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Knowledge sharing and social capital in globally distributed execution

Arjen van Dijk, Paul Hendriks and Ivan Romo-Leroux

Arjen van Dijk is Manager of Change and Operations at the Institute for Management Research, Radboud University Nijmegen, Altoona, Wisconsin, USA.
Paul Hendriks is Professor of Organizations and Knowledge at the Institute for Management Research, Radboud University Nijmegen, Nijmegen, The Netherlands.
Ivan Romo-Leroux is based at the Institute for Management Research, Radboud University, Haarlem, The Netherlands.

Abstract

Purpose – *The purpose of this study is to assess whether social capital explains level and quality of knowledge sharing in globally distributed execution. More specifically, the study examined how knowledge sharing in combined European–Asian teams of a globally operating engineering and construction company was affected by these teams' social capital.*

Design/methodology/approach – *Social capital was approached via constructs covering its structural, relational and cognitive dimensions. Data for 325 employees were collected via an online questionnaire and analysed using multiple regression models.*

Findings – *The analyses confirm that components of social capital offer powerful explanations of both the level and the quality of knowledge sharing. The study also found many differences in how social capital affects the level versus the quality of knowledge sharing and also in how it works in the European versus the Asian situations. No social capital factor appeared to significantly predict both level and quality knowledge sharing in the European and Asian situations alike.*

Originality/value – *This study is novel in empirically establishing how knowledge sharing in globally distributed execution is affected by teams' social capital as an integrative construct bringing together individual and group characteristics.*

Keywords Social capital, Multinational companies, Knowledge sharing, Distributed control

Paper type Research paper

1. Introduction

A growing number of studies address processes of knowledge sharing in globally distributed teams (GDTs; Mattarelli and Gupta, 2009; Ghosh and Scott, 2009). The background for an interest in globally distributed execution, and specifically in onshore–offshore configurations, is the recognition that in today's competitive environment, strategic command of global resources is eminently important to many industries (David *et al.*, 2008; Kasper *et al.*, 2013). However, unifying offshore and onshore activities in successful projects remains a challenge to many organizations (Goodall and Roberts, 2003). A key topic of interest here concerns the process of knowledge sharing between the different sites involved in the distributed execution. Necessary as the process is, knowledge sharing is personal, culturally laden and, therefore, particularly in international business settings, not easily effected (Ghosh and Scott, 2009; Cavaliere and Lombardi, 2015). The opposite seems often true; a growing body of literature recognizes that employees are not always competent or motivated to share their knowledge with others, have trouble understanding each other or differ in how they make sense of situations (Barner-Rasmussen and Aarnio, 2011; Goodall and Roberts, 2003).

Within the emerging stream of studies addressing knowledge sharing in onshore–offshore settings, several factors are studied as antecedents of GDT's success and failure. Among these factors, the role of culture has probably received most research attention (David *et al.*, 2008; von Stetten *et al.*, 2012). Cultural differences are shown to play a decisive role in communication, shared sensemaking, awareness and motivation for knowledge sharing.

Also more specific variables related to culture, such as differences in nationality and language, are shown to impact depth and quality of knowledge sharing (David *et al.*, 2008; Levina and Vaast, 2008; Makela *et al.*, 2012). When the infrastructure for knowledge sharing in GDTs is concerned, the role of technology support appears to have drawn much attention, as an enabler for virtual teams to collaborate or as an obstructer to rich communication (Aman and Nicholson, 2009; David *et al.*, 2008). Also attention is given to the nature of the work, and particularly the types of interdependencies between tasks, organization and control structures, and such human resource-related subjects as work–life conflict (Sarker *et al.*, 2010). As several authors point out, GDT settings should not be treated as inherently similar (Kasper *et al.*, 2013). What works in one situation, may be counterproductive in another.

What emerges from the collected studies is that GDT studies should first and foremost pay attention to the social interaction context in individual team settings, and the different types of boundaries involved in it (Makela *et al.*, 2012; Levina and Vaast, 2008). As several authors argue, characteristics of social dynamics across sites regardless of culture are potentially more powerful explanations of success and failure in GDT settings than individual antecedents (e.g. motivation, trust or attitude *per se*) or general differences in culture that are the subject of many studies (David *et al.*, 2008; Mattarelli and Gupta, 2009). As an interesting conceptual background to capture the breadth of the social interaction context, social capital emerges as a useful beacon for research in this domain (Makela *et al.*, 2012; Montazemi *et al.*, 2012; Ghosh and Scott, 2009; von Stetten *et al.*, 2012). Social capital theory (Nahapiet and Ghoshal, 1998; Bourdieu, 1986) focuses on the characteristics of social relationships and their influence on coordinated action (and therefore on knowledge sharing). Social capital has been much used in the international management research domain for understanding how differences in social context affect all kinds of organizational phenomena, such as the level and institutionalization of cooperation (Barner-Rasmussen and Aarnio, 2011; Makela and Brewster, 2009), knowledge spillovers (Liu *et al.*, 2010), detection of bridging possibilities (Slater and Robson, 2012), learning capabilities and adaptivity level (Prashantham and Floyd, 2012), control mechanisms in multinational corporations (MNCs; Blomkvist, 2012; Larkin, 2014; Lupton and Beamish, 2014) and general performance of MNCs (Slater and Robson, 2012). Also, knowledge sharing in an international setting as affected by differences in social capital has received much research attention (Makela *et al.*, 2012; Makela and Brewster, 2009; Montazemi *et al.*, 2012), even if typically not in the specific situation of globally distributed execution teams.

