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The Role of Brokers and Social Identities in the Development of Capabilities in Global Virtual Teams

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ABSTRACT

While organizations are increasingly relying on global virtual teams (GVTs) to carry out knowledge intensive activities, the understanding of how GVTs develop capabilities is still limited. We explore how GVTs adapt routines and build capabilities, and the role played by brokers and social identities in this process. We interviewed 49 professionals working in fifteen GVTs based in Europe, India, and US, and operating in IT and engineering consulting companies. Our multi-level grounded model highlights that, while brokers help in the creation of mutual knowledge, they reduce the accuracy of perceptions about distant co-workers. Mutual knowledge, combined with limited accuracy of perceptions, diminishes the need to adapt team routines over time. The negative effect of brokers on the creation of team capabilities is reduced when individual professional identities trigger the search for more accurate perceptions of distant colleagues and clients with the objective of adapting team routines and performing more stimulating work. On top of this, organizational identity further enables the process of adaptation of team routines. We conclude with a discussion of theoretical implications on the interplay between operational and social processes in GVTs and team capabilities, as well as practical implications for designing and managing GVTs.

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1. Introduction

Organizations increasingly rely on global virtual teams (GVTs), within and across organizations, to conduct knowledge intensive activities, such as R&D, engineering, IT consulting, and marketing (Manning et al., 2008; Mattarelli and Tagliaventi, 2015). Recent academic studies and industrial reports have shown that distributed work, virtual teams, and global virtual teams are becoming commonplace and are indeed changing the nature of work as we typically think of as organizational scholars (Cramton and Hinds, 2014; Gilson et al., 2015; Global Workplace Analytics, 2016; Grant et al., 2010; Hinds et al., 2011; International Data Corporation, 2011; Witchalls et al., 2010). For instance, a report by the Economist discloses that 78% of European managers work in virtual

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teams, many of which are globally distributed, and that, for 49% of European companies, virtual teams have evolved as a natural way to carry out everyday tasks and processes (Witchalls et al., 2010). Additionally, the use of global virtual teams has become a central feature of the organization of work in many companies, be they large multinationals or small born-global start-ups (Ale Ebrahim et al., 2009). Organizations use GVTs to obtain superior performance, while taking advantage of cost differentials across countries and getting access to global expertise (Caya et al., 2013; Gupta et al., 2009).

Unfortunately, the two very distinctive features of a GVT, i.e., the geographic dispersion of its members and the intensive use of collaborative technology like email or Instant Messaging, pose serious challenges to the attainment of high levels of performance. These challenges are related both to team social processes (e.g., increased conflict, reduced team identification, lack of mutual understanding and familiarity, Cramton, 2001; Hinds and Cramton, 2014; Hinds and Mortensen, 2005; O'Leary and Mortensen, 2009) and to operational processes (e.g., increased coordination costs, reduced knowledge sharing, Mattarelli and Gupta, 2009; Mortensen and Neeley, 2012). The literature on distributed work agrees that, when compared to co-localized teams, GVTs find it more difficult to create common repertoires of norms, rules, protocols, and routines. At the same time, though, codification of routines has been found to be strongly associated to superior performance of GVTs, and best practices for managing GVTs advocate the importance of defining, sharing, and codifying norms and routines (Kotlarsky et al., 2014; Mattarelli and Tagliaventi, 2010). Even though literature has underlined the relevance and drawbacks of defining routines in GVTs, we still know surprisingly little about *the process* through which GVTs construct and reconstruct routines over time, i.e. develop a specific team capability related to adaptation. A few studies have delved into the role of brokers in relation to routines and practices in GVTs. Brokers are appointed to GVTs with the aim of sustaining and promoting the use of common practices and routines (Kotlarsky et al., 2008). The literature tends to focus on their positive impact on team outcomes in terms of coordination and knowledge sharing, but we know little about their impact on the development of team capabilities (e.g. Baba et al., 2004; Chen et al., 2013; Johri, 2008). The objective of this paper is to better understand how the team capability of adapting and revising routines is built in global virtual teams, and how brokers affect this process.

In order to investigate the impact of brokers on the development of team capabilities, we interviewed 49 professionals working in five different IT and engineering consulting companies and conducted case studies on fifteen GVTs engaged in offshore projects between India, US, and Europe. We adopted the grounded theory approach (Strauss and Corbin, 1998) to collect and analyze our data. The multi-level grounded model that we developed underscores the negative impact of brokers on the development of team capabilities and reveals how social identities (professional identity and organizational identity) intervene in this process. Specifically, it shows how the use of brokers in GVTs favors the development of mutual knowledge (i.e. knowledge that members of the GVT share *and* are aware they share), but reduces the accuracy of perceptions of team members and clients. With accuracy of perceptions we refer to a *detailed* knowledge that team members hold about who distant colleagues are and what they do within their organizations. Increased mutual knowledge combined with limited accuracy of perceptions have negative implications for the development of team capabilities. This negative effect is overcome when team members' professional identity triggers their search for more accurate perceptions of others, in order to change existing team routines with the objective of gaining better work, such as more knowledge intensive and challenging activities. Finally, our model shows how organizational identity acts as an enabler of this process.

The rest of the paper is organized as follows: we first review the broad literature on capabilities in teams. We then zoom in the specific literature on global virtual teams that has touched upon the issues on capabilities and focus on the role of brokers in distributed collaborations. Next, we present the methodology for the case studies that we conducted in GVTs of five organizations engaged in knowledge intensive work. Our empirical evidence allows us to build a grounded model and a set of propositions that we discuss in terms of theoretical and practical contributions. In particular, the paper provides a better understanding of operational and social processes in GVTs, furthers our knowledge on team capabilities, and provides practical implications for building and maintaining successful distributed teams.

2. Theoretical background

2.1. Team capabilities and the adaptation of routines

Studies on organizational capabilities have pointed to the importance of not only building routines, but also continuously revising and adapting them to fit external changing conditions as well as internal mutable needs (e.g., Felin et al., 2012; Turner and Fern, 2012). While we are aware that the ability to define, share, and modify routines is necessary for GVTs, we need to extend our understanding of how the ability to intervene on routines develops in distributed work settings. GVTs operating in project-based organizations, such as IT and engineering consulting companies, often face changing conditions and develop their own capabilities to handle contingencies (Kotlarsky et al., 2014). In some cases, GVTs can rely on the existing repertoire of organizational capabilities, but often they need to refine existing routines to match them with the specific contingencies that they are addressing. The literature on organizational capabilities provides the first reference to understand how capabilities can develop and be enacted in the organization, and, more specifically, in GVTs.

Since a capability is 'a high level routine (or collection of routines) that, together with its implementing input flows, confers upon an organization's management a set of decision options for producing significant outputs of a particular type' (Winter, 2003, p. 991), routines can be considered as the building blocks of capabilities (Eggers and Kaplan, 2013). Routines are the repositories where experience is stored (Nelson and Winter, 1982) and are then assembled into capabilities (Helfat and Peteraf, 2003; Laamanen and Wallin,

2009; Tripsas and Gavetti, 2000). When coping with changing conditions, organizations are often required to deploy capabilities aimed at defending and improving their position of competitive advantage (Helfat et al., 2007). Owing to the expected link between capability development and performance, research on capabilities has mainly focused on the organizational level, sustained by the idea of explicating how firm competitive advantage is attained and maintained. Only few studies have delved into capabilities at the team level (e.g., Gardner et al., 2012; Haas, 2006), in spite of many organizations resorting to teams to carry out consultancy projects or to address situations involving critical tasks, new product development, or new market entry. Some evidence refers to the processes of knowledge elaboration in teams. When handling replication activities as routines, team members initially rely on codified knowledge from company repositories, but, once they have acquired experience, they instead resort to internal tacit knowledge (Winter and Szulanski, 2001). A group of contributions has tapped into the context of consultancy teams (Haas, 2006; Haas and Hansen, 2007, 2005; Hansen and Haas, 2001). For instance, Haas and Hansen (2005) analyzed consulting teams devoted to developing and bidding sales proposals on the basis of codified and tacit sources of knowledge. The access to different knowledge sources—be they tacit or codified—could have detrimental effects on team performance: experienced teams rely more on codified knowledge and expert advice than on their own expertise, thereby exhibiting lower performances. The authors conclude that ‘the value of utilizing knowledge resources can vary greatly according to the learning and differentiation needs of different task units [namely, teams], implying that a given stock of firm-level knowledge does not confer equal value to all task units in a firm and may hurt task-unit performance if utilized inappropriately’ (Haas and Hansen, 2005, p. 19).

A recent contribution has investigated how teams develop knowledge integration capabilities, i.e., patterns of communication oriented at creating joint contributions in problem solving (Gardner et al., 2012). By analyzing teams in a project-based organization, three main factors emerged as affecting integration capabilities: relational, experiential, and structural resources (the latter referring to how relational and experiential resources are distributed across team members). One surprising result was that the abundance of experiential resources, i.e. team members’ accumulated know-how and expertise, is not always beneficial to knowledge integration and performance. Conversely, in uncertain conditions, it could even inhibit cooperation between team members (Gardner et al., 2012).

Overall, there has been little attempt at understanding how teams revise, modify, and strengthen the routines that they have built. On top of this, the elucidation of these processes in distributed work settings especially cries out for more research.

