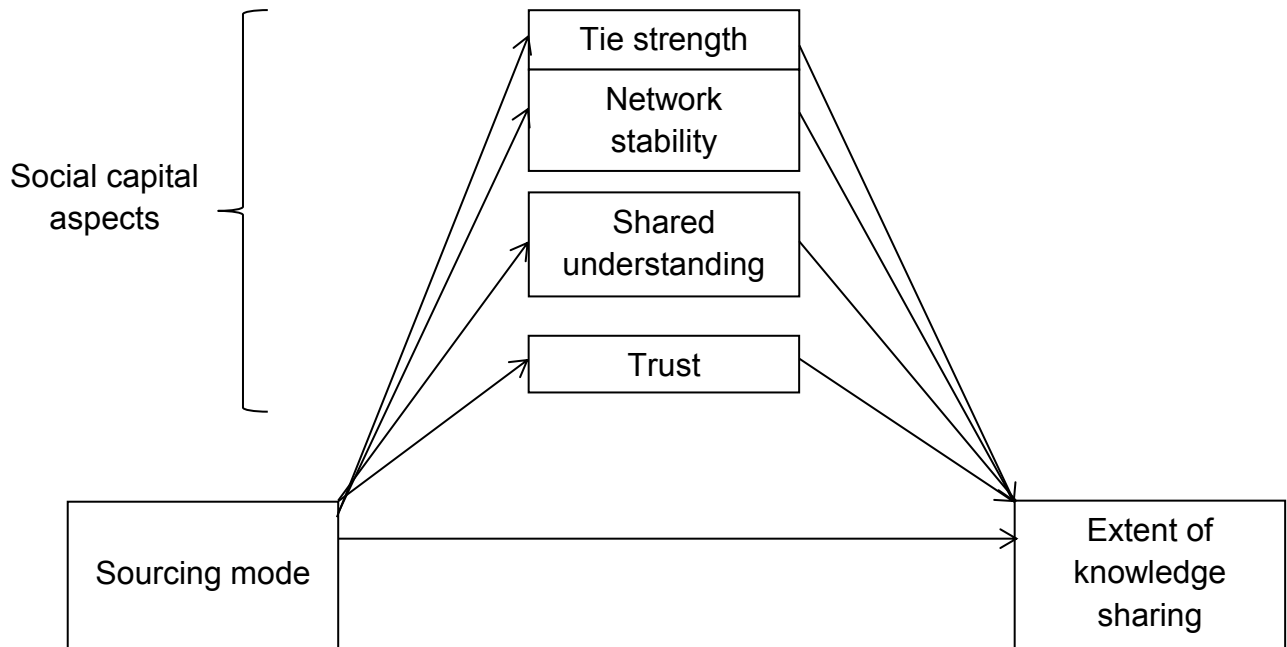
BACKGROUND AND HYPOTHESES

Sourcing Modes: Captive centres and external suppliers

The information system (IS) literature has distinguished between various sourcing modes, including captive centres and external suppliers. A captive centre is an internal sourcing arrangement defined as a de-coupled wholly owned subsidiary that provides services to the parent firm (Oshri, 2011). On the other hand, an external sourcing arrangement, also known as outsourcing, is defined as the contracting of a third party service supplier for the completion of a certain amount of work (Oshri, 2011). In both captive and external sourcing, supplied services nowadays include not only lower end tasks such as back office support, but also higher-end, knowledge intensive tasks that add value to the core functions of the firm, such as information technology research and development (Contractor et al., 2010).

Captive centres are considered to be equity partners (Das and Teng, 1996), implying common objectives with the parent firm, whilst outsourcing suppliers are perceived to be non-equity partners, suggesting partly separate objectives (Das and Teng, 1996). Captive centres as de-coupled units do however typically operate under similar contractual arrangements as external suppliers do, for example by responding to service level agreement requirements.

The knowledge-based view of knowledge sharing within and across firm boundaries

Researchers in the tradition of the KBV hold that knowledge sharing includes the exchange of 'information' as well as 'know-how'. Information is regarded as declarative knowledge or 'knowing *what* something means' (Kogut and Zander, 1992, p. 386), whilst know-how refers to procedural knowledge or 'knowing *how* to do something' (Kogut and Zander, 1992, p. 386). Additional aspects of knowledge include 'know-whom' which refers to knowing who to

approach, for example in order to obtain particular expert inputs, and 'know-where', i.e. where to look, for example for certain information (see Lee, 2001). Following this view, we define knowledge sharing broadly as the bidirectional transfer of information, know-how, know-whom, and know-where. Such knowledge sharing commonly leads to learning, i.e. an increase of the receiver's knowledge and understanding.

Research in the tradition of the KBV has long emphasized the advantages of in-house provision for knowledge sharing. It is commonly argued that knowledge sharing within firm boundaries is easier than knowledge sharing between firms, because it is facilitated by what we identify as cognitive aspects of relationships between members of a firm, namely higher order organising principles including established coordination mechanisms, communication codes, shared language, and routines (Grant, 1996; Kogut and Zander, 1992, 1996; Macher, 2006). Kogut and Zander (1992) for example illustrate vividly how the pattern of commonality that exists within organisations favours knowledge sharing. They mention specifically that "complex organisations exist as communities within which … expertise can be communicated and combined by a common language and organizing principles' (1992, p. 390). Thereby, a form of 'collective knowledge' is generated, which significantly facilitates knowledge sharing activities (Grant, 1996). Thus, firm boundaries are seen to provide a social community that is structured by organizing principles which facilitate knowledge sharing (Kogut and Zander, 1992, p. 384), and these organising principles refer primarily to *cognitive* associations between firm members. Notably, the conceptual distinction of organising principles within versus between firms has been criticised by Foss (1996a; 1996b), who argues that such principles are not likely to be *qualitatively* different within and between firms, and can theoretically be stronger between firms. He concedes however that 'in reality' (1996a, p. 473) there may be a difference in the *quantity* of these principles. Knowledge sharing within an organisation has been further seen to be more efficient, because there is no danger of knowledge spillovers, loss

of expertise to competitors or threat of opportunistic behaviour in general (Schilling and Steensma, 2002).

When it comes to the comparison between captive and external sourcing, these KBV based arguments imply that sourcing from a captive centre, as a form of internal sourcing, is associated with a greater extent of knowledge sharing compared to sourcing from an external supplier. Given that the captive centre and the receiving unit are part of the same firm, the knowledge sharing between them will benefit from the stronger organising principles within firm boundaries. This will result in a greater extent of knowledge sharing in the captive sourcing mode compared to the external sourcing setting, where knowledge sharing takes place across firm boundaries.

This view is put somewhat into question by recent evidence of difficulties in knowledge sharing between captive centres and receiving units within firms, tied to their clear organisational distinction. For example, a rivalry between headquarters and captive centres (e.g. for attractive tasks or professional status) can lead to tensions and hamper their knowledge sharing (Metiu, 2006; Zimmermann and Ravishankar, 2011; 2014; Oshri, 2011). In the same vein, Levina and Vaast (2008, p. 317) found that staff at a captive unit 'had an even harder time getting access to the onshore knowledge they needed' than staff at third party service providers' sites. These studies seem to contest the KBV based perspective on stronger cognitive associations and knowledge sharing within than between firms, and our resultant assumption of more knowledge sharing in the captive than the external sourcing setting. However, these studies rely only on case evidence, and do not empirically compare internal and external service provision. In order to scrutinize whether knowledge sharing is indeed greater in the captive sourcing mode, we test the following hypothesis:

H1: Sourcing mode (sourcing from a captive centre versus an external supplier) is associated with the extent of knowledge sharing between service provider and receiver.

The social capital-based view of knowledge sharing within and across firm boundaries

As mentioned before, KBV based research focusses quite narrowly on the cognitive aspects of within-firm relationships when arguing for easier knowledge sharing within than between firms. In order to better understand why the extent of knowledge sharing may be greater in one sourcing mode than the other, we therefore need to delve deeper into other potential foundations of knowledge sharing in these sourcing modes, and go beyond the narrow focus on cognitive aspects of relationships. We do this by combining the insights from the KBV with social capital research. In the following sections, we firstly introduce the three dimensions of social capital and explain why they are likely to differ within and between firms. Secondly, we present evidence to illuminate the role of each social capital dimension in knowledge sharing. We then integrate these arguments to present our hypothesis on the mediating role of social capital.