While collective understanding of drivers of knowledge sharing in onshore–offshore GDTs is clearly growing, there are still also many knowledge gaps in this research domain. Above, reference was already made to the tendency of studies to focus on single antecedents, instead of drawing a more integrated picture of the social interaction context. While some studies addressing knowledge-sharing processes in GDTs have already adopted the more integrative concept of social capital as their conceptual lens (Kirsch *et al.*, 2010; Makela *et al.*, 2012; Montazemi *et al.*, 2012), there is a strong need for further empirical research along these lines. Also, a tendency can be noted to focus on innovation in GDTs, while issues of productivity and cost-effectiveness are the main drivers of many organizations to engage in onshore–offshore configurations. Research adopting a focus on productive tasks supported via knowledge sharing is therefore called for. What is also striking in the current GDT literature is that most attention goes to the two sectors of software development (Aman and Nicholson, 2009; David *et al.*, 2008; Levina and Vaast, 2008) and the oil industry (Tharaldsen *et al.*, 2010). There is a clear need for GDT research in other sectors.

To fill these gaps, this paper presents the outcome of an empirical investigation into how social capital impacts distributed execution. Objective of the paper is to show how social capital plays a role in establishing the process of knowledge sharing and how it affects the

quality of knowledge sharing. To that end, a case study is presented of knowledge sharing between two offices at an engineering and construction company headquartered in the USA with a main office located in Western Europe. The two offices addressed in the study are the company's European headquarters and their global execution centre located in Asia. The company embraces distributed execution as a vehicle for achieving cost-effectiveness, and stresses the need of a "one-team" approach in GDT as a precondition for successful project completion. This implies a focus on knowledge sharing as basis for what Buckley and Carter (2004) identify as additive and sequential knowledge combination (two locations contributing to one product, or two locations developing their own new knowledge, to be combined at a later stage). The degree and nature of social capital within and across the sites enters the stage as a relevant explanatory construct.

The structure of the paper is as follows. In the next section, the theoretical background and conceptual model of the research are presented. In the subsequent section, the research site is described. Next, the article elaborates on the methodological approach. Subsequently, the results of the study are presented. The final sections offer discussion and conclusion.

2. Theoretical background: knowledge sharing and social capital in globally distributed teams

2.1 Knowledge sharing in distributed execution

"A globally distributed team consists of individuals belonging to one or more organizations, who are based in different countries, interdependent and guided by a common purpose" (Mattarelli and Gupta, 2009, p. 244). Performance of GDTs critically depends on the team's capability to meaningfully integrate the collective team member's knowledge (Kirsch et al., 2010; Raab et al., 2014; Staples and Webster, 2008). Not just the work in GDTs is distributed but typically also the knowledge. As in any team, knowledge gaps may exist among team members, which may be deepened by the distributed nature of GDTs (Ghosh and Scott, 2009). This immediately translates into the central role of knowledge sharing in GDT operations (Mattarelli and Gupta, 2009). Broadly speaking, knowledge sharing is the process where two or more individuals or groups actively engage in closing some knowledge gap by communicating, combining and matching their insights (cf. Buckley and Carter, 2004). In their review paper of knowledge sharing literature, Wang and Noe (2010, p. 117) state that "Knowledge sharing refers to the provision of task information and know-how to help others and to collaborate with others to solve problems, develop new ideas, or implement policies or procedures". The particular value of knowledge sharing relates to various forms of complementarity of different parties' knowledge that enables or prohibits successful combination (Buckley and Carter, 2004). Processes of shared sensemaking and cognitive convergence more than the distribution of information typify the nature of the knowledge-sharing process (Goodall and Roberts, 2003), and therefore, tacit knowledge and understanding play a key role. Especially in transnational cooperation and knowledge transfer situations, unspoken differences in worldview and sensemaking may hamper effective knowledge sharing, and implicit assumptions of a shared interpretation of a given situation may prove to be misguided, if they even surface at all (Kasper et al., 2013; Montazemi et al., 2012). As Goodall and Roberts (2003) put it, even if physical distance may compound difficulties of achieving mutual understanding, it is not so much the frequency and density of communication that is primarily at stake here, but the socially embedded nature of understanding and translating knowledge into action. Two constructs are offered to capture success and failure of knowledge sharing: the amount of knowledge sharing (Staples and Webster, 2008) and the quality of the process (Raab et al., 2014). Both concepts combined indicate the efficiency and effectiveness of the knowledge-sharing process. The amount of knowledge sharing refers to the number and diversity of activities in which team members build their collective cognition, such as the provision and discussion of best practices, referral to relevant knowledge carriers, activities of shared

problem-solving and the like. The quality of knowledge sharing refers to the content of the process. Typical indicators for the quality of shared knowledge include characteristics such as relevance, accuracy, reliability, timeliness and completeness of shared knowledge (DeLone and McLean, 2003; McKinney *et al.*, 2002).

2.2 Social capital as antecedent to knowledge sharing

As argued above, the social interaction context is singled out by collective GDT literature as the prime influence on knowledge-sharing processes and their effect on GDT performance. Broadly adopted in the international management literature, social capital theory is recognized as offering a powerful conceptual lens for developing an integrative perspective beyond individual factors (motivation, attitude, etc.) and general cultural influences (Ghosh and Scott, 2009; Kirsch *et al.*, 2010; Makela *et al.*, 2012; Montazemi *et al.*, 2012; von Stetten *et al.*, 2012). According to Portes' (1998) review of social capital, the first systematic analysis of the concept dates back to the work of Bourdieu (1986). In his analysis, Bourdieu defined the concept as "the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition" (Bourdieu, 1986, p. 248). Like physical, human and intellectual capital, social capital is a productive resource, facilitating a wide range of actions that create value for the company as a whole, or for the individual employee in specific (Nahapiet and Ghoshal, 1998; Tsai and Ghoshal, 1998; Coleman, 1990; Andriessen, 2008). In organization studies, even if some authors question its conceptual rigour, social capital qualifies as a popular concept for capturing the social relations side to organizations (Andriessen and Gubbins, 2009). Over time, the concept evolved and a consensus emerged that social capital "stands for the ability of actors to secure benefits by virtue of membership in social networks or other social structures" (Portes, 1998, p. 6). These benefits include – among others – privileged access to knowledge and information, reputation and enhanced understanding of network norms (Inkpen and Tsang, 2005).