2.2. Team capabilities in globally distributed contexts and the role of brokers

GVTs face limits in knowledge sharing due to geographic and temporal distance, and some empirical evidence supports that team co-location favors knowledge sharing in comparison with computer-mediated communication (e.g., Hollenbeck et al., 1998). In particular, in GVTs, limited awareness about the contexts, personal characteristics, and competences of distant colleagues makes coordination and knowledge sharing across geographical subgroups more cumbersome (Hinds and Cramton, 2014; Weisband, 2002). Thus, the spontaneous practices that emerge in co-located teams are difficult to replicate in global contexts. This is why empirical studies and best managerial practices underline that distributed teams need codification of practices and the formalization of routines more than co-localized teams (Kotlarsky et al., 2014). On this subject, studies on routines and practices in GVTs have often focused on the ability of brokers to foster coordination and knowledge sharing. In GVTs, managers often appoint brokers (also called straddlers, knowledge intermediaries, and liaisons) to formalize and control the flow of communication and knowledge across subgroups and define specific interaction patterns that team members should adhere to (Kotlarsky et al., 2008).

The literature on the use of brokers in GVTs can be grouped in two broad areas. On the one side are the studies that take a *positive* perspective and underscore the beneficial role of brokers for fostering *team* processes and outcomes. In this line of research, the use of brokers helps team members share practices and codified knowledge (e.g., knowledge about their customers or the architecture of the product that they are designing), thereby improving the functioning of the team and reducing the negative impact of distance. For instance, brokers help diffuse knowledge and information (Baba et al., 2004), bridge different perspectives (Bird et al., 2009; Sole and Edmondson, 2002), and control outcomes and behaviors (Johri, 2008). Chen et al. (2013) further observe how brokers diffuse efficient solutions and ‘best practices’ within and across global virtual teams.

Another set of studies takes a *critical* perspective and focuses on the *individual* experience of brokers in GVTs, often underscoring the difficulties of professionals who need to span multiple cultural boundaries. This literature focuses mainly on individuals who are appointed to GVTs with the objective of bridging cultural boundaries and thus facilitating cross-cultural collaboration among geographical subgroups (e.g., AlMazrouei and Zacca, 2015; Brannen and Thomas, 2010; Dau, 2016; Levina and Vaast, 2005). Such literature investigates how these individuals, who act as brokers between different subgroups in GVTs, strive in a cross-cultural context and become successful leaders. Particular attention has been given to the role of expatriates and biculturals. Expatriates are professionals who are asked to live and work in a different country. A few studies have investigated the process of adjustment to a different culture (e.g., AlMazrouei and Zacca, 2015) and how such process impacts, both positively and negatively, upon expatriates’ boundary spanning activities (Au and Fukuda, 2003). Biculturals, i.e., individuals who have interiorized more than one cultural profile (Brannen and Thomas, 2010), are often appointed as brokers in GVTs. Levina and Kane (2009) underline that, while biculturals are typically successful in addressing coordination issues, they amplify status differences across geographical subgroups, which are often high in GVTs dealing with offshore projects.

The two perspectives just described tend to focus either on the positive effects of brokers on team outcomes or on the individual experience of brokers in complex multicultural collaborations. Only a few studies have investigated the potential pitfalls in the use of brokers on the outcomes of GVTs (Johri, 2008; Leonardi and Barley, 2008; Mattarelli and Gupta, 2009). Leonardi and Barley (2008) underline how the use of brokers reduces the opportunities for direct contacts between individuals—already scarce in a globally

distributed context—and, as a consequence, limits the opportunities for sharing tacit knowledge. In their work, the authors investigated GVTs among India, Mexico, and US, and found that in situations where onsite coordinators were present, the teams were perceived as being more effective. However, for some professionals (e.g., Indians), not interacting directly with their colleagues, but through a coordinator, reduced the opportunities for learning. Similarly, the work by Mattarelli and Gupta (2009) shows that the status difference between professionals working in US versus India is bridged through the use of brokers. In particular, brokers favor the transfer of codified knowledge when status differences are high. Conversely, when status differentials are more limited, brokers hamper spontaneous direct learning between onsite and offshore members.

Our study attempts to disentangle the process through which GVTs construe and revise routines, and the role of brokers in this process. Building on extant research that throws into sharp relief the relevance of brokers in team routine maintenance and diffusion, we aim at tapping into the effect of these brokers upon team capability development. Since brokers affect knowledge flows and sharing in distributed work settings, we expect them to play a role in the process of adaptation of routines. Consequently, our research question is: How do brokers influence the construction and reconstruction of team routines in GVTs?

3. Data and methods

3.1. Research context

To grasp the process through which team capabilities are built in GVTs, we conducted an exploratory interpretivist qualitative research (Bertolotti and Tagliaventi, 2007; Van Maanen, 2011; Walsham, 1995) of fifteen knowledge intensive consulting teams adopting the ‘offshore-onsite model’. Following this model, each GVT is composed by consultants located ‘onsite’ at the client site, ‘offshore’ at the organizational unit (or headquarters) in an emerging country, and ‘nearshore’ in countries near the client (Mattarelli and Gupta, 2009; Oshri et al., 2007). This broad context is of relevance for our study because offshoring of knowledge intensive work, such as R&D, IT, and engineering towards emerging countries has become common and relevant for many large organizations as well as SMEs (Grimaldi et al., 2010; Manning et al., 2008; Oshri et al., 2015). In addition, consulting teams, both co-located and globally distributed, rely significantly on codification of routines, thus rendering the topic of team capabilities particularly salient (Haas and Hansen, 2007).

As in many qualitative studies, the focus of our study was not fully specified beforehand and was developed over time. In particular, our study started within a broader research project that was aimed at investigating the multiple challenges faced by offshore-onsite GVTs. Within this research agenda, we initially selected three large Indian companies that were leaders in providing IT services to clients located all over the world and were adopting the onsite-offshore model: Lightning, BigIT, and Total Consulting.² In the teams that we studied in these companies, consultants were spread between India, where the vendor was located (offshore members), and the US (onsite members), where the client companies were located. The consultants work dealt with creating new IT systems (e.g., developing new software), maintaining existing IT systems (e.g., taking care of bugs, failures, and issues raised by users), or a combination of the two. Team members based in the US typically worked with the client onsite during their daytime and shared the knowledge they were acquiring or developing with offshore colleagues in India through collaborative technology such as email, instant messaging (when possible), and software versioning systems. Offshore members received work from onsite coworkers and sent back their work to their onsite counterparts, taking advantage of time differences. The three companies obtained CMM (level 3 to 5) certification for software development and used work protocols, templates, and collaborative technologies to formalize and document work processes. A program of rotation of team members across onsite and offshore locations was in place.

After a small set of interviews with managers and employees, the importance of routines and brokers emerged and guided our subsequent data collection (i.e., theoretical sampling, Birks et al., 2013; Jones and Noble, 2007) and further qualitative analysis (described in Section 3.3). In order to grasp if the processes that we were disentangling applied also to different knowledge intensive distributed contexts, we looked for additional GVTs in two other companies: Creative Tank and Smart Resources. Creative Tank and Smart Resources are Italian medium-sized organizations, each with an organizational unit in India. They set GVTs to provide engineering services to European companies. Team members take care of a variety of mechanical engineering tasks, ranging from converting designs on paper or 2D drawings to 3D CAD files, to updating existing mechanical systems, and also to designing new mechanical systems. Project managers were based in Italy or close to the client site and managed the requirements from the client. Engineers were mostly located in India and executed the tasks and requests that they were assigned. Interactions between onsite and offshore subgroups were supported by collaborative technology such as email, video-conferencing, CAD data management systems. Rotations between onsite and offshore were set up to improve coordination and knowledge sharing.

We selected two small (instead of large) companies in a different industry (engineering instead of IT) for multiple reasons. First, large consulting companies are typically depicted as more ‘formal’ and endowed with a superior capability of codifying the routines that they use and the knowledge that they develop. However, codification plays a fundamental role for efficiency and efficacy in small and medium consulting companies too (Lissoni, 2001), and there is evidence that these companies make use of GVTs and brokering roles as well (Ale Ebrahim et al., 2009; Mattarelli and Tagliaventi, 2015). Thus, understanding how their teams develop capabilities remains of paramount relevance. Furthermore, a lot of studies have focused on offshoring and GVTs in the IT industry and much less empirical work has been done in different industries, such as engineering, which play a fundamental economic role (Manning

² We use pseudonyms instead of the real names of the companies and interviewees for privacy sake.

et al., 2008). Finally, personal contacts of two of the authors allowed us to get access to the five organizations and to interview team members, following internal approval of the company.

The first two columns of Table 1 contain details about the industry, total revenues, and number of the employees of the five companies when we started our data collection.

3.2. Data collection

We conducted in-depth semi-structured interviews with 49 people working in 15 teams operating in the five companies. In order to select the teams, we made preliminary interviews with top managers to identify GVTs that were representative of the work conducted within the five organizations. Then we interacted with the project manager of each team in order to identify team members with different positions who were based onsite or offshore or who had experienced working both onsite and offshore. The consultants of Lightning, BigIT, and Total Consulting are Indian (33), while the ones in Creative Tank and Smart Resources are Italian (5) and Indian (11).