Social capital within and across firm boundaries

In their seminal study, Nahapiet and Ghoshal (1998) reason that social capital is likely to be stronger within than between firms. The authors distinguish between three dimensions of social capital. The *structural* dimension of social capital is defined as the overall pattern and configuration of connections between actors, and includes for example the number and strength of social ties, network centrality, and network range. In our study, we concentrate on two structural aspects which are prominent in the literature on social capital in relation to knowledge sharing: 'tie strength' and 'network stability'. We adopt Hansen's (1999) definition of *tie strength* as the closeness of relationships and frequency of interactions (see Hansen, 2002; Smith et al., 2005). Network stability can be defined as the frequency of membership changes

in a network (Inkpen and Tsang, 2005). Stable networks are associated with stronger social ties, whilst unstable networks are characterized by high attrition rates which weaken the links of the network. The *cognitive dimension* of social capital has been defined as the resources within relationships that provide shared representations (Nahapiet and Ghoshal, 1998). It includes several aspects such as common knowledge, congruent understandings (for example of tasks, rules, and work routines), shared goals, and a shared vision. For the purpose of this study, we focus on the role of sourcing partners' shared understanding of a broad range of aspects that are likely to be relevant to sourcing success, namely the partners' procedures and practices as well as their business domain and objectives. The *relational dimension* of social capital refers to assets created and leveraged through personal relationships (Nahapiet and Ghoshal, 1998), for example norms, culture, expectations, obligations, and identification. In the context of knowledge sharing, probably the largest attention has been paid to trust (see Van Wijk et al., 2008, for a review), which we therefore also focus on. Trust is often defined as the willingness to be vulnerable to another party, based on the belief in the partner's ability to fulfil their tasks, their benevolence, their integrity (Mayer et al., 1995), and honesty (Goo et al., 2009).

Nahapiet and Ghoshal (1998) suggest that internal organisation facilitates the three dimensions of social capital in the following ways: Internal organisation creates enduring social structures (structural dimension) and thereby allows for more 'time' for relationship development (relational dimension); it fosters 'interaction' (structural dimension) by providing 'a myriad of contexts and occasions for the […] coming together of people and their ideas' (structural dimension) (1998, p. 258). Finally, they claim that organisations by definition imply a measure of 'closure' through the creation of explicit legal, financial, and social boundaries.

Nahapiet and Ghoshal (1998, p. 257) do acknowledge that in practice, the conditions for strong social capital can also be met in some forms of inter-organisational networks, which can therefore 'become relatively well endowed with social capital' over time, an observation that

concords the recent trends towards more inter-firm collaboration (e.g. Willcocks et al., 2004). However, Nahapiet and Ghoshal (1998) retain the view that internal organisation is generally more beneficial for developing social capital. In the same vein, Inkpen and Tsang (2005) propose that social capital will be stronger in the context of strategic alliances compared to industrial districts. Nevertheless, they propose that social capital will be weaker in both of these external relationships compared to intra-firm networks. For the context of software services offshoring, Srikanth and Puranam (2014:1266) make the similar claim that although common ground can to some extent be built between firms through repeated interactions over time, this ground is unlikely to be equivalent to the stock of common ground created within a firm over a similar period of repeated interactions. An empirical example is provided by Ghosh's (2010) case study, where bonding and bridging practices between client and supplier firm helped to build social capital, but this social capital did not reduce 'organisational gaps' originating in structural and cultural differences between client and supplier firm. Willcocks et al. (2004) also argue that 'Do-it yourself-sourcing' compared to external sourcing is most likely to provide strong social capital from the outset.

With regard to the particular aspects of social capital that we focus on, we can thus assume that internal organisation through a captive sourcing mode will facilitate both strong ties and network stability. In line with the tenets of the KBV as well as social capital, we further posit that the captive as compared to the external sourcing mode will foster better shared understanding, for example of procedures, practices, and the business domain and objectives. In the same vein, firm-internal, interpersonal relationships within the captive mode are likely to help develop trust.

The role of social capital in knowledge sharing

There is now ample empirical research to demonstrate that social capital plays a key role in facilitating knowledge sharing in organisational settings (e.g. Hansen, 1999; Reagans and McEvily, 2003; Tsai and Ghoshal, 1998). A few studies have also shown the role of social capital for knowledge sharing for the particular contexts of external or internal IS sourcing (see George et al., 2014 for a review). With regard to external sourcing, Ghosh and Scott (2009) demonstrate that relational aspects of social capital (generalised trust, identification, and knowledge sharing norms) were required to close 'knowledge gaps' between client and suppliers. Rottman (2008) in turn describes several practices that organisations can use to create, manage, and exploit social capital (network ties and configuration, shared goals and culture, trust) with offshore suppliers in strategic alliances, and thereby facilitate knowledge transfer. For a captive offshoring setting, Zimmermann and Ravishankar (2014) found that structural aspects of social capital (tie strength and network stability), as well as relational aspects (trust and shared team identity) and cognitive aspects (shared contextual understanding) facilitated onshore employees' ability to transfer knowledge to offshore counterparts in a captive centre, whilst relational aspects additionally supported employees' willingness to transfer knowledge.

Research beyond the outsourcing literature provides useful suggestions on how particular aspects of the social capital dimensions support knowledge sharing. Hence, the *structural* dimension of social capital is argued to affect knowledge exchange mainly by providing access to parties for exchanging knowledge, and by supporting the development of the cognitive and relational dimensions of social capital (Nahapiet and Ghoshal; 1998: 251). Research has demonstrated accordingly that knowledge transfer and exchange are affected by the two structural aspects that we focus on, tie strength and network stability. Strong ties are known to increase the ease of knowledge transfer (e.g. Hansen, 1999; 2002; Levin and Cross, 2004; Reagans and McEvily, 2003; Schulz, 2003), and we assume the same effect for knowledge

sharing, which refers to bidirectional knowledge transfer. Network stability, in turn, is likely to facilitate knowledge sharing because it is conducive to building personal relationships over time. Networks provide firms with opportunities to access and share knowledge, and the stability of these networks is therefore a significant factor for the exploitation of such opportunities. Inkpen and Tsang (2005: 153) suggest that social ties and knowledge may disappear when network members leave, in particular when it comes to knowledge that cannot be easily transferred to others.

In line with the KBV, the *cognitive dimension* of social capital is seen to be fundamental to knowledge sharing because knowledge exchange requires at least some sharing of context between the exchange partners, and this sharing of context relies on a shared language and vocabulary as well as collective narratives (Nahapiet and Ghoshal, 1998: 253). Accordingly, several studies have shown that knowledge can be transferred more easily from the source to the recipient when the two have common knowledge (Andersson et al., 2002; Cramton, 2001; Reagans and McEvily, 2003: 243) or congruent understandings (Vlaar et al., 2008). It has to be noted that the relationship between knowledge sharing and shared understanding tends to be reciprocal, as knowledge sharing helps to increase shared understanding (Nahapiet and Ghoshal, 1998).

The *relational dimension* of social capital can facilitate knowledge sharing by influencing the access to knowledge sharing partners, the anticipated value of knowledge sharing, and the motivation to share knowledge (Nahapiet and Ghoshal, 1998: 254). In this vein, trust and perceived trustworthiness are generally seen to increase people's motivation to engage in knowledge sharing because they reduce concerns about the partner's potential opportunistic behaviour, and they increase expectations of cooperation (Bouty, 2000; Tsai and Ghoshal, 1998). Moreover, trust leads to the expectation that the shared knowledge will be used to the mutual benefit of both parties (Uzzi and Lancaster, 2003: 385).