In this research, the definition of social capital will be adopted that is offered by Nahapiet and Ghoshal (1998). These authors describe social capital as "the 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). While alternative social capital frameworks exist, Nahapiet and Ghoshal's (1998) framework was considered as the most appropriate one for this research. The underlying principles for using this particular framework match Bolino *et al.*'s (2002) rationale: it integrates many of the social capital facets discussed in previous work, it incorporates a cognitive dimension and it establishes a relationship between social capital and intellectual capital (i.e. organizational knowledge; Andriessen, 2008). In addition to this, their framework "accommodates both the private and public good perspectives of social capital" (Nahapiet and Ghoshal, 1998, p. 151). This latter argument refers to the central proposition of this stream of social capital theory, which states that networks of relationships are a valuable resource for the individual and for the organization.

Social capital incorporates many aspects of a social context, a fact that necessitates a multidimensional perspective. Nahapiet and Ghoshal (1998) distinguish three different dimensions: the cognitive, the relational and the structural dimensions of social capital. The first of these, the cognitive dimension, refers to those resources "providing shared representations, interpretations, and systems of meaning among parties" (Cicourel, 1973). These resources include a shared vision (Tsai and Ghoshal, 1998), and shared language (Nahapiet and Ghoshal, 1998). A *shared vision* "embodies the collective goals and aspirations of the members of an organization" (Tsai and Ghoshal, 1998, p. 467). The same authors claim that organization members will be more likely to become partners exchanging their resources when they share a common understanding of collective goals. Nahapiet and Ghoshal's (1998) understanding of the s*hared language* resource links to

Cohen and Levinthal's (1990) idea of absorptive capacity. The latter argue that "the ability to evaluate and utilize outside knowledge is largely a function of the level of prior related knowledge" (Cohen and Levinthal, 1990, p. 128). This "prior related knowledge" includes basic skills, a shared language and knowledge of scientific or technological developments in a given field. A shared language is more than the language itself; "it also addresses the acronyms, subtleties, and underlying assumptions that are the staples of day-to-day interactions" (Lesser and Storck, 2001, p. 836). Basically, a shared language facilitates a universal understanding of the information that is to be exchanged. Shared language also stands for the overlap in knowledge between relational partners (Nahapiet and Ghoshal, 1998). When partners share a similar background or practical experience, communication will be more efficient, as both partners intrinsically understand what it is they are discussing. At the same time, more opportunities for learning will arise due to the increased possibility to combine each other's related knowledge into new knowledge.

The second, relational dimension of social capital describes the kind of personal relationships people have developed with each other through a history of interactions (Granovetter, 1992). It refers to the "assets that are rooted in these relationships" (Tsai and Ghoshalm, 1998, p. 465). Three core constructs defining the relational dimension are trust (Fukuyama, 1995), norms of reciprocity (Coleman, 1990) and identification (Nahapiet and Ghoshal, 1998). *Trust* is "a critical factor affecting interfirm knowledge transfer and creation" (Inkpen and Tsang, 2005). It is a concept that is based on both social judgements (e.g. of the other's competence), as well as on the assessment of the risk in case it turns out that the relational partner is treacherous (Inkpen and Tsang, 2005). A substantial body of research supports the claim that people are more willing to engage in social exchange in general, and knowledge exchange in particular when the trust between one another is high (Fukuyama, 1995). Trust was defined by Child (2001, p. 275) as "the willingness of one person or group to relate to another in the belief that the other's action will be beneficial rather than detrimental, even though this cannot be guaranteed". *Norms of reciprocity* refer to "actions that are contingent on rewarding reactions from others and that cease when these expected reactions are not forthcoming" (Blau, 1964, p. 6). When applied to knowledge sharing, the norm of reciprocity concerns the mutual (perceived) exchange of knowledge between two social actors. Reciprocity is considered as a factor that drives knowledge sharing. *Identification* is "the process whereby individuals see themselves as one with another person or group of people" (Nahapiet and Ghoshal, 1998, p. 256). They argue that it influences the motivation to share knowledge. Identification increases the perceived opportunities for exchange with a social partner, and it enhances the actual frequency of cooperation. When a person or a group of people have conflicting identities, this can create barriers to the sharing of information, knowledge creation and learning.

The structural dimension of social capital regards the overall pattern of connections between actors. Nahapiet and Ghoshal (1998) draw on Granovetter's (1992) structural embeddedness – which describes the impersonal configuration of linkages between people or units – to specify this third dimension of social capital. Among the most important facets of this dimension is the existence or non-existence of network ties between actors, and the network configuration describing the pattern of linkages in terms of measures as density, hierarchy and connectivity (Nahapiet and Ghoshal, 1998). Inkpen and Tsang (2005) add network stability as a third aspect to the dimension.