Table 1 provides additional information about teams and team members. In particular, it contains details on the specific projects and clients that they are dealing with, the tenure of the GVTs, i.e., how long team members had been working together, GVT size and configuration, i.e., how members are distributed across geographical subgroups, and the roles of the members that we interviewed. The IT and engineering projects of the 15 teams addressed clients belonging to multiple industries, e.g. retail, banking, automotive, packaging, and agricultural machinery. Team members had been working together for a time ranging from 4 months (Total Consulting Team 1 and Creative Tank Team 2) to 5–6 years (e.g., Big IT team 1). Team size ranged from 3 members (Smart Resources team 5) to 100 members (Lightning Team 1), with larger teams belonging to the larger companies. Teams were composed of two geographical subgroups, with the exception of Total Consulting Team 3, which was composed of two subgroups in different locations in India and one subgroup in the US. The interviewees held different positions within their teams: 15 were project managers, 17 middle managers or team leaders, and 17 developers or team members. Most of our interviewees (33) had worked both onsite and offshore. Two of them had just returned offshore, from onsite, and were able to provide the onsite perspective only. The remaining 14 persons had only worked offshore on the specific project (though 2 of them were onsite for another project).

Interviews lasted 1 h and a half on average. We asked our informants to tell us about their experience in GVTs, if and what issues they had handled and how they had overcome them, what were the advantages and drawback of working in GVTs, how they had built routines to work from a distance, and what support they had received from management. After the initial interviews, professional identity and organizational identity emerged as relevant concepts. Accordingly, we added questions to capture the values, attributes, and preferences interviewees associated with their work as IT and engineering professionals and as members of their organizations.

We also collected archival data, mostly internal documents, meeting excerpts, and project websites and repositories, to better understand the context of the work of our informants and their teams and organizations.

3.3. Data analysis

To analyze interviews and documents, we followed a three-step coding process (e.g., Gioia et al., 2013). In undertaking this process we continuously went back and forth between data and literature on GVTs and capabilities to highlight similarities and discrepancies that could further inspire our coding and theorizing, and to detect any inconsistencies between new intuitions and our data (Miles and Huberman, 1994). As a first step, the first three authors read all the field notes several times to get a thorough view of the data. We met on a regular basis to analyze batches of two or three transcripts and discuss our independent open coding. Open coding pertains to the identification of the recurrent phenomena found in the text, derived from respondents' terminology. Each word, sentence, or paragraph is analyzed with the objective of responding to questions such as: What is this an instance of? What is this about?. Drawing on similar statements, we identified some recurrent themes that we grouped into first-order concepts (such as 'circulation of codified knowledge supported by brokers' and 'development of the same knowledge bases by team members from different locations'). Second, the first three authors separately grouped convergent first order concepts at a higher level of abstraction, i.e., identified theoretical categories or 'second-order themes'. Through second-order themes, we aggregated recurrent first-order categories into theoretical concepts that can be used to explain what is happening in the context under study (Gioia et al., 2013). In creating second-order themes, we availed ourselves of existing literature and we held joint meetings to compare the theoretical categories that each of us had disclosed and reconcile disagreements through discussion. For instance, we grouped the above-mentioned themes into the category 'mutual knowledge', which is a concept defined by Cramton (2001). The data structure reported in Fig. 1 summarizes the first-order concepts and second-order themes that we identified. In order to further check for the reliability of our coding, we asked the fourth author to code a sample of the interviews with the final coding scheme and we compared the emerging coding with that of the first author. We computed Cohen's Kappa that was, on average, higher than 0.8. As a third step, we detected relationships between second-order themes and built a grounded model. Following Gioia et al. (2013), the grounded model 'should be one that shows the dynamic relationships among the emergent concepts that describe or explain the phenomenon of interest and one that makes clear all relevant data-to-theory connections (thus allaying the usual concern that qualitative research too often does not show just how data relate to theory).' (p. 22). It is important to notice that the novelty of our theorizing does not lie in the single categories of our grounded model, but in the relationships that we discovered and in the overall model that we propose.

In the following paragraphs, we present our findings organized by the second order themes that emerged through our coding. Fig. 2 depicts our grounded model on the development of team capabilities.

Table 1
Characteristics of the GVTs under investigation at the time of the data collection.

Vendor organization	Characteristics of the organization	Teams	Description of the project	Client Domain	GVT tenure	Configuration of the GVT	Interviewed GVT members ^a
Total Consulting Large multinational that offers ICT services	Revenue: 4,2 billion Total Employees: 91,187	Total Consulting Team 1	Update of an old application for assortment and development of a new decision-making tool	Retail	4 months	8 people onsite in the US; 15 people offshore in India	1 developer, 1 project manager, 2 middle managers
		Total Consulting Team 2	Maintenance of an existing E-commerce project portal and development of a promotion management tool directed to end consumers	Retail	2.5 years	16 people onsite in the US; 22 people offshore in India	1 project manager, 1 developer
		Total Consulting Team 3	Support for an online system to retrieve stock data about grocery levels	Retail	1.5 years	5 people onsite in the US; 12 offshore in India (site 1); 3 offshore in India (site 2)	1 middle manager, 1 project manager, 2 developers
Lightening Large multinational that offers ICT services	Revenue: 4,9 billion Total Employees: 61,179	Lightening Team 1	Development and maintenance of applications for new food distribution centers	Retail	2 years	30 people onsite in the US; 70 people offshore in India	2 developers, 1 project manager, 1 middle manager
		Lightening Team 2	Support and enhancements for middleware and back-end systems (e.g. customer database, address database)	Banking	5 years	12 people onsite in the US; 40 people offshore in India	2 project managers, 4 middle managers, 2 developers
		Lightening team 3	Development of a new system for collecting data on insurance products clients plus adaptation and maintain the existing application	Banking	6 months	22 people onsite in the US; 25 people offshore in India	1 middle manager, 2 developers
BigIT Large multinational that offers ICT services	Revenue: 5,7 billion Total Employees: 100,000	BigIT team1	Development and maintenance of an application for car-dealers	Automotive	5 years	19 people onsite in the US; 25 people offshore in India	2 middle managers, 1 project manager, 1 developer
		BigIT Team2	Support and enhancements for trade settlement application	Banking	4 years	6 people onsite in the US; 14 people offshore in India	2 middle managers, 1 developer, 1 project manager
		Smart Resources Team 1	Completion of product range Conversion from 3D to 2D models	Packaging	6 years	3 onsite in Italy; 7 offshore in India	3 project managers, 1 team leader, 1 team member
Smart Resources SME that offers engineering services	Revenue: 6 million Total Employees: 105	Smart Resources Team 2	Completion of product range	Automation	1 year	2 onsite in Italy; 7 offshore in India	1 project manager, 1 team leader, 1 team member
		Smart Resources Team 3	Conversion from 2D to 3D models Drafting	Packaging	3 years	1 onsite in Italy; 4 offshore in India	1 project manager, 1 team leader, 1 team member
		Smart Resources Team 4	Conversion from 2D to 3D models	Agricultural machinery	6 years	1 onsite in Italy; 7 offshore in India	1 project manager, 1 team leader, 1 team member
Creative Tank SME that offers engineering services	Revenue: 5 million Total Employees: 27	Smart Resources Team 5	Design of new packaging machines	Automation industry	1 year	2 onsite in Italy; 1 offshore in India	1 project manager, 1 team leader, 1 team member
		Creative Tank Team 1	Conversion from 2D to 3D models	Packaging	1 year	2 onsite in Italy; 4 offshore in India	1 project manager, 1 team leader, 1 team member
		Creative Tank Team 2	Industrialization of an existing product for a new market	Wood making	4 months	1 onsite in Italy; 4 offshore in India	1 project manager, 2 team members

^a The sum of the numbers of interviewees from this column is larger than 49 (i.e., the numbers of people we interviewed) because some individuals worked in more than one team at the same time.



Fig. 1. Data structure.

4. Findings

4.1. Presence of brokers

The global virtual teams that we studied used, albeit to a different extent, brokers, i.e., individuals holding a managerial position, who took care of filtering and controlling the communication and knowledge flow between the subgroups (Levina and Vaast, 2008; Nicholson and Sahay, 2004; Sahay et al., 2004).

For instance, in the large companies that we studied, the formal use of brokers in teams Total Consulting team 3, Lightening team 2, Lightening team 3, Big IT team 1, and Big IT team 2 reduced the opportunity for direct interactions among team members as well as direct interactions with clients. For Big IT team 1, and Big IT team 2, an onsite broker—in the form of a ‘Subject Matter Expert’ or a

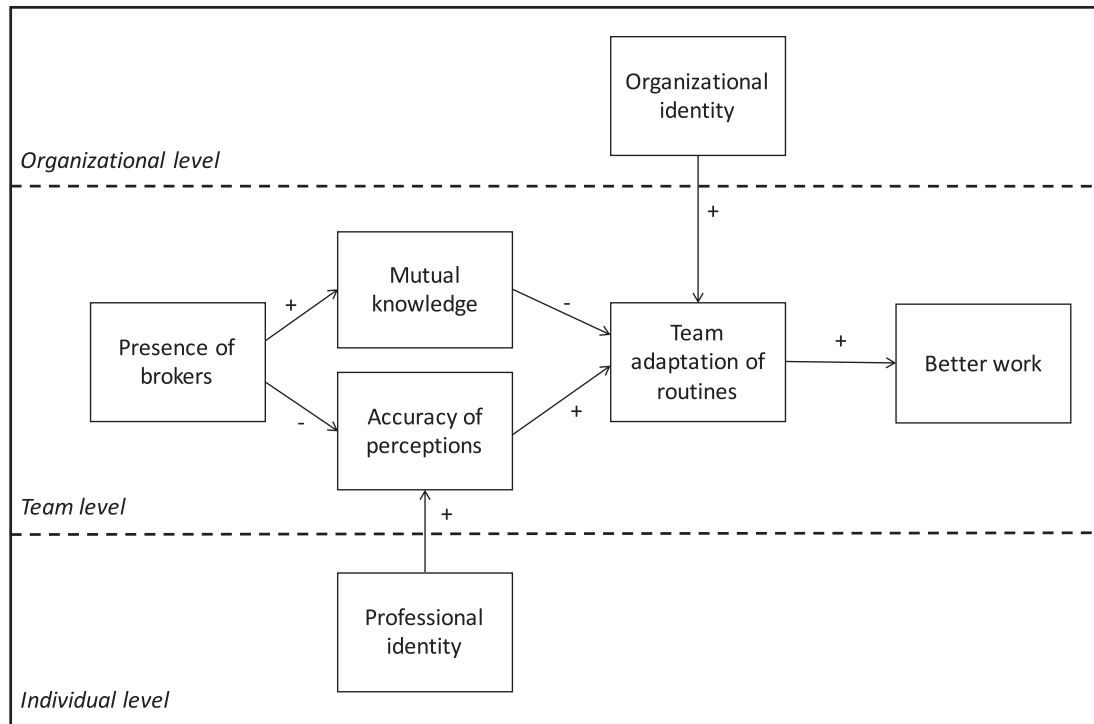


Fig. 2. A model on the role of brokers, professional identity, and organizational identity, on the development of team capabilities in global virtual teams.