The mediating role of social capital

Considering our assumption that social capital is stronger in a captive than an external sourcing mode along with the outlined importance of the three dimensions of social capital for knowledge sharing, we expect that it is due to greater social capital that the extent of knowledge sharing will be greater in a captive than an external sourcing setting. This reasoning provides a broader basis for the KBV based suggestion that internal organisation is beneficial for knowledge sharing (e.g. Kogut and Zander, 1996), and it supports previous propositions that stronger social capital makes it easier to share knowledge within than between firms (Inkpen and Tsang, 2005; Nahapiet and Ghoshal, 1998; Willcocks et al., 2004). We argue that this is also true for the context of captive sourcing, despite the need of crossing distinct firm-internal boundaries between the captive centre and the receiving unit, and despite the increasingly collaborative relationships of firms with their external service suppliers. By drawing on social capital research, we argue that knowledge sharing is stronger in a captive sourcing mode not only because of cognitive links between service providing and receiving units, but also due to structural and relational links. Together, the three dimensions of social capital will create a better basis of knowledge sharing in the captive setting. The threefold nature of social capital thus procreates the advantage of internal organisation, even if internal and external firm relationships are becoming more similar in sourcing settings. We hence expect that a captive sourcing mode will be positively associated with the strength of social capital aspects, which will in turn be positively associated with the extent of knowledge sharing, and that for this reason there will be more knowledge sharing in the captive than the external sourcing mode (see Figure 1). In other words, the structural, cognitive, and relational aspects of social capital can be taken as important mediators of the extent of knowledge sharing in a captive compared to an external sourcing mode. This leads to our second hypothesis:

H2: The extent of (a) tie strength, (b) network stability, (c) shared understanding, and (d) trust between service provider and receiver will mediate the relationship between sourcing mode and extent of knowledge sharing.

METHODS

Sample and procedure

We conducted an online survey on a sample of UK (44%) and US (56%) firms with more than 3000 employees. We applied a 'key informant' methodology for data collection (Kumar et al., 1993; Segars and Grover, 1998; Goo et al., 2009), by including senior managers at each firm who were involved in making decisions about both captive and external sourcing within the organisation. These managers were asked to respond to a survey regarding their relationships between their firm and (a) the chosen most valuable global in-house centre and (b) the chosen most valuable third party outsourcing relationship, thus generating two sets of observations for each firm. We used a screening question to exclude any participants who could not respond to both sets of questions. We used the term 'global in-house centre' to designate captive centres, because it is a prominent term in the practitioner literature (NASSCOM, 2015). We provided our participants with definitions of the two sourcing modes to ensure that they understood the terminology correctly.

The advantage of this research design is that it allows us to directly compare the two types of sourcing modes while controlling for firm characteristics. Another approach would have been to survey firms that work with external suppliers and other firms that work with captives and then compare their amount of social capital and knowledge sharing. Such a rather typical design does however create endogeneity problems, i.e. would not enable us to know whether differences in social capital and knowledge sharing are because the firms that use captive

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centers are different from firms using outsourcing, or whether the differences are due the differences of captive versus external organising.

Over 980 firms were initially contacted, and 150 fully completed the survey instrument, resulting in a response rate of 15.3%. Based on the data, there was not a significant difference between the demographic characteristics of the firms that responded and those that did not. Overall, the respondents represented a diversity of firms across multiple sectors and worked in a range of firm areas, but with a dominance of IT with 69.33% of respondents (see Table 1 for a full description). Across respondents, a broad range of services was sourced from captives and external suppliers, with an approximately even spread across respondents (see Table 2).

Table 1 Description of the firms

Description of the Firms		Frequency	Percentage
Location	United Kingdom	66	44.00%
	United States	84	56.00%
Firm Sector	Financial services	23	15.30%
	Manufacturing	28	18.60%
	Retail, distribution and transport	21	14.00%
	Pharmaceutical	9	6.00%
	Electronics	10	6.70%
	Energy	5	3.30%
	Insurance	15	10.00%
	Telecommunication	13	8.70%
	Public sector	7	4.70%
	Other commercial sector	3	2.00%
	Other non-commercial sector	16	10.70%
Firm Size	3000 to 5000 employees	39	26.00%
	5000 to 10,000 employees	52	34.70%
	More than 10,000 employees	59	39.30%

Respondent Characteristics			
Area of the company	Owner/board executive	10	6.67%
	Finance	14	9.33%
	IT	104	69.33%
	Facilities	4	2.67%
	Marketing	2	1.33%
	Customer services	6	4.00%
	Human resources	3	2.00%
	Logistics	4	2.67%
	Other	3	2.00%

Table 2. Types of services provided by type of sourcing arrangement

	Captive Sourcing Arrangement		External Sourcing Arrangement	
	Frequency	Percentage	Frequency	Percentage
Application Management	84	56	135	90
Software Testing	87	58	130	86.7
Data Warehousing	87	58	122	81.3
ERP Systems	71	47.3	119	79.3
Finance and Accounting	57	38	115	76.7
Human Resources	60	40	112	74.7
Procurement	52	34.7	112	74.7
Contact Centres	60	40	121	80.7
Legal Services	44	29.3	114	76
Research and Development	45	30	108	72

N = 300 (level 1), 150 (level 2)

Each of our respondents answered a series of questions regarding each sourcing mode (captive and external). Our sample size was thus 150 with regard to the number of participating client firms (level 2), but the sample size was 300 with regard to the number of sourcing relationships included in the analysis (level 1). Given this sampling design, in our analysis we had to account for the resulting intra-class correlation (Lohr, 2009)[1]. We used linear mixed models to account for the structure of our data, as described in our analysis section.

Measures

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[1] The intraclass correlation for our data was determined by taking the between cluster (firm) variation and dividing it by the total variation within the data. .275/(.275+.369) = .427. These estimates of the variance were obtained by estimating the intercept-only model with our data.

Dependent Variables

Our measure of the *extent of knowledge sharing* was based on the scale developed by Lee (2001), including items on the exchange of know-how, know-where, and know-whom, and items on the exchange of proposals and reports, manuals and methodologies, and success and failure stories (See Appendix A for details of all scales used in the analysis). Within the scope of the study, we did not assess whether this knowledge sharing leads to learning, i.e. increases the receiver's knowledge and understanding.

Independent Variable

To assess the influence of *sourcing mode* on social capital and knowledge sharing, we asked respondents to answer two sets of identical questions on social capital and knowledge sharing. The first set of questions were in relation to their selected Global In-house centre and the second set of questions were in relations to their chosen third party outsourcing relationship. We constructed a dichotomous variable that indicates which of those relationships the respondent was rating. This allows us to directly compare the effect of the type of relationship while controlling for firm level factors.

Mediating Variables

We examined four aspects of *social capital*: tie strength and network stability (structural dimension), shared understanding (cognitive dimension), and trust (relational dimensions). All items on social capital were assessed on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The items to measure social capital along with the measures for knowledge sharing were put through factor analyses using Promax rotation and Kaiser normalisation in order to evaluate the internal and discriminant validity of the variables. The

results displayed in Appendix A show five distinct factors, relating to each of the variables of interest. Each of the obtained variables reflects the average of the mean item values.

Our measure of *tie strength* was based on Chiu et al.'s (2006) scale, which combines closeness of ties and communication frequency (based on Hansen, 1999). We developed our own measure of *network stability*, given the lack of empirical research on this construct in relation to knowledge sharing. With respect to the chosen captive/external sourcing relationship, we asked respondents to rate the extent to which they agreed that (1) 'We have maintained long-term relationships with our counterparts', (2) Counterparts change frequently' (reversed item), and (3) 'Attrition rate makes it hard to keep in contact with counterparts'(reversed item). *Shared understanding* was loosely based on Kirsch et al.'s (2002) scale. Whilst Kirsch et al.'s (2002) scale focusses only on the client's understanding of the IS development process, our measure referred to an understanding of the partner's procedures, practices, business domain, and objectives. Moreover, different to Kirsch et al. (2002), our measure included both the service provider's understanding of the client and vice versa. Using Goo et al.'s (2009) scale, we examined *trust* in terms of beliefs about the other party's benevolence, integrity, and honesty.