2.3 Conceptual model and hypotheses

The conceptual model that is used in this research is shown in Figure 1. Based on extant literature (Nahapiet and Ghoshal, 1998; Chiu *et al.*, 2006), a positive relationship is hypothesized between all aspects of social capital and the level and quality of knowledge sharing. For instance, it is assumed that an increase in trust between exchange partners (part of the relational dimension of social capital) will boost the knowledge-sharing process and increase the quality of knowledge that is being shared. A similar positive relationship

Figure 1 Conceptual model
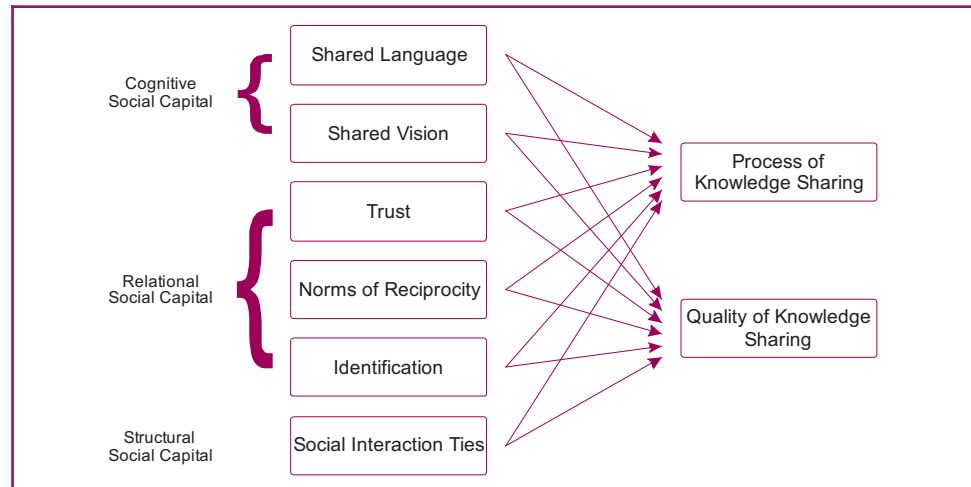
is hypothesized for the relationships between the other five constructs adopted here to define social capital and the process and quality of knowledge-sharing constructs.

3. Empirical illustration

The case organization maintains a network of offices in more than 25 countries. To successfully compete in a strong competitive increasingly globalized market economy, the company is continuously pressurized to increase cost-effectiveness. This has resulted in offshoring detail engineering work from Western offices to offices located in countries where labour costs are significantly lower. In addition to the benefits of cost minimization, this distributed execution also gives Western offices access to a larger and more diverse workforce which, due to global time differences, enables a project group to work 24 h a day. The company recognizes that benefits of using a distributed execution model will be negated if the project team does not act as a single, homogeneous unit. They have adopted a "one-team" approach as critical to overall project success. Sharing available and necessary knowledge with each other is considered to be an important component of the "one team" approach, as are the interpersonal relationships between the team members, which form the foundation for a successful collaboration.

At the moment, the company uses several global execution centres which are located in Asia. This research focuses on the outsourcing relationship between the European office and their primary global execution partner in East Asia. The global execution centre is not an external entity, but an overseas subsidiary fully owned by the company. As only parts of a project are being offshored from a Western office to a global execution centre, bottom-line collaboration is vital for the success of the total project. The necessary work needs to be completed in virtual project teams in which members from both offices have to work together to synchronize their work in the most effective way.

4. Methods

The research population concerns employees at the European and Asian offices who have collaborated with colleagues from the other office. A targeted group of 733 employees from these divisions was selected as potential respondents, combining all 323 employees at the European office and 410 people at the Asian office who, according to their project history, had worked on a project that was executed together with the European office. All these employees were invited by email and received three weeks to fill out the survey distributed as an online questionnaire. After two weeks, a reminder email was sent to guarantee that everybody who wanted to participate in the survey would have the chance to do so.

Additionally, department managers were asked to remind their employees of the survey. Full confidentiality was guaranteed. To avoid social desirability bias, it was warranted that all individual responses would be anonymous. Furthermore, it was confirmed that the analysis would be restricted to an aggregated level that would prevent the identification of any individual. To guarantee this, the company in question demanded that data concerning the researched constructs would be stored in a fully separate file from the data that could be linked to individuals or groups (all control variables; see below). This precluded the use of a stepwise regression. In all, 606 persons replied (a response rate of 82.7 per cent), of which 281 said they had no recent (±5 years) experience with a distributed execution project. The remaining 325 useful responses were marked as the final sample of this research.

The questionnaire that was used combines existing scales (see Appendix 1). The *Process of Knowledge Sharing* construct was measured based on previous work of Weggeman (1997), Lee (2001) and Lee *et al.* (2005). In total, a 16-item measurement was used. This measure examines knowledge sharing from the perspective of the employee, that is the respondent assesses how, according to their opinion, the sharing of knowledge is performed. The *Quality of Shared Knowledge* was measured with Chiu *et al.*'s (2006) adaptation from DeLone and McLean's (2003) and McKinney *et al.*'s (2002) construct measurement. These items measure six attributes of the content of shared knowledge: ease of understanding, relevance, completeness, reliability, accuracy and timeliness.

Building on Nahapiet and Ghoshal's (1998) perspective, multiple constructs were used to measure social capital. Three constructs address the relational dimension. *Trust* was assessed with eight items adopted from Schoorman *et al.* (1996) and Chiu *et al.* (2006) to reflect an individual's belief in the distributed execution colleague's non-opportunistic behaviour and their competence. *Identification* was measured with five items, adapted to "reflect an individual's sense of belonging, feeling of togetherness, and positive feeling" (2006, p. 1,881) towards the distributed execution colleagues, building on prior studies (Nahapiet and Ghoshal, 1998) and the organizational context. Thirdly, *Norms of Reciprocity* was measured with three items from Chiu *et al.* (2006) which focus on the fairness of knowledge sharing. The cognitive dimension was approached via two constructs. The items measuring *Shared vision* were based on the work of Nahapiet and Ghoshal (1998) and Tsai and Ghoshal (1998). This construct concerns an individual's "perceptions of whether members share the same vision, goal, and value about knowledge sharing" (Chiu *et al.*, 2006, p. 1881). A *Shared Language* focused on communication understandability, and its measurement was adapted from Nahapiet and Ghoshal (1998) and Cohen and Levinthal (1990). The construct S*ocial Interaction Ties* representing the structural dimension of social capital was measured in the questionnaire with broadly used and validated operationalizations (Tsai and Ghoshal, 1998; Inkpen and Tsang, 2005; Chiu *et al.*, 2006) incorporating items like network ties, network configuration and network stability.