'Lead'—acted as a coordinator who filtered the interactions between onsite and offshore members. In Total Consulting team 3 and Lightning team 3, the onsite broker was the only onsite member who directly interacted with members of the client organization. In Lightning team 2, an offshore broker played the role of coordinator between the onsite broker and offshore members. In the following field note, Mahesh, a project manager, describes the function of brokers in Lightning team 2:

We have one lead in every location. At onsite, the lead talk to the client managers to get, like for engineering fixes, they get, you know, all the fixes prioritized. So, they have meetings with the user managers during their local times. For example, New York local time 8:00 to 6:00. Then, they pass the work offshore, that is to say to the lead offshore.

A similar broker configuration applies to the teams operating for the medium-sized companies. Both of them avail themselves of project managers who interact directly with clients and act as brokers between locations. In the case of Creative Tank, whose customers are both Indian and European companies, Indian or Italian team members based at the customer's location are appointed as project managers. Indian managers are preferred when the customer is Indian, whereas Italian managers are expected to be well suited to European customers. Conversely, in Smart Resources, whose clients are almost exclusively European big companies, project managers are always Italian. A common feature of both medium-sized companies, however, is that team members lack direct contacts with the client and feel *'detached from the clients' world'*, as a member of Smart Resources team 1 asserted. Not being able to reach the client straightforwardly was perceived as particularly penalizing by Indian teammates, who did not have frequent chances of working with, and increasing their knowledge about, mechanical firms in India. Many of our informants would underline how sorry they felt about these missed opportunities by saying that *'unfortunately'* they could not set a direct link with customers.

Differently from the previous teams, in Total Consulting team 1 and Total Consulting team 2, all client members, onsite members, and offshore members had frequent occasions of directly interacting with each other, face-to-face or by using collaborative technologies such as email, instant messaging, video and teleconferencing. In Lightning team 1, since the team was very large, only onsite members typically interacted with the client, but provided continuous updates to, as well as consulted with, offshore members. Stated differently, in these teams, the use of brokers was less relevant for the successful execution of work.

4.2. The influence of brokers on the development of mutual knowledge

Our interviews revealed that brokers, consistently with their role, allowed for an even distribution of communication and knowledge within the team. In particular, the role of brokers was central for circulating codified knowledge within the team, through documents, templates, protocols, and shared knowledge management systems. On top of this, brokers allowed for the building of mutual knowledge, defined as the knowledge that members of the GVT share *and* are aware they share (Cramton, 2001).

As Vasundhara, a member of Lightning team 1, stated, although working from a distance and the lack of direct contact with the client render the flow of knowledge among team members slower and somewhat harder than in co-located work contexts, in the end team members perceive to have the same knowledge across sites:

It does not have the same flavor as the firsthand knowledge transfer if it is happening only onsite, but through a different flavor the same end result is achieved. You will not get it through a classroom session or through a hands-on, but you get it in the form of documentation and then you still get the knowledge through a different process, maybe a little longer, maybe somewhat difficult but the, ultimately all three [team] locations have to be at the same knowledge level to be able to provide continuous support.

4.3. The influence of brokers on the accuracy of perceptions

While brokers allowed for creating mutual knowledge within their teams, their filtering role reduced the direct interactions through which members could know, in detail, about each other and their clients. In other words, an intense use of brokers reduced the opportunities for understanding and appreciating the background and work of distant team members and clients. We refer to this detailed awareness about others as accuracy of perceptions (e.g., Kilianski, 2008). The perception of who distant coworkers are appeared to be particularly vague when the project manager acted as a broker. In those cases, the project manager, who interacted with the offshore team leads, filtered most relationships. Although team members praised project managers' high level of competencies and experience, they felt detached from distant coworkers. Moreover, they often mentioned being stressed about the fact that they were not able to tell anything detailed to friends or relatives asking them how the professionals with whom they collaborated from a distance were.

Srinivasan, a member of Smart Resources team 3, described the combination between the appreciation of project managers and lack of understanding of distant teammates that he would experience by saying that: *'Our project managers are excellent, but they used to shield us from our colleagues who are in Italy. I sometimes wondered what their [distant coworkers] opinions were [about us], to what extent they were satisfied with our work.'*

In addition, we detected a blurred perception of clients in all teams where a broker was present. Being cut out of direct interactions with customers led team members to doubt about how their clients worked, and what their preferences and expectations from the team work were. Shashid (Lightening team 1) sums up how the clients would remain unfathomable to those who were not in touch with them in the excerpt from the interview below:

On a day-to-day basis we did not get communication from him [the client] directly. All we get to hear was from our onsite counterpart [broker], who was in touch with him. So basically we could get to know what he was working on only through these tools [...] and he would be quite a mystery to us.

4.4. The influence of mutual knowledge and accuracy of perceptions on team adaptation of routines

Our data show that high levels of mutual knowledge combined with a low accuracy of perceptions about others in GVTs reduce the capability of the team to adapt existing routines and, as a consequence, make the team stable, but less prone to face changes. Specifically, establishing mutual knowledge reduces, in team members and managers, the need for finding new ways to do things. At the same time, reduced knowledge about other members' and clients' preferences and characteristics hampers team members' ability to propose changes for their team and therefore foster redefinition and improvement of routines.

Rama, the team lead of Creative Tank team1, expresses in the excerpt from the interview below how the level of common knowledge achieved by team members is intertwined with an approximate understanding of who the client and distant coworkers may be and the negative impact on the team ability to change.

Being satisfied with what you think is the team knowledge base may be harmful. You believe that you know enough and, at the same time, you don't have quite an idea about what the others over there [onsite] know. The risk is to stick to how things are being done, carefully searching to avoid any disturbance to the current way of doing.

4.5. The influence of professional identity on the accuracy of perceptions: towards better work

The process described above suggests that an intense use of brokers brings about inertia within the team. We found this result interesting, because GVTs significantly rely on brokers to coordinate their activities. Thus, when analyzing our data, we asked ourselves: are GVTs with brokers really so bad at developing team capabilities? In our data, we found instances of teams that actually changed their routines over time. In trying to understand this process more, we discovered the agentic role of individuals. Specifically, we found that team members' professional identity (i.e., the set of values, beliefs, and aspirations that an individual uses to define herself as a professional, Pratt et al., 2006), based on values such as visibility, autonomy, ownership, and continuous learning, triggered their desire for getting more interesting and knowledge intensive work. In order to do so, individuals strived to understand more about their clients and their team members (i.e., to increase the accuracy of their perceptions) to be able to propose changes in routines that would let them play out their professional identity.

Vasundhara, a member of Lightning team 3, underlines how being in direct touch with customers is a core feature of software developers' professional identity that they try to attain when she says that *'We actually look for interactions particularly with the client managers. This visibility is the thing that people long for'*. Similarly, Krishna, a Smart Resources team 4 member, stresses the centrality of continuous learning for a professional: *'The main characteristic of an engineer is that we have a passion for learning'*. Concerning ownership of a product, i.e., the opportunity to see the development of a product through from its initial conception down to its delivery to the client, *'it's unnatural for a professional not to aspire to get a grasp on each and every activity that goes from receiving a request [from a client] to its implementation'*.

Team members seek opportunities to enact the features of their professional identities in their everyday job. This aspiration leads professionals to learn more about distant team members and clients in order to propose and enact changes aimed at getting better work and thus to make their work more consistent with their professional identity. For instance, participating in rotation programs, which require that an exchange between onsite and offshore members take place about every six months, and visiting the client companies help our informants refine their perceptions about customers and distant co-workers. Concerning the former, Sundar, a member of Smart Resources team 3, stated that spending some time in Italy at the client's site led him to realize that clients were willing to open up to further collaboration with the virtual teams and expected some proactivity on offshore members' side:

Two years ago I spent six months in Italy [...] I worked with the client company's managers and I grasped an openness that I would have never expected. They were waiting for us to go beyond the current deal and push our common effort forward.

Driven by their professional identity, individuals also try to develop more accurate perceptions regarding distant colleagues. For instance, some team members developed accurate perceptions about others' competencies by intensifying the use of Skype and videoconference to *'see what my counterpart is like'* (Rama, Creative Tank team 2 member) whenever possible. Conversely, in other teams, individuals used stereotypes and broad cultural visions to describe the competencies of their distant colleagues.