Control Variables[2]

We controlled for the *duration of collaboration* between the firm and their chosen captive/external sourcing relationship, assuming that social capital will develop during the time of collaboration. We asked respondents to designate for how long their firm had managed the relationship between them and their most valuable captive, and their most valuable third party outsourcing relationship. We also controlled for the number of contracts between the firm and

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[2] In an additional set of models we also controlled for firm size and sector, presented in Appendix B. We did not find that they significantly improved the fit of the model nor provided any additional insights, so they are not presented in the main text.

their sourcing supplier, expecting that a greater number of contracts allows for more frequent interactions and greater familiarity, and thus the development of social capital. In addition, we also controlled for aspects of strategic intent, by asking respondents to rate to what extent they agreed (on a scale from 1=disagree to 5=strongly agree) that their strategic intent in using the selected outsourcing engagement/Global In-house centre was to (1) reduce operational costs, (2) improve service standards, and (3) seek new sources of innovation. While strategic intent is not necessarily a predicator of the extent of knowledge sharing, we still assumed that under certain intentions such as seeking innovation through the outsourcing engagement, there could be a higher demand for knowledge exchanges as compared to other strategic objectives such as cost reduction. The means, standard deviations and paired t-tests of all variables are presented in Table 3, and correlations of all variables included in the analysis are presented in Table 4[3].

Table 3. Means and Standard Deviations by Outsourcing Arrangement

	Captive Sourcing Arrangement		External Sourcing Arrangement		Paired t-test value
	Mean	SD	Mean	SD	
Duration of Collaboration	5.44	3.02	4.81	2.52	1.86
Number of Contracts	4.24	2.56	4.45	2.32	-0.67
Strategic Intent: Reduce Operational Costs	3.98	0.93	4.07	0.76	-1.30
Strategic Intent: Improve Service Standards	4.08	0.95	3.97	0.91	1.41
Strategic Intent: New Sources of Innovation	3.79	1.01	3.88	0.91	-1.02
Social Capital: Tie Strength	4.01	0.86	3.82	0.81	2.51*
Social Capital: Network Stability	3.65	0.98	3.80	0.82	-1.99*
Social Capital: Shared Understanding	4.16	0.83	4.00	0.77	2.04*
Social Capital: Trust	3.98	0.89	3.77	0.94	2.47**
Knowledge Sharing	4.07	0.79	3.80	0.80	3.94**

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[3] Despite some relatively high correlations in Table 4, multicollinearity tests did not indicate this was a cause for concern in our regression models.

Notes: N = 300 (level 1), 150 (level 2); * p < 0.05; **p < 0.01

Table 4. Correlation of Variables

		1	2	3	4	5	6	7	8	9	10
1	Number of Contracts	-									
2	Duration of Collaboration	0.35	-								
3	Strategic Intent: Reduce Operational Costs	0.05	-0.04	-							
4	Strategic Intent: Improve Service Standards	0.02	-0.04	0.84	-						
5	Strategic Intent: New Sources of Innovation	-0.03	-0.17	0.47	0.52	-					
6	Captive Sourcing Arrangement	-0.04	0.11	-0.05	0.06	-0.05	-				
7	Social Capital: Tie Strength	-0.06	-0.15	0.40	0.38	0.36	0.11	-			
8	Social Capital: Network Stability	-0.03	-0.09	0.40	0.37	0.39	-0.08	0.53	-		
9	Social Capital: Shared Understanding	0.01	-0.06	0.53	0.54	0.45	0.10	0.67	0.41	-	
10	Social Capital: Trust	-0.02	-0.08	0.45	0.48	0.39	0.11	0.62	0.45	0.74	-
11	Extent of Knowledge Sharing	-0.03	-0.12	0.43	0.45	0.43	0.17	0.69	0.44	0.74	0.68

Notes: N=300 (level 1), 150 (level 2); correlations above +/- 0.11 are significant at the $p < 0.05$ level, correlations above +/- 0.15 are significant

at the $p < 0.01$ level

Common Methods Variance

In order to test for common methods variance (CMV) we conducted Harman's single-factor test (Podsakoff et al., 2003). Our results did not indicate that common methods bias was high as six distinct factors emerged to explain the variance in our analysis. The largest factor explained only 22.36%, indicating that no one for the majority of covariance among the measures, meeting both of the criteria set forth by Podsakoff et al. (2003) for determining if a detrimental level of common method bias exists. In addition to the Harmon single factor test, we also applied the marker variable technique (Lindell and Whitney, 2001). The marker variable technique consists of incorporating an additional variable into the study that is theoretically unrelated to at least one other variable of interest. CMV is evaluated based on the correlation between the theoretically unrelated variables. We included a variable that measures the perceived benefit of undertaking outsourcing strategies[4] along with the other factors of theoretical interest. The marker variable was not significantly related to our variables of interest, thus we concluded that CMV is not a significant problem in our study.

ANALYSIS AND RESULTS

After assessing measurement properties and CMV, we tested our hypotheses regarding the effects of the type of sourcing arrangement on the extent of knowledge sharing and social capital. Due to the nested nature of our data we estimated general linear mixed models (Hox, 2002; West et al., 2007). We incorporated the firm level variables, as well as the sampling

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[4] The variable included gave respondents the following prompt: "Pursuing multiple sourcing strategies, i.e. 3rd party outsourcing and global in-house centres, has standardised our vendor management approach." Respondents rated the extent that they agree with the statement from 1=strongly disagree to 5=strongly disagree. This variable is theoretically not related to our variables of interest as it focusses on the consequences of firms pursuing both internal and external sourcing, whilst our variables concern the comparison between internal and external sourcing.

strategy at level 1 by including a random intercept. At the level 2, we incorporated the characteristics of the relationship as well as, the social capital present in the relationship. We then calculated the indirect effects of each of the mediation paths and then tested the indirect effects for statistical significance using 95% bias corrected and accelerated bootstrapped confidence intervals (CI) (Hayes, 2013) based on 1,000 samples to avoid concerns regarding inflated Type I error rate (cf. Shrout and Bolger, 2002), using the bootstrap function within STATA. Table 5 presents the results from the regressions predicting the extent of knowledge sharing, Table 6 presents the regressions predicting social capital and Table 7 presents the indirect effects and the boot strapped confidence intervals to test the mediation effects.

In Table 5, we include three models. Model 1 includes just the control variables. Model 2 adds the effect of the type of sourcing arrangement. Models 3 tests the effects of the mediating variables.

In Model 1, we found that intending to improve service standards and find new sources of innovation increase the extent of knowledge sharing. In Model 2, we add the effect of the type of sourcing arrangement. There was a positive and significant effect for the use of a captive sourcing arrangement (b = 0.257, p < 0.01), supporting hypothesis 1, sourcing mode is associated with the extent of knowledge sharing. More specifically, captive sourcing arrangements had significantly more knowledge sharing than did external sourcing arrangements. The control variables maintain their direction and significant.

Table 5. Linear mixed model regression models predicting the extent of knowledge sharing

	Model 1		Model 2		Model 3	
	B	S.E.	B	S.E.	B	S.E.
Number of Contracts	-0.005	0.015	0.003	0.019	0.004	0.011
Duration of Collaboration	-0.005	0.018	-0.012	0.015	-0.008	0.012
Strategic Intent: Reduce Operational Costs	0.115	0.083	0.168	0.093	0.023	0.069
Strategic Intent: Improve Service Standards	0.218 **	0.073	0.156 *	0.076	0.003	0.062
Strategic Intent: New Sources of Innovation	0.255 **	0.051	0.259 **	0.062	0.103 *	0.05
Captive Sourcing Arrangement			0.257 **	0.058	0.142 *	0.054
Social Capital: Tie Strength					0.256 **	0.064
Social Capital: Network Stability					0.031	0.048
Social Capital: Shared Understanding					0.334 **	0.089
Social Capital: Trust					0.137 *	0.054
Constant	1.981	0.249	1.792	0.31	0.502	0.248
Random Effect Parameter – Standard Deviation of Random Intercept	0.465	0.047	0.469	0.048	0.502	0.338
Pseudo Log Likelihood	-289.47		-280.32		-191.3	
Wald Chi^2	113.56 **		92.45 **		205.44 **	
Degrees of Freedom	7		8		12	

Notes: N = 300 (level 1), 150 (level 2); * p < 0.05; ** p < 0.01; Tolerances for all regressions were above .2, and VIFs were below 5