5. Results

5.1 Reliability and validity of the constructs

Table I shows the Cronbach's alpha values for all constructs. Except for the independent variable *shared language*, all values are above the threshold of 0.70 confirming their reliability. A check learned that only the removal of the third item (concerning occurred misunderstanding) would lift the Cronbach's alpha above the set limit of 0.70 (removal of that item would lead to a value of 0.73). However, for validity reasons, the authors decided not to remove this item, as it establishes the (actual) occurrence of misunderstandings between colleagues of the two offices. Without this item, the variable would ignore the valuable information that can be found in the current and past organizational setting. The final scale measuring shared language consists therefore of five items, with a final alpha of 0.61. As all of the measurement scales originate from previous accepted scientific literature, it was decided that the (content) validity of each individual scale can be

Table I	Cronbach's alpha	
Construct		*Alpha*
Process of knowledge sharing (16 items)		0.87
Quality of shared knowledge (6 items)		0.92
Shared language (5 items)		0.61
Shared vision (3 items)		0.87
Trust (8 items)		0.70
Norms of reciprocity (3 items)		0.83
Identification (5 items)		0.87
Social interaction ties (7 items)		0.81

assumed. The items, of which each scale consists, correspond with the operationalization of the discussed variables.

5.2 Descriptive data

Of the 325 respondents who took part in this research, 61.5 per cent have the Asian execution office as their home office, whereas 38.5 per cent work for the European office. The majority of all respondents are engineers (35 per cent) or designers (27 per cent) at their home office. At the European office, designers represent the smallest group (4 per cent), whereas at the Asian office, they form the largest group (38 per cent). At the European office, most respondents described themselves as engineers (43 per cent). Roughly one-third of the total sample has considerable work experience within the industry (15 years or more, 35 per cent). At the European office, over 80 per cent of the respondents have more than 10 years of experience, whereas at the Asian office, the peak is in the category of 2 to 5 years of experience (37 per cent).

Table II shows the descriptive statistics for the seven constructs. Given the seven-point Likert scale that was used for measurement with values of 5 and higher indicating that respondents are (somewhat or very much) comfortable, values of 5.0 and higher can be taken as indications of a positive picture. What the overall picture shows is that most constructs score above this value. The two exceptions are *trust* (M = 4.79, SD = 0.76) and *social interaction ties* (M = 4.44, SD = 1.17). It is important to note, however, that the results from both offices differ significantly (see the two right-hand columns in Table II showing the results of the independent *T*-test assessing whether the means of the two locations differ significantly; analysis showed that all assumptions to meaningfully apply the *T*-test – normal distribution of the sampling distribution, homogeneity of variance and independence of scores – were met). The lead office in Europe scores significantly lower on all constructs than the Asian office, except for the two constructs of trust and social interaction ties mentioned above. In fact, for the European office, both dependent variables score below 5.0 and not one of the three dimensions of social capital shows values of 5.0 or higher for

Table II	Descriptive statistics for all constructs				
Construct	*Total Mean (SD)*	*Europe Mean (SD)*	*East Asia Mean (SD)*	*t*	*df*
Process of knowledge sharing	5.07 (0.76)	4.61 (0.74)	5.29 (0.65)	−8.05*	195
Quality of shared knowledge	5.29 (0.87)	4.85 (0.87)	5.51 (0.78)	−6.91*	323
Shared language	5.01 (0.74)	4.55 (0.70)	5.25 (0.65)	−5.62*	177
Shared vision	5.37 (0.94)	5.02 (0.93)	5.55 (0.90)	−1.66	316
Trust	4.79 (0.76)	4.45 (0.84)	4.97 (0.65)	−3.23*	167
Norms of reciprocity	5.65 (0.83)	5.54 (0.89)	5.70 (0.80)	−8.84*	316
Identification	5.51 (0.84)	5.28 (0.99)	5.63 (0.74)	−4.88*	315
Social interaction ties	4.44 (1.17)	4.51 (1.36)	4.41 (1.07)	0.69	175

Notes: N (Total) = 325; N (European office) = 109; N (Asian office) = 216; maximum possible mean score for each variable = 7.00; *= $p \leq 0.001$

all its formative constructs. In the Asian office, on the other hand, the emerging image is more positive, replicating the overall picture with all but two constructs scoring over 5.0 (in one case only slightly below; for the Asian office, therefore, only the structural dimension of social capital remains under par).

5.3 Regression analyses

To determine the impact of the multiple social capital constructs adopted in this research on the "process of knowledge sharing" and on the "quality of shared knowledge", six multiple regression models were calculated (two overall models, and four separate models for the European and Asian situations). All models were tested to establish whether the data meet the criteria of linearity, homoscedasticity, normally distributed residuals and lacking perfect multicollinearity. These tests showed for all six models that the data are suited for the application of ordinary least squares regression. Appendices 2 and 3 show the Pearson correlations for the two "total" models (i.e. both research sites combined; Models 1 and 4).

The Models 1, 2 and 3 measure the relationship between social capital and the process of knowledge sharing (Table III). The three models have several things in common. First of all, it appears that norms of reciprocity and the presence of a shared vision do not explain the process of knowledge sharing, seeing as no significant relationships were established in any one of the three settings. Second of all, the variables concerning identification with colleagues at the other office, and the presence of social interaction ties, both proved to have a significant contribution to the explanation of the process of knowledge sharing in all three settings. It is remarkable, however, that, whereas the presence of a shared language shows to provide the greatest explanatory power of the process of knowledge sharing in the assessment of the Asian office by itself, and of the relationship as a whole, it does not show a significant contribution to the process at the European office. The same applies to the presence of trust within the relationship. It does not contribute to the process of knowledge sharing at the European office, while it does have a significant contribution in the other two settings. What is also striking is that the explanatory power of the model in the European situation (Model 2 showing a determination coefficient of 37.5 per cent) is clearly lower than for the other two models (both Models 1 and 3 explain over 50 per cent of variance in the dependent variable). It still remains fair to say that in all three situations, social capital not only shows to be a significant but also a strong predictor of knowledge sharing.