In some teams, offshore teammates developed a profound understanding of the contextual differences across sites that made them weaken their perceptions of a gap in competencies with onsite colleagues. The diffused rhetoric on collaborations between the Western and emerging countries is based on the idea that there is not just an economic gap, but also a competence gap between countries. Gurudas, a Creative Tank team 2 member, told us that he came to understand that members across sites differed in terms of the opportunities that they enjoyed, not of the competencies that they deployed. Italian team members had, in fact, the opportunities to work more intensively with mechanical firms than Indian team members, who worked in a context mostly populated with service companies; however, the core of their competencies were alike. In his own words:

They [Italians] are used to working with the biggest automotive players and mechanical suppliers, while here we tend to work more with IT companies and service companies in general, but in the end we are as good as they are, technically speaking.

Conversely, other teams were imbued with the perception that distant co-workers had different knowledge bases, another perception that was grounded in the diffused rhetoric on distributed collaboration between developed and emerging countries. For instance, a recurrent claim made by Indian team members was that their education was more practice-oriented than that of their Western colleagues, who were more prepared from a theoretical point of view. Likewise, some team members felt that a different seniority accounted for a difference in technical expertise. Concerning this, in onsite-offshore GVTs, junior members used to be assigned offshore, while more experienced ones were located onsite. This criterion nourished the perception of a difference in competencies that had to be overcome.

4.6. Accuracy of perceptions and the development of team capabilities: getting better work

An accurate perception of clients' and distant team members' characteristics and expectations – which a fuller enactment of professional identity can foster – enables teams to generate and revise their routines. Specifically, the perception that distant co-workers may have dissimilar competencies (e.g., lesser experience with mechanical projects) prompts the continuous adaptation of knowledge sharing routines. For instance, Lightning team 2, after realizing that some members lacked competencies on core application functionalities and that the formal training that the company offered to newcomers was not sufficient, established a routine informally called *'brushing-through'* aimed at transferring additional knowledge to new team members. Shashid describes below how the knowledge sharing process is handled within the group:

Some of us need a more extensive knowledge transfer on core application functionalities. Even if they have some awareness [thanks to the company induction programs], there will be a brush-through on the entire area of support provided by some us. You can see it as a double-check.

Brushing-through occurs through videoconferences usually taking place at the end of the week, i.e., on Fridays, in which relatively more expert team members explain technical features to less expert ones and discuss frequent issues that they face in their everyday work.

When team members are perceived as having similar technical expertise, teams set routines aimed at codifying and updating best practices. Best practices refer to how to respond to clients' requests, transfer knowledge across projects, and assign work to team members. Regarding clients' requests, team members reported on how they came to agree on the steps to follow to plan activities

on a daily basis and tackle unexpected events. An example is the definition of the routine that our informants labeled as 'overcoming showstop', which calls for interactions between onsite and offshore members to clarify clients' requests and avoid delaying responses, that Kipra (Lightening team 4) described as:

We get to know how many requests there are per day. Say there are around five requests, so in that case I call my onsite counterpart and find out, you know, what it actually means. Some of the emails [...] might not be clear to me. In that case, I call him and just make sure that we are all in the same page. So, in these calls I include my team members here also so that even they are aware [...]. If they have some questions they can clarify in the morning itself because of the [...] overlapping period. So we have some liberty to talk to them and substantiate the data, which we receive. [...] Maybe at some point of time we realize that: 'okay, now, you know, this is a showstopper!'. I cannot go ahead, so in that case, at the end of the day, we send a mail to onsite [coworkers] saying to them our concerns, and in case there were something very urgent, in that case we call them and we tell them until what point we have reached.

Another best practice, developed mostly in teams whose competencies are perceived as evenly distributed, relates to the recording and the reuse of the 'lessons learnt' in a specific project. Some teams resort to shared repositories and regular discussions to 'make sense of the experience that we have made and render it a common asset to build on', in Sankar's words. He describes how his team has created a repository called SMTD and organizes weekly meetings to analyze what they have done, and how to proceed further:

We maintain a repository called as SMTD. This SMTD is the master document for all of us. So SMTD is updated by each and every person with [...] whatever lessons we have learned and the best practices which we follow in the project that is [...] discussed among each other in our weekly meeting. We have a weekly meeting in which we basically discuss all the lessons, which we have learned and the best practices, which we followed during the week. During this particular week whatever we have learned we will be telling each other and whatever we have learned, any new things, which we have learned and any new outcomes we discuss with the onsite person..

Team members also exploit their perceptions of similarities and differences to discuss and converge upon the most convenient team structure based on the projects at hand, as Vasundhara (member of Big IT team 3) told us:

I get a feedback from my offshore counterparts and I also have one-on-one meeting with each of the regional managers before I take over, and then I ask them what are their priorities, what are their thoughts about offshore, what kind of work they need to work from here. So, taking all these inputs we kind of make this team structured altogether, so that we are better aligned to work on the priority of what we have defined there.

Teams also employ more accurate perceptions of who distant members are in order to elaborate statistics that help them gauge the team performance and grasp how to improve it. For instance, members of Lightning team 3 converged on the design and management of a performance measurement system that was not in place before, the so-called 'resolution scorecard', as Sankar describes in the excerpt from the interview below:

Initially, there was no mechanism kept in place. We were doing it but, you know, actually it was not clearly visible to the clients, but later we came up with innovative ideas wherein we started tracking each and every call which we receive. We have something called as, you know, resolutions scorecard as well as response scorecard. That means if I receive 100 calls this week we can exactly tell within how many minutes we have responded to that call and, you know, we have a scorecard engine, which each and every day sends a mail to the clients as well as to the Lightning team saying, you know, what is the compliance level today [...] So that's an innovative thing, which I think we have done.

Also the perception of the openness of customers sustained the birth and renewal of team routines. The idea underlying changes in routines aimed at better serving clients is that teams can propose additional services to clients that go beyond the initial arrangement. As reported above, in line with the perception that 'clients' curiosity has to be fed' (Ram, Creative Tank team 3), team members try to overcome repetitive processes that penalize their identity of professionals who have a thorough view on products, and experiment with new solutions. Unnikrishnah (Total Consulting team 2) underlines how clients and suppliers co-evolve and how it is a team necessity to imbue the relationship with a strategic perspective:

When we define a customer, every year we move up the value chain primarily, we start with a transaction, we have to weigh things, then we basically try to get into the real business thing. Then over a period of time you mature, the customer matures, and then you get into the strategic way of doing things. [...] We manage lot of their applications from the maintenance perspective, but now we have extended, we are trying to bring the solution services as well. Like, you know, how can we help customer building solutions which is very strategic in nature?

Some of the individuals whom we interviewed used the 'hungrying the client' metaphor to account for the team ability to propose new services to clients, thereby enriching their relationship. In particular, Vasundhara (Total Consulting team 1) compared her team effort to come up with new ideas that may be appealing to clients to the offer of more appropriate food by a restaurant:

So if you get into the strategic thing, see, it is primarily you can look at it like this. See, I'm telling you, see, you want a burger; you're asking me, "See, I want a burger," okay. Now I'm going and getting a burger for you, okay. So I have to figure out a place where, you

know, maybe, you know, some 5, 10 miles away and get that burger for you. Now, but if you say “I’m still hungry,” okay, I can go to another shop and give you something better than a burger.[...] I will fulfill your hunger with the right food, with the fastest way of getting the food [...] I know the right shop, I know the nearest shop, I know what you want. I will give you a better dish to eat, which is good for you.

4.7. The effect of organizational identity on the adaptation of routines

We found that the process of adaptation of routines was further supported and enabled by the organizations' core values, i.e., in the response that insiders would provide when asked ‘Who are we as a company?’ or organizational identity (e.g. Clark et al., 2010). In particular, our data show that values such as flexibility and innovation promoted the continuous adaptation of routines within the GVTs that we studied.

Smart Resources and Creative Tank are small companies that are centered on flexibility and continuous adaptation as key features, allowing for routines to be endlessly morphed upon knowledge gathered in projects, as the CEO of Smart Resources stated during an interview:

We are decidedly lean, scarcely structured, we don't have rules that are carved in marble: simply, whatever one of us raises as an interesting topic, we appraise it together and see whether it's worth implementing, involving whoever might have a say. [...] Something interesting can come out of any project, something that has been overlooked up to now and adds another brick to our way of doing things.

Big companies like Total Consulting, Lightning, and Big IT are characterized by a higher degree of formalization and a defined set of routines. Their essence as *innovative* organizations, however, requires that they be continuously searching for new ideas and fostering revision and adaptation of routines, as Unnikrishnan, member of Total Consulting team 2, highlights: ‘*We basically are a technology company that tests the water and never sleeps. It's true that we need common ways of doing things, but these ways must be under continuous construction if we want to stick to our values.*’

The field notes above also suggest that organizational identity not only enabled the adaption of routines, but it also allowed for a continuous synchronization between team and organizational routines. In other words, the new routines defined at the team level were often scrutinized to become organizational routines, because it was core for these organizations to be flexible and innovative.

5. A grounded model on the development of team capabilities in global virtual teams

The evidence described above is summarized in our multi-level grounded model in Fig. 2 that depicts how team capabilities are developed in GVTs. Table 2 contains a set of propositions derived from our grounded model.