Table 6. Linear mixed model regressions predicting mediating variables

	Tie Strength		Network Stability		Shared Understanding		Trust	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.
Number of Contracts	-0.013	0.023	-0.018	0.025	0.003	0.018	0.003	0.021
Duration of Collaboration	-0.025	0.019	0.018	0.021	-0.002	0.016	-0.008	0.017
Strategic Intent: Reduce Operational Costs	0.207	0.129	0.307 **	0.115	0.236 *	0.096	0.059	0.142
Strategic Intent: Improve Service Standards	0.100	0.104	0.004	0.088	0.196 *	0.087	0.385 **	0.132
Strategic Intent: New Sources of Innovation	0.147 *	0.054	0.136 +	0.069	0.226 **	0.051	0.136 *	0.062
Captive Sourcing Arrangement	0.218 **	0.069	-0.097	0.072	0.149 *	0.066	0.177 *	0.069
Constant	2.014	0.342	1.691	0.380	1.629	0.317	1.413	0.351
Random Effect Parameter - Standard Deviation of Random Intercept	0.454	0.081	0.547	0.066	0.333	0.074	0.496	0.077
Pseudo Log Likelihood	-317.180		-337.118		-283.690		-332.100	
Wald Chi^2	72.43 **		35.75 **		95.12		85.36	
Degrees of Freedom	8		8		8		8	

Notes: N = 300 (level 1), 150 (level 2); + p < 0.10; * p < 0.05; ** p < 0.01; Tolerances for all regressions were above .2, and VIFs were below 5

In order to test the mediation presented in hypotheses 2a – 2d we estimated an additional series of linear mixed model regressions to test the effect of captive versus external sourcing arrangements on the four aspects of social capital. These models are presented in Table 6. We then added the four aspects of social capital to our models predicting the extent of knowledge sharing in order to test their effect on the extent of knowledge sharing.

First, we examine the effect of captive sourcing arrangements on tie strength. We find support that captive sourcing arrangements are positively and significantly associated with tie strength aspect of social capital ($b = 0.218$, $p < .01$). Next, we examine the effect of captive sourcing arrangements on network stability. We find that captive sourcing arrangements are not significantly associated with network stability ($b = -0.097$, $p > 0.05$). In fact, we find the result to be negative and non-significant. Turning to shared understanding, we do find support for captive sourcing arrangements positively and significantly increasing the amount of shared understanding ($b = 0.149$, $p < 0.05$). Finally, examining trust, we find that captive sourcing arrangements are associated with significantly higher levels of trust ($b = 0.177$, $p < 0.05$). In sum, we find support for captive sourcing arrangements being positively and significantly associated with three of the four aspects of social capital measured in the study. In terms of control variables, we found that intending to find new sources of innovation increase, increases all forms of social capital. Intending to reduce operational costs is associated with increased network stability and shared understanding. Finally, intending to improve service standards increases shared understanding and trust.

In order to examine if the four aspects of social capital mediate the effect of captive sourcing arrangements on the extent of knowledge sharing (hypotheses 2a-2d), we added the social capital variables to our models predicting knowledge sharing. The results of this analysis are displayed in Model 3 of Table 5. We do find that captive sourcing arrangements have significantly more knowledge sharing, but the magnitude of this effect has decreased compared

to Model 2 (b = 0.142, p < 0.05). We do have significant and positive effects for three out of our four aspects of social capital (tie strength, b = 0.256, p < 0.01; shared understanding, b = 0.334, p < 0.01; and trust, b = 0.137, p < 0.05). We do not have a significant effect for the effect of network stability on the extent of shared understanding. The decrease in magnitude in the effect for the sourcing arrangement and the significant effects for three out of the four aspects of social capital indicate that a partial meditation may be present.

In order to assess whether the aspects of social capital mediate the effect of the sourcing arrangements, we calculated the indirect effects for each of the mediators (e.g. the effect of the sourcing arrangement on tie strength multiplied by the effect of tie strength on knowledge sharing) (presented in Table 7). We then estimated 95% bias corrected and accelerated bootstrapped confidence intervals. The significance of the indirect effect is indicated by the exclusion of zero from the 95% unstandardized confidence interval. Our results indicate that the effect of captive sourcing arrangements on the extent of knowledge sharing is mediated by three out of the four aspects of social capital: tie strength (indirect effect = 0.056, lower bound 0.014, upper bound 0.131), shared understanding (indirect effect = 0.024, lower bound 0.010, upper bound 0.136) and trust (indirect effect = 0.024, lower bound 0.006, upper bound 0.083), thus supporting hypotheses 2a, 2c and 2d. The results do not support the hypothesis 2b that network stability mediates the effect of captive sourcing arrangements on the extent of knowledge sharing (indirect effect = -0.003, lower bound -0.028, upper bound 0.004).

Table 7: Indirect Effects and Bootstrapped Confidence Intervals

	Indirect Effect	Bootstrapped Standard Error	95% bias corrected and accelerated bootstrapped confidence intervals	
			Lower Bound	Upper Bound
Social Capital: Tie Strength	0.056	0.030	0.014	0.131
Social Capital: Network Stability	-0.003	0.007	-0.028	0.004

Social Capital: Shared Understanding	0.024	0.032	0.010	0.136
Social Capital: Trust	0.024	0.018	0.006	0.083
Total Effect	0.101	0.061	0.039	0.287

Post-hoc tests

Due to the relatively strong relationship between network stability and knowledge sharing (r = .44, p < 0.05), we were surprised to find that there was not a significant relationship in the multivariate analysis. This led us to create a post-hoc hypothesis that the effect of network stability on knowledge sharing is mediated by the three remaining aspects of social capital, presented in Figure 2.

Figure 2 Network stability, social capital aspects, and extent of knowledge sharing
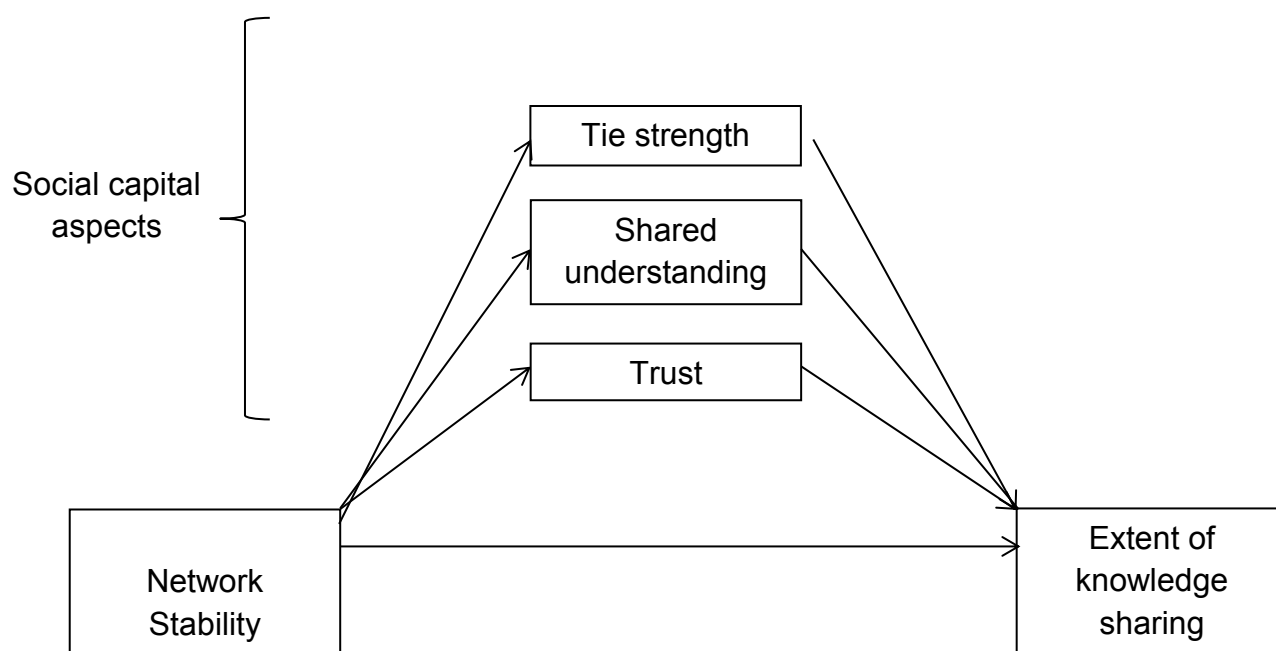
We estimated a series of models presented in Table 8. In model 1, we test the direct effect of network stability on knowledge sharing, we find that network stability has a positive and significant effect on knowledge sharing (b = 0.208, p < 0.05). Suggesting that firms who create stable networks have a higher level of knowledge sharing. In model 2, we add the effects of the three remaining aspects of social capital (tie strength, shared understanding and trust). We find that networks stability is no longer a significant predictor of knowledge sharing (b = 0.031, p > 0.05).   Again, we do have significant and positive effects for the three remaining aspects of social capital: tie strength (b = 0.256, p < 0.01); shared understanding (b = 0.334, p < 0.01); and trust (b = 0.137, p < 0.05).