Models 4, 5 and 6 (Table IV) measure the relationship between social capital and the quality of the knowledge shared between the European office and the Asian office. The construct of social interaction ties is the only social capital characteristic that shows no significant explanation of the quality of the knowledge which is shared between the European and Asian offices in any of the three measured settings. When addressing the distributed execution relationship as a whole, all other social capital traits do have a significant contribution to the dependent variable under consideration. The presence of a

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Table III Results of the linear regression models for process of knowledge sharing

Independent variables	Model 1 (Total) B (SE B)	β	Model 2 (Europe) B (SE B)	β	Model 3 (Asia) B (SE B)	β
Shared language	0.38 (0.08)	0.379***	0.19 (0.14)	0.185	0.34 (0.10)	0.328***
Shared vision	−0.02 (0.06)	−0.024	0.06 (0.10)	0.077	−0.11 (0.08)	−0.144
Trust	0.14 (0.05)	0.142**	−0.08 (0.10)	−0.092	0.25 (0.06)	0.251***
Norms of reciprocity	−0.01 (0.05)	−0.006	0.05 (0.09)	0.058	0.05 (0.06)	0.056
Identification	0.17 (0.05)	0.199***	0.23 (0.08)	0.308**	0.17 (0.07)	0.196*
Social interaction ties	0.16 (0.03)	0.247***	0.14 (0.05)	0.263**	0.19 (0.03)	0.309***
Model F	53.86***		9.92***		44.43***	
R^2	0.518		0.375		0.578	

Notes: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

Table IV Results of the linear regression models for quality of knowledge sharing

Independent variables	Model 4 (Total) B (SE B)	β	Model 5 (Europe) B (SE B)	β	Model 6 (Asia) B (SE B)	β
Shared language	0.57 (0.08)	0.492***	0.52 (0.16)	0.439***	0.39 (0.11)	0.317***
Shared vision	−0.15 (0.07)	−0.165*	−0.28 (0.11)	−0.313*	−0.07 (0.08)	−0.075
Trust	0.23 (0.06)	0.200***	0.25 (0.11)	0.240*	0.20 (0.06)	0.167**
Norms of reciprocity	0.15 (0.06)	0.140*	0.13 (0.11)	0.125	0.15 (0.07)	0.158*
Identification	0.18 (0.06)	0.184**	0.07 (0.09)	0.080	0.37 (0.08)	0.351***
Social interaction ties	−0.02 (0.03)	−0.023	not included[a]		0.01 (0.03)	0.017
Model F	58.25***		9.19***		59.15***	
R^2	0.536		0.313		0.644	

Notes: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; [a]the social interaction ties variable was not included in regression Model 5 because this variable appears not to have a significant correlation with the quality of shared knowledge within the Europe sample

shared language demonstrates the strongest positive influence on the quality of shared knowledge based on the European office in isolation and on the entire sample as one. For employees at the Asian office however, identification with European colleagues has the strongest contribution to the prediction of the quality of shared knowledge; with shared language as a close second. A shared vision between both offices is the only variable that seems to have a negative impact on the quality of the shared knowledge, an impact which proves to be significant for the European office by itself and for the entire distributed execution relationship. Finally, in all three models, the level of trust that exists between both offices shows to have a positive and significant impact on the quality of the shared knowledge.

Table V summarizes the outcomes of this research in light of the hypothesized positive relationships between all six aspects of social capital on the one hand, and the two dependent variables (process and quality of knowledge sharing, respectively) on the other. Comparing the predictions, it can be noticed that social capital is a strong and significant predictor both for knowledge-sharing process and quality. Also, for both variables, the explanatory power of the social capital model is lower at the home office than at the overseas office. A striking difference is that the structural dimension of social capital (assessed via "Social Interaction Ties") significantly predicts the process of knowledge sharing, but plays no significant role in explaining the quality of shared knowledge. For cognitive social capital (measured via shared language and shared vision), five out of six relationships prove significant in their explanation of quality of shared knowledge, whereas only two out of six significantly predict the process of knowledge sharing. With respect to the relational dimension, the picture is more mixed (most striking here is the stronger role of norms of reciprocity in explaining quality versus process of knowledge sharing, as indicated by the number of significant regression coefficients).

Table V Summary of significant positive effects between aspects of social capital and the process and quality of knowledge sharing*

Construct	Process of knowledge sharing Total	Europe	Asia	Quality of knowledge sharing Total	Europe	Asia
Shared language	Yes	No	Yes	Yes	Yes	Yes
Shared vision	No	No	No	Negative	Negative	No
Trust	Yes	No	Yes	Yes	Yes	Yes
Norms of reciprocity	No	No	No	Yes	No	Yes
Identification	Yes	Yes	Yes	Yes	No	Yes
Social interaction ties	Yes	Yes	Yes	No	—**	No

Notes: *The study hypothesized all effects to be positive; "Yes" identifies a confirmation of the hypothesis in question; both "No" and "Negative" point to a rejection of the hypothesis in question, respectively, because of a non-significant effect or a significant negative effect; **see the explanation in Table IV