Our model underscores the relevance of the presence of brokers, individuals' professional identity, and organizational identity in engendering social processes that favor (or inhibit) the development of team capabilities. Specifically, the grounded model shows how the use of brokers in global virtual teams favors the development of mutual knowledge (see Proposition 1a). The establishment of mutual knowledge, though, reduces team efforts in, as well as members' desire for, building new team routines or changing existing ones (see Proposition 2a). The use of brokers in fact reduces and filters the interactions among team members and between team members and clients and, as a consequence, hampers the development of accurate perceptions about other team members and clients (see Proposition 1b). However, accuracy of perceptions of other team members and clients is required in order to revisit and change existing team routines and sustain team capabilities (see Proposition 2b). Our data also show that team members' professional identity, associated with their desire of working on complex projects and gaining autonomy, visibility and ownership of their work, counterbalances inertia and prompts individuals to attain more awareness about others (both colleagues and clients), i.e., to increase the accuracy of their perceptions. An increased accuracy of perceptions is instrumental in the process of changing existing team routines in order to be assigned more interesting and rewarding pieces of work, i.e. ‘better work’ (Koppman et al., 2016, see Proposition 3). Finally, our model shows the enabling role of organizational identity in this process. Organizational identities characterized by values such as innovation and flexibility can indeed sustain a process of continuous revision of routines in GVTs (see Proposition 4).

6. Discussion

Our analyses and our grounded model offer both theoretical and practical contributions. In terms of theoretical contributions, our findings add to the literature on brokers in distributed teams and to the emergent debate on the development of team capabilities.

6.1. Theoretical contributions

Previous literature on distributed teams has pointed to the pivotal role of brokers, i.e., individuals who span boundaries within teams and connect subgroups. In the organizations that we studied, we found different brokering roles. In some teams, one person was assigned the role of spanning boundaries between two countries. In other teams, one person acted as a reference point at a location and a different individual acted as a reference point at another location. In still other teams, brokering roles were neither designed

Table 2
Propositions.

Propositions	Representation within the grounded model
<p>Proposition 1. The presence of brokers in GVTs impacts upon mutual knowledge and accuracy of perceptions. Proposition 1a. The presence of brokers in GVTs increases mutual knowledge. Proposition 1b. The presence of brokers in GVTs decreases accuracy of perceptions</p>	
<p>Proposition 2. Mutual knowledge and accuracy of perceptions impact upon GVT adaptation of routines. Proposition 2a. Mutual knowledge reduces GVT adaptation of routines. Proposition 2b. Accuracy of perceptions increases GVT adaptation of routines.</p>	
<p>Proposition 3. Individuals' professional identity drives the search for better GVT work, through an increased accuracy of perceptions that enables the adaptation of routines. Proposition 3a. Individual's professional identity triggers the search for high accuracy of perceptions with the aim of performing GVT adaptation of routines. Proposition 3b. GVT adaptation of routines is oriented towards gaining better work.</p>	
<p>Proposition 4. An organizational identity based on values of flexibility and innovation promotes GVT adaptation of routines.</p>	

nor emergent over time. Instead, individuals created and sustained diffused interactions among team members. While most literature tends to underline the positive implications of using brokers, a few works have raised potential pitfalls for teams in resorting to brokers over time (Johri, 2008; Leonardi and Barley, 2008; Mattarelli and Gupta, 2009).

Our work adds to this line of research by showing how the use of brokers can be controversial in the development of team capabilities. Specifically, we have shown that, while brokers sustain the development of mutual knowledge, they reduce the overall

awareness about others (both team members and clients). In other words, while brokers help define a basic set of knowledge and practices that the team shares, they make perceptions about others fuzzier and less accurate since they mediate ties and exchanges. These two outcomes of the use of brokers (development of mutual knowledge and limited accuracy of perceptions) are not, in general, negative for a distributed team. First, mutual knowledge has been acknowledged as a fundamental antecedent of team effectiveness (Cramton, 2001). Second, many practitioners advocate that, in certain conditions (e.g., when a GVT designs a modular product), it is better to reduce as much as possible the interactions and interdependencies among locations in order to centralize leadership and control and, thereby, simplify the overall management of the team (e.g., Peña-mora et al., 2009). According to these perspectives, the less the subgroups know about each other, the better. Conversely, our findings disclose that, taken together, mutual knowledge and reduced accuracy of perceptions make the development of team capabilities more difficult. On one hand, if people know that they are on the same page, they do not feel the urge to change the team routines. On the other hand, if people do not have accurate perceptions about others, they do not have the information necessary to actually change what is done by the entire team. The process just described suggests that brokers have a detrimental effect on the development of team capabilities. Nevertheless, our evidence shows how this negative cycle is broken by the agentic role of team members, inspired by their professional identity, and by organizational values promoted by management, shared by insiders, and expressed in the organizational identity. Specifically, the professional identity of team members, composed of values such as autonomy, visibility, learning, and ownership, brings individuals to acquire more information about others (i.e., to increase the accuracy of their perceptions) to change how things are done in the team. A similar process has also been described by Mattarelli and Tagliaventi (2015), who detail how some members of GVTs can be dissatisfied with their working conditions, since these conditions are not aligned with their aspirations and beliefs as professionals, i.e., their professional identity. In order for this mismatch to be overcome, they come up with new work-related ideas that they try to implement within the organizational boundaries to pave the way for their involvement in more challenging activities and tasks, thus improving their work conditions. We add to this contribution by linking the search for coherence between professional identity and work practices to the role of brokers and the development of team capabilities.

On top of this, our model also shows how the process of continuously adapting team routines is supported by the values of organizational identity. If individual team members had not been supported by organizational values such as flexibility and innovation, they probably would not have embarked on a process of adapting team routines. Indeed, the literature on organizational identity shows how the central and characteristic values that define an organization impact upon, and constraint the behaviors of employees (Albert and Whetten, 1985; Clark et al., 2010; Gioia et al., 2000; Mattarelli et al., 2015). In the GVTs that we studied, values evoking change (flexibility and innovation) enabled the revision of routines, thereby fostering the emergence of team capabilities.

A second contribution of our paper is to the literature about capabilities in teams. Our grounded model depicts how team capabilities ensue from the process of elaboration of routines that is handled by team members. We observed that team routines are adapted according to the stimuli offered by team members: for instance, knowledge sharing processes and collaboration with clients are improved by individuals in search of visibility and ownership of the project as core values undergirding their professional identity. By developing more clear perceptions of their on-site colleagues and clients, they are able to build coherent routines devoted respectively to enhance collaboration and promote new services for clients. As we maintained, this complex process assumes the features of a capability at a team level, focused on the evolution and the adaptation of existing routines. Likewise, considering the three building blocks underlying a capabilities—individuals, processes, and structures – (Felin et al., 2012)—we can clearly identify in our model the agentic role of *individuals* who take part in a *process* of change involving existing routines, in the context of GVTs in which hierarchical *structures* define interactions. Therefore, we can consider the whole process as a team-level capability.

Differently from current research that considers capabilities as being deployed mainly by top-management teams in organizations (Adner and Helfat, 2003; Helfat et al., 2007; Helfat and Martin, 2015), we observed that adaptation capabilities can also originate within GVTs, through contributions by globally distributed members. Expanding on some recent contributions that have identified the role of mid-managers and employees as key actors in the adaptation of practices (Canato et al., 2013; Ravasi and Phillips, 2011), we unravel the process through which team members change routines according to their social identities (professional and organizational).

Moreover, in the process that we depict in the grounded model, the selection of best performing routines is made while the team is still operating, and not at the end of the projects that the team carries out. Team members do not have the possibility to evaluate directly the performance impact of their activities, as they are required to select and adapt routines based on their ongoing experience. This pattern stands in marked contrast to the evidence found by Haas and Hansen (2007; 2005; 2001), who show how the evaluation of each team's organizational activities is conducted only at the end of the team operations, relying on specific measures of performance. The same happens in the teams involved in the Alessi case (Salvato, 2009) and in MoTec case (Manning et al., 2013): here it is *managers* who institutionalize best performing routines *after* project completion. What clearly emerges from the project-based organizations that we studied is that *team members* who are directly facing changing conditions lead the process of the adaptation of routines. Surprisingly, the typical selection and retention phases deployed by managers appear to be overcome by the need for preserving not the single best practice, but a multiplicity of different routines that are able to fit with the specificities of team features.

6.2. Practitioners implications

Our work offers some practical implications for organizations, team managers, and team members. First, it is well known that companies, especially large multinationals, design specific organizational structures to improve knowledge sharing and favor the development of mutual knowledge within GVTs. In order to do so, they often appoint brokers to facilitate coordination across subgroups and simplify interactions from a distance. Our study points out that organizations should be aware that the use of brokers makes teams

less prone to change. Indeed, while brokers put team members on the ‘same page’ at a broad level, they reduce the accuracy of perceptions across subgroups. Brokers may sustain stereotypical interpretations of differences across subgroups, possibly reinforcing potentially harmful subgroup dynamics. Thus, when designing brokering roles, it is important to remember that these roles are designed with the aim of bringing subgroups *together* and not to separate or isolate them in order to facilitate coordination. Organizations should design other knowledge sharing mechanisms in addition to brokering roles that facilitate and reward dyadic interactions between team members. They can do so by promoting an organizational identity values such as collaboration and innovativeness and by adding collaborative technology aimed at sharing personal information across subgroups, such as enterprise social media.