Table 8. Linear mixed model regressions predicting the knowledge sharing

	Model 1		Model 2	
	B	S.E.	B	S.E.
Number of Contracts	0.007	0.018	0.004	0.011
Duration of Collaboration	-0.017	0.016	-0.008	0.012
Strategic Intent: Reduce Operational Costs	0.078	0.089	0.023	0.069
Strategic Intent: Improve Service Standards	0.166 *	0.078	0.003	0.062
Strategic Intent: New Sources of Innovation	0.190 **	0.052	0.103 *	0.05
Captive Sourcing Arrangement	0.294 **	0.060	0.142 *	0.054
Social Capital: Network Stability	0.208 **	0.058	0.031	0.048
Social Capital: Tie Strength			0.256 **	0.064
Social Capital: Shared Understanding			0.334 **	0.089
Social Capital: Trust			0.137 *	0.054
Constant	1.372	0.267	0.502	0.248
Random Effect Parameter - Standard Deviation of Random Intercept	0.422	0.052	0.502	0.338
Pseudo Log Likelihood	-271.58		-191.3	
Wald Chi^2	126.94 **		205.44 **	
Degrees of Freedom	9		12	

Notes: N = 300 (level 1), 150 (level 2); * $p < 0.05$; ** $p < 0.01$; Tolerances for all regressions were above .2, and VIFs were below 5

In addition, we also estimated the effects of network stability on the three remaining aspects of social capital (presented in Table 9). We find that network stability has a positive and significant effect on all three aspects of social capital: tie strength (b = 0.251, p < 0.01); shared understanding (b = 0.175, p < 0.01); and trust (b = 0.290, p < 0.05). In order to test the mediation effects, we calculated the indirect effects for each of the mediators (e.g. the effect of network stability on tie strength multiplied by the effect of tie strength on knowledge sharing) (presented in Table 10). We then estimated 95% bias corrected and accelerated bootstrapped confidence intervals. The significance of the indirect effect is indicated by the exclusion of zero from the 95% unstandardized confidence interval. Our results indicate that the effect of network stability on knowledge sharing is mediated by the remaining three aspects of social capital: tie strength (indirect effect = 0.092, lower bound 0.054, upper bound 0.178), shared understanding (indirect effect = 0.058, lower bound 0.024, upper bound 0.080) and trust (indirect effect = 0.040, lower bound 0.017, upper bound 0.080). We address these findings further in the discussion.

Table 9. Linear mixed model regressions predicting mediating variables

	Tie Strength		Shared Understanding		Trust	
	B	S.E.	B	S.E.	B	S.E.
Number of Contracts	-0.006	0.020	0.006	0.017	0.008	0.020
Duration of Collaboration	-0.030	0.018	-0.003	0.016	-0.013	0.017
Strategic Intent: Reduce Operational Costs	0.124	0.115	0.156	0.093	-0.023	0.137
Strategic Intent: Improve Service Standards	0.075	0.099	0.206	0.091	0.376 **	0.138
Strategic Intent: New Sources of Innovation	0.103	0.053	0.161 *	0.051	0.098	0.066
Captive Sourcing Arrangement	0.251 **	0.067	0.180 **	0.064	0.205 **	0.064
Social Capital: Network Stability	0.359 **	0.066	0.175 **	0.067	0.290 **	0.071
Constant	1.445	0.288	1.259	0.300	0.932	0.331
Random Effect Parameter -Standard Deviation of Random Intercept	0.359	0.076	0.317	0.081	0.468	0.072
Pseudo Log Likelihood	-294.545		-277.650		-318.667	
Wald Chi^2	129.11 **		120.22 **		115.28 **	
Degrees of Freedom	9.000		9.000		9.000	

Notes: N = 300 (level 1), 150 (level 2); * p < 0.05; ** p < 0.01; Tolerances for all regressions were above .2, and VIFs were below 5

Table 10. Indirect Effects and Bootstrapped Confidence Intervals

	Indirect Effect	Bootstrapped Standard Error	95% bias corrected and accelerated bootstrapped confidence intervals	
			Lower Bound	Upper Bound
Social Capital: Tie Strength	0.092	0.031	0.054	0.178
Social Capital: Shared Understanding	0.058	0.023	0.024	0.117
Social Capital: Trust	0.040	0.016	0.017	0.080
Total Effect	0.190	0.039	0.141	0.297

DISCUSSION

Implications for research

Based on insights from the KBV and social capital research, our study aimed to establish whether the extent of knowledge sharing is greater in a captive setting than an external sourcing mode, and to scrutinize why this may be the case. Our survey findings suggest that the extent of knowledge sharing between service provider and receiver is indeed greater in the captive setting, and that the relationship between sourcing mode and extent of knowledge sharing is mediated by aspects of social capital. Stronger ties, greater shared understanding, and stronger trust mediated this relationship, whilst network stability did not have a mediation effect.

Our study provides one of the first empirical comparisons of knowledge sharing within and between firms, given that prior literature has drawn this comparison mostly on a conceptual basis (e.g. Grant, 1996; Inkpen and Tsang, 2005; Nahapiet and Ghoshal, 1998; Kogut and Zander, 1996). This evidence is particularly important in view of Foss' (1996a) suggestion that conceptually, the higher-order organising principles that support knowledge sharing are not qualitatively different within firms compared to market relationships, although in reality there

is probably a quantitative difference between the two. The difference in quantity is hence an empirical question, to which we answer by providing the required empirical evidence. Our empirical evidence thus supports KBV based arguments concerning the mechanisms that distinguish firm settings from market settings. In addition, our research strengthens the KBV perspective of the firm conceptually, by defining non-cognitive aspects of social capital which serve as additional higher order principles that facilitate knowledge sharing within firms.

Notwithstanding the prior finding that relationships within and between firms are becoming more similar (e.g. Willcocks et al.; 2004), we empirically confirm that the extent of knowledge sharing is stronger in a captive than an external sourcing setting. Our study thus suggests that firm boundaries are still crucial when it comes to knowledge sharing, even in the case of captive settings where strong intra-organisational demarcations exist. We were able to explain this continuing importance of firm boundaries with the help of the social capital lens. Due to its threefold nature, social capital provides a stronger reason for the on-going importance of firm boundaries as compared to the primarily cognitive reasons that are put forward by the KBV. The greater strength of all three social capital dimensions in the captive compared to the external sourcing mode provides a more thorough explanation for why the captive setting provides knowledge sharing advantages despite its strong firm-internal boundaries, and despite the diminishing barriers to knowledge sharing between firms.

Our findings thereby shed some new light on prior findings on knowledge sharing challenges in internal and external sourcing settings. Some of the case studies that reveal conflicts and insufficient knowledge sharing in captive sourcing settings (Levina & Vaast, 2008; Metiu, 2006; Zimmermann and Ravishankar, 2011; 2014) do take into account relational aspects (e.g. trust) and structural aspects (e.g. frequency of interactions), alongside cognitive aspects (e.g. shared understanding) of relationships. However, as mentioned this research does not compare captive versus external sourcing modes and does therefore not allow for any conclusions on

whether a captive compared to an external sourcing mode is still the better option. Our findings suggest that firm-internal conflicts between headquarters and captive centres do in practice not counterbalance the advantage of internal organisation when it comes to social capital and knowledge sharing.