6. Discussion

The social relationships between people – and the social capital that resides within these relationships – have an important influence on the development and distribution of knowledge (Nahapiet and Ghoshal, 1998). This is why this study assessed knowledge sharing in the company's GDTs through a social capital lens. In the case study, a certain lack of trust (cf. the relational dimension of social capital) between colleagues of both offices (emerging primarily in the desire to monitor a colleague's work) appears to exist. Also, the existing social interaction ties (cf. the structural dimension of social capital) between the two offices indicate that the relationships between both offices rarely go beyond the necessary and formal contacts to get the job done. The absence of more personal relationships with one another deprives employees of additional opportunities to exchange knowledge (other than job specific knowledge) with each other. The instability of an employee's overseas network, due to higher employee turnover rates in the Asian office and constantly changing colleagues within projects, also obstructs the development of enduring interpersonal relationships. However, looking at the complete distributed execution relationship, the existence of a certain lack of trust together with the limited social interaction ties do not appear to hinder the process of knowledge sharing and the quality of shared knowledge to such an extent that they become paralyzed (Makela et al., 2012; Montazemi et al., 2012; Raab et al., 2014). Other aspects of social capital, such as identification with colleagues abroad (thus confirming exploratory research by Mattarelli and Tagliaventi, 2010), norms of reciprocity (in line with Lin and Chiu, 2011) and a shared vision (supporting Montazemi et al., 2012) towards helping and learning, prove to occur satisfactorily within the relationship.

The role of a shared language in cognitive social capital deserves specific attention, also with respect to the differences between the two offices. The employees in the Asian office are significantly more satisfied with the level of a shared language than their counterparts in the European office (Table II). From their perspective, there is a significant knowledge gap caused by a difference in work experience and technical background between them and their Asia-based counterparts. When knowledge ought to be shared bidirectionally, but the two acting parties differ significantly in their knowledge level and experience, knowledge sharing will be complicated and misunderstandings are more likely to occur. This knowledge gap also came to light when respondents were asked about what they saw as the benefits of the distributed execution relationship. While almost all employees at the Asian site focused on the benefit of being exposed to new knowledge, employees at the European office focused more on matters like "cultural enrichment" and "efficiency benefits". Interestingly enough, based on the responses of the European office, it was not proven that a shared language has a significant effect on the process of knowledge sharing (even though this relationship does become visible at the Asian office). There does appear to be a strong significant relationship between the occurrence (or lack) of a shared language, and the quality of the knowledge shared between both offices. Social capital proves to play a more subtle role in its effects on knowledge sharing than shown in studies by Montazemi et al. (2012), who inspect all three dimensions of social capital, and Chiu et al. (2006), who only look at the structural dimension. These authors hypothesize and confirm that knowledge sharing will benefit from more structural, cognitive and relational social capital. The data in the present study reveal a more differentiated picture. As shown in the previous section, some relationships proved significant at the level of the whole sample, but not at the level of both research sites. Also when it comes to predicting the process of knowledge sharing, social capital works differently from quality of the process. For instance, the structural dimension *social interaction ties* does predict process but not quality of knowledge sharing. When quality of knowledge sharing is concerned, the cognitive dimension is more prominent as a predictor.

7. Conclusion

Overall, this research confirms the role of social capital as a strong predictor of knowledge sharing (both process and quality). The analysis also shows the differential value and role of social capital when perceived from the sending and receiving end of distributed execution relationships. On average, the process and quality of knowledge sharing as well as the level of social capital are assessed more positively at the Asian office than at the European office. Also, social capital, even if highly relevant, is a weaker predictor for both aspects of knowledge sharing at the European office. A possible explanation may come from the fact that, on average, the Asian office's employees fall short in experience compared with their Europe-based counterparts, which influences the direction of knowledge shared between both offices.

The main limitations of this study concern its focus on only one distributed execution relationship; this should signal limits to the external validity of the results. Further, while the study adopted a broad perspective on social capital covering aspects of all three dimensions, still a selection had to be made of aspects included and excluded in the questionnaires. This implies that perhaps important aspects of social capital have been overlooked. Also, risks of common method bias may be present because data were collected via questionnaires. Respondents may aim at consistency rather than accuracy in answering the questions, thus introducing undue variance in the variables. The use of well-tested questionnaires helps to reduce the risks involved, yet cannot fully eradicate these. Given the setup of the research, care should also be taken with causal interpretations of the relationships. Additional longitudinal research would be needed to better understand cause–effect relationships.

These limitations, in the authors' view, do not damage the relevance of this study's findings. For practitioners, that relevance first and foremost concerns the confirmation of the key role of social capital in distributed execution. Consequently, when considering the need of management intervention in GDTs, insight in holes and deficits of social capital is crucially important for a well-grounded diagnosis. Also the chance of success of improvement programmes is predicated upon the role of social capital in accepting and integrating proposed solutions. Better understanding social capital thus will be key to improved performance in GDTs (Ghosh and Scott, 2009). For academics, the main contribution of this study, next to its confirmation of the strong predicting role of social capital in knowledge-sharing studies and expansion to a case study of an engineering company, concerns the insight into the differential effects of social capital on process and quality of knowledge sharing combined with the unfolding of social capital's role from the sending and receiving ends in distributed work.

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Appendix 1. Questionnaire

Unless otherwise indicated, items were measured with a seven-point Likert scale (Strongly Disagree [1] – Strongly Agree [7]).

Process of knowledge sharing

1. We share information and knowledge necessary for the tasks on hand with each other.

2. We share best practices with each other.

3. We share our success and failure stories with each other.

4. We share business knowledge obtained from newspapers, magazines, journals, television, etc., with each other.

5. We share know-how from previous work experiences with each other.

6. We share our knowledge about whom to approach when a specific situation occurs.

7. We share expertise obtained from training.

8. My counterpart is helping me to increase my knowledge on how to execute my tasks.

9. The culture, atmosphere and climate of cooperation are of such a nature that employees feel free to spontaneously and informally share their knowledge and information with others.