Second, our findings also underline that, while brokers facilitate short-term effectiveness, they may hamper the long-term functioning of the team. Team managers are often interested in improving short-term effectiveness in order to get incentives for themselves and their teams. We can suggest two possible actions that project managers may engage in to avoid team inertia and promote changing behaviors in teams. On one hand, managers can actively promote and distribute information to make perceptions about team members and clients more accurate (e.g., through the use of collaborative technology or the establishment of periodic face-to-face meetings). On the other hand, managers can promote a discourse on professional identity and organizational identity within the team. When team members discuss about who they are as professionals and members of an organization, they can also propose changes in ways of doing things, i.e. routines, that can improve work content and conditions. In other words, discussing social identities is likely to be the opportunity for revising routines, as the definition of who we are as professionals and members of an organization is intertwined with what we do in the workplace (Nag et al., 2007).

Finally, team members strive to express themselves as professionals. Working on GVTs can be frustrating especially because individuals are often unsure whether their professionalism is recognized by distant team members. Team members should be aware that finding ways – e.g., new practices, new tasks, new ideas – to express themselves as professionals can benefit themselves as well as their teams and turn self-expression into a win-win game for the whole team.

6.3. Limitations and future research directions

This work, of course, is not without limitations. First, it is based on case studies and we cannot generalize our findings to different teams and contexts, but can only aim at theoretical generalizability (Lee and Baskerville, 2003; Eisenhardt and Graebner, 2007). This implies that, although a similar pattern applies to the teams under study, allowing for its transferability to other domains, it is not generalizable (Gioia et al., 2013). To this regard, we believe that an interesting avenue for future research would be to investigate the same issues in other, more knowledge intensive GVTs, such as R&D teams, open innovation teams, and software development teams (e.g., Bertolotti et al., 2015). In these contexts, characterized by high uncertainty and the necessity of continuous change, the development of team capabilities is of paramount importance.

Second, our teams belong to large multinationals and medium-sized companies. We believe that the fact that the processes that we depict in our findings happen both in large and medium-sized companies with consistently similar patterns suggests that our model goes beyond specific organizational contexts. Future studies should expand on this consideration and understand whether and how the context characteristics impact on the development of team capabilities.

In addition, it would be interesting to investigate how the process of morphing routines within teams is intertwined with the development of organizational capabilities. Within the same organization in fact, different sets of team routines may be proposed to address similar problems and management has to gauge, compare, incorporate, or modify the different sets so as to define the routines to be sponsored at a higher level. We invite future research to shed light on the dynamics that management engage in to appraise and endorse changes in organizational routines inspired by the development of team capabilities, and to overcome possible tensions between teams in this process.

Finally, our model is based on data collected on a short time lapse. We asked our informants to recollect what happened over time, while it may be appropriate for future studies to tackle specifically how our model can dynamically evolve. In particular, we expect the relationship between team capabilities and organizational capabilities that we have recalled above to be core over time. Indeed our model suggests that team capabilities may stimulate the emergence of organizational capabilities. However, the development of organizational capabilities may make teams more inertial in nature as they can pose an upper-level constraint on the spontaneous adaptation of routines within the single teams. How the interplay between team and organizational capabilities works and what variables affect it in GVTs still need elucidation.

7. Conclusion

As one of the first attempts to study capabilities at a team level, our grounded model proposes that GVT members can engage in a process of routine adaptation fostered by the accuracy of perception of their co-workers and of their clients. This process assumes the features of a team-based capability. Furthermore, we show that brokers play a critical role in GVTs, providing mutual frameworks of understanding that reduces the need to enhance accurate perceptions, with positive implications for short-term coordination, but a negative impact on the long-term development of team capabilities. Finally, our research highlights the interplay between team capabilities and social identities, i.e., the definition of who team members are as professionals and as organizational insiders. To conclude, we believe that taking a multi-level and multi-facet perspective on the operational and social processes of GVTs can foster our understating of how to make these teams thrive in the short and long term.

References

- Adner, R., Helfat, C.E., 2003. Corporate effects and dynamic managerial capabilities. *Strateg. Manag. J.* 24, 1011–1025.
- Albert, S., Whetten, D.A., 1985. Organizational identity. In: Cummings, L.L., Staw, B.M. (Eds.), *Research in Organizational Behavior*. Elsevier, Oxford, UK, pp. 263–295.
- Ale Ebrahim, N., Ahmed, S., Taha, Z., 2009. Virtual R&D teams in small and medium enterprises: a literature review. *Sci. Res. Essays* 4, 1575–1590.
- AlMazrouei, H., Zacca, R., 2015. Expatriate leadership competencies and performance: a qualitative study. *Int. J. Organ. Anal.* 23, 404–424.
- Au, K.Y., Fukuda, J., 2003. Boundary spanning behaviors of expatriates. *J. World Bus.* 37, 285–296.
- Baba, M.L., Gluesing, J., Ratner, H., Wagner, K.H., 2004. The contexts of knowing: natural history of a globally distributed team. *J. Organ. Behav.* 25, 547–587.
- Bertolotti, F., Tagliaventi, M.R., 2007. Discovering complex interdependencies in organizational settings: the role of social network analysis in qualitative research. *Qual. Res. Organ. Manag. Int. J.* 2, 43–61.
- Bertolotti, F., Mattarelli, E., Vignoli, M., Macri, D.M., 2015. Exploring the relationship between multiple team membership and team performance: The role of social networks and collaborative technology. *Res. Pol.* 44 (4), 911–924.
- Bird, C., Nagappan, N., Devanbu, P., Gall, H., Murphy, B., 2009. Does distributed development affect software quality?: an empirical case study of Windows Vista. *Commun. ACM* 52, 85–93.
- Birks, D.F., Fernandez, W., Levina, N., Nasirin, S., 2013. Grounded theory method in information systems research: its nature, diversity and opportunities. *Eur. J. Inf. Syst.* 22, 1–8.
- Brannen, M.Y., Thomas, D.C., 2010. Bicultural individuals in organizations: implications and opportunity. *Int. J. Cross Cult. Manag.* 10, 5–16.
- Canato, A., Ravasi, D., Phillips, N., 2013. Coerced practice implementation in cases of low cultural fit: cultural change and practice adaptation during the implementation of six sigma at 3 M. *Acad. Manag. J.* 56, 1724–1753.
- Caya, O., Mortensen, M., Pinsonneault, A., 2013. Virtual teams demystified: an integrative framework for understanding virtual teams. *Int. J. e-Collab.* 9, 1–33.
- Chen, J., McQueen, R.J., Sun, P.Y.T., 2013. Knowledge transfer and knowledge building at offshored technical support centers. *J. Int. Manag.* 19, 362–376.
- Clark, S.M., Gioia, D.A., Ketchen, D.J., Thomas, J.B., 2010. Transitional identity as a facilitator of organizational identity change during a merger. *Adm. Sci. Q.* 55, 397–438.
- Cramton, C.D., 2001. The mutual knowledge problem and its consequences for dispersed collaboration. *Organ. Sci.* 12, 346–371.
- Cramton, C.D., Hinds, P.J., 2014. An embedded model of cultural adaptation in global teams. *Organ. Sci.* 25, 1056–1081.
- Dau, L.A., 2016. Biculturalism, team performance, and cultural-faultline bridges. *J. Int. Manag.* 22, 48–62.
- Eggers, J.P., Kaplan, S., 2013. Cognition and capabilities: a multi-level perspective. *Acad. Manag. Ann.* 7, 295–340.
- Eisenhardt, K.M., Graebner, M.E., 2007. Theory building from cases: opportunities and challenges. *Acad. Manag. J.* 50, 25–32.
- Felin, T., Foss, N.J., Heimeriks, K.H., Madsen, T.L., 2012. Microfoundations of routines and capabilities: individuals, processes, and structure. *J. Manag. Stud.* 49, 1351–1374.
- Gardner, H.K., Gino, F., Staats, B.R., 2012. Dynamically integrating knowledge in teams: transforming resources into performance. *Acad. Manag. J.* 55, 998–1022.
- Gilson, L.L., Maynard, M.T., Young, N.C.J., Vartiainen, M., Hakonen, M., 2015. Virtual teams research 10 years, 10 themes, and 10 opportunities. *J. Manag.* 41, 1313–1337.
- Gioia, D.A., Schultz, M., Corley, K.G., 2000. Organizational identity, image, and adaptive instability. *Acad. Manag. Rev.* 25, 63–81.
- Gioia, D.A., Corley, K.G., Hamilton, A.L., 2013. Seeking qualitative rigor in inductive research notes on the Gioia methodology. *Organ. Res. Methods* 16, 15–31.
- Global Workplace Analytics, 2016. Latest telecommuting statistics – global workplace analytics [WWW document]. URL: <http://globalworkplaceanalytics.com/telecommuting-statistics> (accessed 9.1.16).
- Grant, A.M., Fried, Y., Parker, S.K., Frese, M., 2010. Putting job design in context: introduction to the special issue. *J. Organ. Behav.* 31, 145–157.
- Grimaldi, R., Mattarelli, E., Prencipe, A., Von Zedtwitz, M., 2010. Offshoring of intangibles: organizational and strategic issues. *Ind. Innov.* 17, 331–336.
- Gupta, A., Mattarelli, E., Seshasai, S., Broschak, J., 2009. Use of collaborative technologies and knowledge sharing in co-located and distributed teams: towards the 24-h knowledge factory. *J. Strateg. Inf. Syst.* 18, 147–161.
- Haas, M.R., 2006. Knowledge gathering, team capabilities, and project performance in challenging work environments. *Manag. Sci.* 52, 1170–1184.
- Haas, M.R., Hansen, M.T., 2005. When using knowledge can hurt performance: the value of organizational capabilities in a management consulting company. *Strateg. Manag. J.* 26, 1–24.
- Haas, M.R., Hansen, M.T., 2007. Different knowledge, different benefits: toward a productivity perspective on knowledge sharing in organizations. *Strateg. Manag. J.* 28, 1133–1153.
- Hansen, M.T., Haas, M.R., 2001. Competing for attention in knowledge markets: electronic document dissemination in a management consulting company. *Adm. Sci. Q.* 46, 1–28.
- Helfat, C.E., Martin, J.A., 2015. Dynamic managerial capabilities review and assessment of managerial impact on strategic change. *J. Manag.* 41, 1281–1312.
- Helfat, C.E., Peteraf, M.A., 2003. The dynamic resource-based view: capability lifecycles. *Strateg. Manag. J.* 24, 997–1010.
- Helfat, C.E., Finkelstein, S., Mitchell, W., 2007. *Dynamic Capabilities*. Wiley-Blackwell.
- Hinds, P.J., Cramton, C.D., 2014. Situated coworker familiarity: how site visits transform relationships among distributed workers. *Organ. Sci.* 25, 794–814.
- Hinds, P.J., Mortensen, M., 2005. Understanding conflict in geographically distributed teams: the moderating effects of shared identity, shared context, and spontaneous communication. *Organ. Sci.* 16, 290–307.
- Hinds, P., Liu, L., Lyon, J., 2011. Putting the global in global work: an intercultural lens on the practice of cross-national collaboration. *Acad. Manag. Ann.* 5, 135–188.
- Hollenbeck, J.R., Ilgen, D.R., Lepine, J.A., Colquitt, J.A., Hedlund, J., 1998. Extending the multilevel theory of team decision making: effects of feedback and experience in hierarchical teams. *Acad. Manag. J.* 41, 269–282.
- International Data Corporation, 2011. The rise of mobility. IDC Worldwide Mobile Worker Population 2011–2015 Forecast.
- Johri, A., 2008. Boundary spanning knowledge broker: an emerging role in global engineering firms. *Frontiers in Education Conference, 2008. FIE 2008. 38th Annual. IEEE* (p. S2E–7).
- Jones, R., Noble, G., 2007. Grounded theory and management research: a lack of integrity? *Qual. Res. Organ. Manag. Int. J.* 2, 84–103.
- Kilianski, S.E., 2008. Who do you think I think I am? Accuracy in perceptions of others' self-esteem. *J. Res. Pers.* 42, 386–398.
- Koppman, S., Mattarelli, E., Gupta, A., 2016. Third-world "sloggers" or elite global professionals? Using organizational toolkits to redefine work identity in information technology offshore outsourcing. *Organ. Sci.* 27, 825–845.
- Kotlarsky, J., van Fenema, P.C., Willcocks, L.P., 2008. Developing a knowledge-based perspective on coordination: the case of global software projects. *Inf. Manag.* 45, 96–108.
- Kotlarsky, J., Scarbrough, H., Oshri, I., 2014. Coordinating expertise across knowledge boundaries in offshore-outsourcing projects: the role of codification. *MIS Q.* 38 (607–A5).
- Laamanen, T., Wallin, J., 2009. Cognitive dynamics of capability development paths. *J. Manag. Stud.* 46, 950–981.
- Lee, A.S., Baskerville, R.L., 2003. Generalizing generalizability in information systems research. *Inf. Syst. Res.* 14, 221–243.
- Leonardi, P.M., Barley, S.R., 2008. Materiality and change: challenges to building better theory about technology and organizing. *Inf. Organ.* 18, 159–176.
- Levina, N., Kane, A., 2009. Onshore immigrant managers as boundary spanners on offshored projects: partners or bosses. *Ind. Studies Assoc. Annu. Conf.*, Chicago, IL.
- Levina, N., Vaast, E., 2005. The emergence of boundary spanning competence in practice: implications for implementation and use of information systems. *MIS Q.* 335–363.
- Levina, N., Vaast, E., 2008. Innovating or doing as told? Status differences and overlapping boundaries in offshore collaboration. *MIS Q.* 32, 307–332.
- Lissoni, F., 2001. Knowledge codification and the geography of innovation: the case of Brescia mechanical cluster. *Res. Policy* 30, 1479–1500.
- Manning, S., Massini, S., Lewin, A.Y., 2008. A dynamic perspective on next-generation offshoring: the global sourcing of science and engineering talent. *Acad. Manag. Perspect.* 22, 35–54.
- Manning, S., Hutzschenreuter, T., Strathmann, A., 2013. Emerging capability or continuous challenge? Relocating knowledge work and managing process interfaces. *Ind. Corp. Chang.* 22, 1159–1193.