In the same vein, some of the studies on the increasingly common partnership-style outsourcing arrangements alude in passing to non-cognitive aspects of social capital *[check whether that is true, for each of them, and also whether they compare internal versus external*]. For instance, trust is usually seen as an important condition of outsourcing success (Dibbern et al., 2016; Willcocks et al., 2004), and the strength of social relationships is seen to vary with supplier staff as well as in-house employees (Dibbern et al., 2016; Lioliou and Zimmermann, 2016). However, this research has not examined social capital in its three aspects systematically. *[check whether that is true, for each of them*]. Our findings suggest that when considering all three dimensions of capital together, external sourcing arrangements generally do not yield the level of social capital that is present in captive sourcing settings. However, our findings also suggest that even in external sourcing arrangements where the level of shared understanding (cognitive aspect of social capital) is low (as in the cases presented by Dibbern et al., 2008 and Zimmermann et al., 2011), knowledge sharing can be improved through the cultivation of tie strength (structural aspect of social capital) and trust (relational aspect).

A surprising result is that the stability of networks in the case of the captive as an internal setting was not greater than the stability of networks in the external sourcing setting, but was even slightly higher in the external setting. In other words, counterparts in captive sourcing settings changed at least as quickly as in outsourced settings[ii]. This result contradicts Nahapiet and Ghoshal's (1998) and Inkpen and Tsang's (2005) observation that all aspects of social capital are likely to be more stable within a firm. It also contrasts with the expectation of practitioners who may create internal service delivery centres with the hope for greater

continuity within such internal settings. One explanation for our findings may be the mentioned distinctive boundaries between the receiving unit and the captive centre which may eliminate the differences between internal and external sourcing settings when it comes to network stability. It may be harder for members of the receiving unit to keep in touch with colleagues at captive centres who move to other departments, and to maintain a clear mental map of changing roles and responsibilities at the captive unit over time. Moreover, the increasingly collaborative relationships with employees at external supplier sites might make it easier for the receiving units to keep in touch with counterparts who rotate within the supplier firms. Another reason may be that internal and external settings both provide advantages for achieving network stability which equal each other out. For example, external suppliers may more often opportunistically move personnel to more important clients (Dibbern, Winkler, & Heinzl, 2008, p. 354), which may be less of an issue in internal settings. On the other hand, external suppliers may offer more interesting career paths through the option of working with various clients (*noch check whether dibbern says this is through working with different clients:* Dibbern et al., 2008, p. 354), which helps to retain employees with the firm. For all of these reasons, network stability in a sourcing setting may depend less on whether the network is within or between firms, but more on attrition factors such as the job market and employees' identification with the employing firm. Further research is needed to explore these speculations, but our research provides a strong indication that networks between parent firms and their captives are not necessarily as stable as expected.

Another interesting finding is that our regression analysis (Table 5) suggests that the relationship between network stability and knowledge sharing was relatively strong ($r = .44$, $p < 0.05$), even though there was not a significant relationship in the multivariate analysis. As mentioned, this led us to create the post-hoc hypothesis that the effect of network stability on the extent of knowledge sharing is mediated by the three remaining aspects of social capital,

which is in line with previous claims that the three social capital dimensions are interrelated, and that stable networks allow for strong relationships to be developed (Nahapiet and Ghoshal, 1998). Our results supported the post-hoc hypothesis, suggesting network stability has a positive effect on knowledge sharing by providing the basis for greater tie strength, shared understanding and trust. Through this indirect effect, network stability does appear to have an important function for knowledge sharing, which makes our finding that network stability was not higher in the captive sourcing mode even more significant. Managers' efforts to achieve the same degree of network stability in an external as in a captive sourcing mode have a good chance of success. Through the effect on trust and shared understanding, these efforts are likely to improve knowledge sharing in both sourcing modes.

Our research also contributes to the literature on social capital. For the context of captive and external sourcing, we provide long-needed empirical support for the theoretical claim that social capital is stronger within than between firms, and that this leads to a greater extent of knowledge sharing (Inkpen and Tsang, 2005; Nahapiet and Ghoshal, 1998). Moreover, we continue previous endeavours of distinguishing between different forms of organisations to examine their particular effect on social capital and consequent knowledge sharing. A number of researchers have developed conceptual categorisations of different types of *external* collaborations with reference to their social capital and knowledge sharing. For example, Inkpen and Tsang (2005) theoretically distinguish between the boundaries that have to be crossed in inter-firm networks as opposed to strategic alliances, with their consequences for social capital and knowledge exchange. Mudambi and Tallman (2010) in turn distinguish between institutional and contractual alliances, and argue that institutional alliances are better suited for developing relational ties between client and supplier firms, helping the supplier firms to adapt to and specialise in the client's requirements.

To our knowledge, less attention has been paid to different types of *internal* organisation in relation to social capital and knowledge sharing. Inkpen and Tsang (2005) do describe a particular type of internal collaboration, namely 'intra-firm networks', and acknowledge that even in these intra-firm collaborations, firm-internal boundaries between firm units have to be crossed. Our study in turn singles out another type of internal collaboration, namely the captive sourcing mode, where the intra-organisational boundaries between the knowledge sharing partners are likely to be distinct and strong. Even for this type of internal organisation however, we can underscore Inkpen and Tsang's (2005) suggestion that firm-internal boundaries, in comparison to boundaries between firms, are likely to pose smaller barriers to social capital and knowledge sharing.

For examining the extent of knowledge sharing, the distinctions between certain internal and external collaborations in general, and between different sourcing modes in particular, will become more important, as these collaborations are becoming more varied and complex (Møller-Larsen et al. 2013). It is therefore significant that for the context of captive and external sourcing, our research suggests that firm boundaries are still significant for the strength of social capital and the extent of knowledge sharing. It remains for future research to examine whether this insight applies also to other types of internal collaborations, and to other forms of collaborations between firms.

Practical implications

Our study has significant practical implications. Firstly, our study illustrates the superiority of captive centres compared to external service provision with regards to the extent of knowledge sharing. Practitioners may of course have a range of factors affecting their 'make or buy' decision in the sourcing context. When it comes to the extent of knowledge sharing however,

our findings suggest that practitioners have to be more concerned about the boundaries between firms than intra-organisational boundaries between a captive centre and the parent firm.

There may be cases where a decision for external sourcing has been made even though a great a deal of knowledge sharing is required, for example due to other pressures such as lack of internal expertise, or to pursue strategic aims such as increasing business model flexibility and responsiveness to changing market conditions (Mudambi and Tallman, 2010). In such cases, managers have to invest most heavily in developing social capital with the external supplier. Our study shows that in practice, the extent of knowledge sharing in external sourcing settings does not reach the level of captive settings, regardless of the number of contracts with the partner, the duration of the collaboration, and aspects of strategic intent. However, managers can do a lot to improve knowledge sharing by building social capital between firms, for example by using boundary spanners, staff exchanges, and enterprise partnering. Nevertheless, if managers do have the option to choose between internal/captive and external sourcing, they should give the knowledge sharing criterion the weight that it deserves.

Our study further demonstrates the importance of cognitive, relational, and structural aspects in facilitating knowledge sharing. Investment in cognitive factors such as processes to facilitate a shared understanding between the partners, visibility of processes, shared codes of communication etc. will thus be crucial. At the same time, however, practitioners should be aware that investments in frequent and close interactions and in trust building activities (e.g. face to face workshops) will also improve knowledge sharing. Resultant strong ties and trust are likely to facilitate knowledge sharing not only on their own account, but also by reinforcing the cognitive elements that benefit knowledge sharing.

When it comes to network stability, managers can do a lot to strengthen network stability, for example by designing long-term interaction plans and stakeholder maps, and ensuring regular

catch up meetings. Our findings suggest that managers this can result the same degree of network stability in an external as in a captive sourcing mode. Through the effect on trust and shared understanding, this is likely to improve knowledge sharing in both sourcing modes.