10. The sharing of knowledge with others can strengthen the position of the relevant employee within the organization.

11. It is not worth the effort for an employee to share his knowledge or information with colleagues from the other office.

12. When I am looking for knowledge or information relevant to my work, I end up in most cases with those individuals who know most about that subject.

13. With regard to the acquiring and spreading of knowledge and information, everyone has a duty to obtain as well as transfer.

14. It sometimes happens that costly mistakes are made because the necessary knowledge or information was not available in time at the right place.

15. We pay explicit and formal attention to the distribution of available knowledge and information to those of whom it is expected that they need this knowledge for the execution of their tasks.

16. We learn from each other's lessons learned.

Quality of knowledge sharing

1. The information shared by my colleagues is relevant to the tasks on hand.

2. The information shared by my colleagues is easy to understand.

3. The information shared by my colleagues is accurate.

4. The information shared by my colleagues is complete.

5. The information shared by my colleagues is reliable.

6. The information shared by my colleagues is timely.

Shared language

1. My colleagues use common terminology when sharing information.

2. My colleagues communicate in an understandable manner to share information.

3. When communicating with colleagues, misunderstandings frequently occur.

4. My colleagues have the same technical background in relation to the field of our work as I do.

5. My colleagues have the same work experience as I have.

Shared vision

1. My colleagues share the vision of helping others to solve their professional problems.
2. My colleagues share the same goal of learning from each other.
3. My colleagues share the belief that helping others is pleasant.

Trust

1. Overall, I feel that I can trust my colleagues from the other office completely.
2. I feel comfortable depending on my colleagues from the other office for the completion of team tasks.
3. If possible, I would not give the colleagues from the other office any influence over issues that are important to the successful completion of team tasks.
4. I feel that I will always be able to count on my colleagues from the other office to help me.
5. My colleagues from the other office will always keep the promises they make to their colleagues.
6. I am comfortable letting my colleagues from the other office take responsibility for tasks which are critical to the group, even when I cannot monitor them.
7. I wish I could oversee the work of my colleagues from the other office.
8. My colleagues from the other office behave in a consistent manner.

Norms of reciprocity

1. I know that my colleagues will help me, so it's only fair to help them.
2. I believe that my colleagues would help me if I needed it.
3. I believe that my colleagues and I share an open perspective towards new knowledge or information.

Identification

1. I feel a sense of togetherness or closeness with my colleagues.
2. I consider the members from the other office to be just as much my colleagues as those from my home office.
3. I have a strong positive feeling towards my colleagues.
4. I am proud to be a member of the work relationship between my home office and the other office.
5. I consider the members from the other office as a true part of the project team.

Social interaction ties

1. How often do you interact with people from the other office? (seven categories, varying from Never [1] to Daily [7])
2. How many different people from the other office do you interact with over the course of a project? (five categories, varying from 0 [1] to more than 10 [5])
3. How many people from the other office have you met in person? (five categories, varying from 0 [1] to more than 10 [5])
4. I know some colleagues from the other office on a personal level.
5. I spend a lot of time interacting with some colleagues from the other office.
6. I maintain close working relationships with some colleagues from the other office.
7. When working on a project, I often work together with the same colleagues from the other office during that project.

Appendix 2

Table AI	Pearson correlations between dimensions of social capital and process of knowledge sharing (total)						
Construct	PKS	T	NR	ID	SL	SV	SIT
Process of knowledge sharing (PKS)	1.000						
Trust (T)	0.520	1.000					
Norms of reciprocity (NR)	0.478	0.539	1.000				
Identification (ID)	0.599	0.544	0.629	1.000			
Shared language (SL)	0.624	0.606	0.601	0.658	1.000		
Shared vision (SV)	0.568	0.555	0.669	0.691	0.817	1.000	
Social interaction ties (SIT)	0.425	0.228	0.288	0.379	0.208	0.286	1.000

Notes: For all values, $p < 0.001$ (one-tailed, $n = 325$); data are shown for the whole model (two sites combined); values for the separate European and Asian sites are similar, and also all significant at $p < 0.001$

Appendix 3

Table AII	Pearson correlations between dimensions of social capital and quality of knowledge sharing (total)						
Construct	QKS	T	NR	ID	SL	SV	SIT
Quality of knowledge sharing (QKS)	1.000						
Trust (T)	0.578	1.000					
Norms of reciprocity (NR)	0.543	0.540	1.000				
Identification (ID)	0.583	0.545	0.629	1.000			
Shared language (SL)	0.680	0.607	0.601	0.659	1.000		
Shared vision (SV)	0.562	0.554	0.669	0.690	0.817	1.000	
Social interaction ties (SIT)	0.189	0.229	0.288	0.379	0.209	0.286	1.000

Notes: For all values, $p < 0.001$ (one-tailed, $n = 325$); data are shown for the whole model (two sites combined); values for the separate European and Asian sites are similar, and also all significant at $p < 0.001$

About the authors

Arjen van Dijk is a Business Administration Graduate from Radboud University Nijmegen, with a specialization in the field of organizational design and development. He currently resides in the USA, where he works as a Manager of Change and Operations at a company within the transportation sector.

Paul Hendriks, who has a background in human geography and social-science research methods, is affiliated with the Institute for Management Research at Radboud University Nijmegen as a Professor of Organizations and Knowledge. He is also Associate Dean of Education at the Nijmegen School of Management of that same university. Paul Hendriks is the corresponding author and can be contacted at: p.hendriks@fm.ru.nl

Ivan Romo-Leroux has a background in civil engineering and international management with experience in leading globally distributed execution teams. He also performed the role of Global Knowledge Manager facilitating and supporting the knowledge transfer processes and providing leadership and guidance to the community members.