- Mattarelli, E., Gupta, A., 2009. Offshore-on-site subgroup dynamics in globally distributed teams. *Inf. Technol. People* 22, 242–269.
- Mattarelli, E., Tagliaventi, M.R., 2010. Work-related identities, virtual work acceptance and the development of globalized work practices in globally distributed teams. *Industry and Innovation* 17 (4), 415–443.
- Mattarelli, E., Tagliaventi, M.R., 2015. How offshore Professionals' job dissatisfaction can promote further offshoring: organizational outcomes of job crafting. *J. Manag. Stud.* 52, 585–620.
- Mattarelli, E., Bertolotti, F., Incerti, V., 2015. The interplay between organizational polychronicity, multitasking behaviors and organizational identification: A mixed-methods study in knowledge intensive organizations. *Int. J. Hum. Comput. Stud.* 79, 6–19.
- Miles, M.B., Huberman, A.M., 1994. *Qualitative Data Analysis: An Expanded Sourcebook*. SAGE Publications, Thousand Oaks, CA.
- Mortensen, M., Neeley, T.B., 2012. Reflected knowledge and trust in global collaboration. *Manag. Sci.* 58, 2207–2224.
- Nag, R., Corley, K.G., Gioia, D.A., 2007. The intersection of organizational identity, knowledge, and practice: attempting strategic change via knowledge grafting. *Acad. Manag. J.* 50, 821–847.
- Nelson, R.R., Winter, S.G., 1982. *An Evolutionary Theory of Economic Change*. Harvard University Press, Cambridge, MA.
- Nicholson, B., Sahay, S., 2004. Embedded knowledge and offshore software development. *Inf. Organ.* 14, 329–365.
- O'Leary, M.B., Mortensen, M., 2009. Go (Con)figure: subgroups, imbalance, and isolates in geographically dispersed teams. *Organ. Sci.* 21, 115–131.
- Oshri, I., Kotlarsky, J., Willcocks, L., 2007. Managing dispersed expertise in IT offshore outsourcing: lessons from Tata consultancy services. *MIS Q. Exec.* 6, 53–65.
- Oshri, I., Kotlarsky, J., Willcocks, L.P., 2015. *The Handbook of Global Outsourcing and Offshoring 3rd Edition*. Palgrave Macmillan, London, UK.
- Peña-mora, F., Vadhavkar, S., Aziz, Z., 2009. Technology strategies for globally dispersed construction teams. *J. Inf. Technol. Constr.* 14, 70–80.
- Pratt, M.G., Rockmann, K.W., Kaufmann, J.B., 2006. Constructing professional identity: the role of work and identity learning cycles in the customization of identity among medical residents. *Acad. Manag. J.* 49, 235–262.
- Ravasi, D., Phillips, N., 2011. Strategies of alignment organizational identity management and strategic change at Bang & Olufsen. *Strateg. Organ.* 9, 103–135.
- Sahay, S., Nicholson, B., Krishna, S., 2004. *Global IT Outsourcing: Software Development across Borders*. Cambridge University Press, Cambridge, UK; New York.
- Salvato, C., 2009. Capabilities unveiled: the role of ordinary activities in the evolution of product development processes. *Organ. Sci.* 20, 384–409.
- Sole, D., Edmondson, A., 2002. Situated knowledge and learning in dispersed teams. *Br. J. Manag.* 13, S17–S34.
- Strauss, A.L., Corbin, J.M., 1998. *Basics of Qualitative Research*. SAGE, Thousand Oaks, CA.
- Tripsas, M., Gavetti, G., 2000. Capabilities, cognition, and inertia: evidence from digital imaging. *Strateg. Manag. J.* 21, 1147–1161.
- Turner, S.F., Fern, M.J., 2012. Examining the stability and variability of routine performances: the effects of experience and context change. *J. Manag. Stud.* 49, 1407–1434.
- Van Maanen, J., 2011. *Tales of the Field: On Writing Ethnography*. second ed. University of Chicago Press, Chicago and London.
- Walsham, G., 1995. Interpretive case studies in IS research: nature and method. *Eur. J. Inf. Syst.* 4, 74–81.
- Weisband, S., 2002. Maintaining awareness in distributed team collaboration: implications for leadership and performance. In: Hinds, P.J., Keisler, S. (Eds.), *Distributed Work*. The MIT Press, Cambridge, MA, pp. 311–333.
- Winter, S.G., 2003. Understanding dynamic capabilities. *Strateg. Manag. J.* 24, 991–995.
- Winter, S.G., Szulanski, G., 2001. Replication as strategy. *Organ. Sci.* 12, 730–743.
- Witchalls, C., Woodley, M., Watson, J., 2010. Managing virtual teams: taking a more strategic approach. Report by the Economist Intelligence Unit (graphics.eiu.com/upload/eb/NEC_Managing_virtual_teams_WEB.pdf).