Limitations and future research

In our research, we subscribe to the view that a greater extent of knowledge sharing contributes to the success of sourcing relationships (e.g. Chua and Pan, 2008; Kotlarsky and Oshri 2005). However, we do not differentiate between the degrees to which knowledge sharing is required. Generally, knowledge sharing is seen to be more important when tasks and processes of sourcing partners are interdependent and activities cannot be easily split into separate modules for each sourcing partner (Tanriverdi et al., 2007). Knowledge sharing is also more important if the sourced activities are knowledge intensive and rely on client firm-specific knowledge (e.g. Dibbern et al., 2008). Such interdependence and knowledge idiosyncrasy are hence reasons for choosing the internal sourcing option (e.g. Gerbl et al. 2015). Our survey focussed on firm level data and was addressed to respondents involved in decision making about captive and external sourcing. At this level, we were able to control for types of services (including application management, software testing, HRM, etc.). It is likely that the firms in our sample were sourcing various types of tasks, and that our findings therefore apply across such task characteristics. However, we were not able to tap on task characteristics, including modularity and knowledge idiosyncrasy. By gathering project or team level data, future research could assess such task characteristics, and establish whether they make a difference for the size of the effect of sourcing mode on knowledge sharing, and for the degree to which social capital mediates the relationship between sourcing mode and knowledge sharing.

More research is also needed to explain our unexpected findings. Further investigation is needed to explore why network stability did not act as a mediator. To shed more light on this

question, future research could include network characteristics beyond the changing counterparts, for example job rotation, and examine mental maps of roles and responsibilities of changing counterparts within and across firms.

Our comparison between external and captive sourcing settings has allowed us to conclude that firm boundaries still matter in these sourcing settings. In order to explore the features of sourcing settings that affect social capital and knowledge sharing in more detail, future research could go a step further and asses the role of other boundaries in sourcing settings. In particular, sourcing from offshore captive units or offshore suppliers tends to encounter distance-related barriers to social capital and knowledge sharing. It would be useful to assess how particular types or degrees of distance, for example geographical distance, degrees of virtuality, culture distance, or institutional distance (see Gerbl et al., 2014) affect social capital and knowledge sharing in captive as well as external sourcing settings, and compare this influence to the effect of organisational boundaries.

Finally, the IS outsourcing literature offers some other reasons for better within- than between-firm knowledge sharing (apart from strong relationships), for example lower risks of knowledge expropriation (e.g. Kogut and Zander, 1996) and of losing core competences (e.g. Trkman and Desouza, 2012), as well as greater ease of using coordination and control mechanisms within than between firms (e.g. Tiwana and Keil, 2009). With regard to the ease and extent of *inter*-firm knowledge sharing, Loebbecke et al. (2016) additionally suggest that this extent varies with the type of knowledge (tacit or explicit), with the mode of knowledge sharing (unilateral or bilateral), and the dynamics of knowledge sharing (intended and actual). Future research should therefore investigate the importance of social capital compared to such other contingencies of knowledge sharing in internal and external sourcing modes.

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Appendix A Measures and factor analysis of components in analysis

Construct	Items	Cronbach's Alpha	Pattern Matrix						% of Total Variance Explained	Average Variance Extracted
Tie Strength	We maintain close social relationships with some members of the vendor/global in-house centre.	0.880	0.814						10.21%	0.718
	We know some members of the vendor/Global In-house Centre on a personal level.		0.821							
	We spend a lot of time interacting with some members of the vendor/Global In-house centre.		0.957							
	We have frequent communications with some members of the vendor/Global In-house centre.		0.787							
Network Stability	We have maintained long-term relationships with our counterparts in the vendor/Global In-house centre.	0.712		0.721					6.62%	.714
	Our counterparts change frequently in the vendor/Global In-house centre. (reversed item)			0.883						
	Our attrition rate makes it hard to keep in contact with counterparts in the vendor/Global In-house centre. (reversed item)			0.918						
Shared Understanding	Our counterparts have a solid understanding of our procedures and practices.	0.897			0.707				22.36%	.588

Construct	Item							%	
	We have a solid understanding of their existing procedures and practices.				0.725				
	Our counterparts have a concrete understanding of our business domain.				0.786				
	Our counterparts and us have a concrete shared understanding of the business objectives of this arrangement.				0.843				
Trust	Our counterpart makes beneficial decisions to us under all circumstances.	0.883				0.811		20.21%	.765
	Our counterpart is sincere at all times.					0.926			
	Our counterpart has always provided us a completely truthful picture of the relevant issues regarding the provision of the services for us.					0.883			
Extent of Knowledge Sharing	Our counterparts and ourselves share know-how from work experience with each other.	0.899					0.822	10.47%	.697
	Our counterparts and ourselves share each other's know-where and know-whom.						0.847		
	Our counterparts and ourselves share business proposals and reports with each other.						0.823		
	Our counterparts and ourselves share manuals and methodologies with each other.						0.850		
	Our counterparts and ourselves share each other's success and failure stories.						0.833		

Appendix B Results with Additional Control Variables

	Knowledge Sharing				Tie Strength				Network Stability				Shared Understanding				Trust			
	B		S.E.		B		S.E.		B		S.E.		B		S.E.		B		S.E.	
Financial services	-0.019		0.096		-0.011		0.138		0.138		0.189		-0.069		0.144		-0.263		0.176	
Retail, distribution and transport	-0.162		0.121		-0.326		0.193		-0.132		0.171		-0.205		0.122		-0.061		0.172	
Pharmaceutical	-0.081		0.151		-0.263		0.314		0.129		0.279		-0.005		0.159		-0.039		0.201	
Electronics	0.046		0.151		-0.103		0.175		0.163		0.242		-0.043		0.183		0.007		0.212	
Energy	0.134		0.221		-0.207		0.403		0.123		0.388		0.101		0.286		0.091		0.265	
Insurance	0.142		0.126		0.214		0.159		-0.045		0.264		0.328		0.187		0.344		0.184	
Telecommunication	-0.003		0.101		-0.103		0.199		0.122		0.203		-0.149		0.188		-0.122		0.224	
Public sector	0.146		0.099		0.048		0.210		-0.098		0.334		0.054		0.182		0.212		0.19	
Other commercial sector	-0.359		0.401		0.685	**	0.216		0.348		0.312		0.526		0.354		0.204		0.272	
Other non-commercial sector	0.054		0.118		-0.243		0.163		-0.145		0.118		-0.113		0.133		-0.351		0.216	
3000 to 5000 employees	0.133		0.083		-0.053		0.154		0.118		0.161		0.032		0.103		0.324	*	0.129	
5000 to 10,000 employees	-0.042		0.075		0.076		0.104		0.191		0.141		0.090		0.019		0.301	*	0.124	
Number of Contracts	0.001		0.011		-0.013		0.024		-0.024		0.024		0.002		0.094		-0.001		0.021	
Duration of Contracts	-0.008		0.012		-0.036		0.019		0.018		0.021		-0.015		0.016		-0.018		0.018	
Strategic Intent: Reduce Operational Costs	0.002		0.065		0.225		0.129		0.348	**	0.106		0.218	*	0.092		0.106		0.139	
Strategic Intent: Improve Service Standards	0.035		0.057		0.092		0.107		-0.023		0.084		0.194	*	0.082		0.346	**	0.129	
Strategic Intent: New Sources of Innovation	0.087	*	0.039		0.168	**	0.059		0.166	**	0.064		0.195	**	0.049		0.129	*	0.061	
Captive Sourcing Arrangement	0.145	**	0.054		0.214	**	0.071		0.111	*	0.051		0.172	*	0.068		0.181	**	0.067	
Social Capital: Tie Strength	0.261	**	0.062																	
Social Capital: Network Stability	0.033		0.045																	
Social Capital: Shared Understanding	0.353	**	0.089																	

	(1) Coef.	(1) Sig.	(1) S.E.	(2) Coef.	(2) S.E.	(3) Coef.	(3) S.E.	(4) Coef.	(4) S.E.	(5) Coef.	(5) S.E.
Social Capital: Trust	0.11	*	0.051								
Constant	0.403		0.283	2.205	0.339	1.726	0.399	1.639	0.301	1.429	0.355
Random Effect Parameter	0.219		0.046	0.411	0.041	0.546	0.063	0.267	0.091	0.408	0.077
Pseudo Log Likelihood	-183.173			-309.599		-335.126		-276.221		-318.359	
Wald Chi^2	718.07	**		110.32		46.26 **		249.75 **		152.15 **	
Degrees of Freedom	22			18		18		18		18	

Notes: The reference category for firm sector is manufacturing, and the reference category for firm size is larger than 10,000 employees.

* $p < 0.05$, ** $p < 0.01$