

STRATEGIES FOR MANAGING KNOWLEDGE ACROSS BOUNDARIES: THE UTILIZATION OF HIGHLY SKILLED CONTRACTORS

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Keywords: Contractors, Social Capital, Knowledge Networks, Managing Knowledge, Organizational Boundaries, Epistemology of Practice.

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Suggested track: F Integrating knowledge across organizations

1. Introduction

According to the knowledge-based view of the firm, a firm is seen as an aggregate of knowledge (Foss, 1996; Grant, 1996; Liebeskind, 1996; Spender, 1996; Schreiner, 1998). Proponents of the knowledge-based view focus on knowledge as the organization's most important resource. However the definitions of the term 'knowledge' remain ambiguous (Alvesson et al. 2002; Schreyögg and Geiger, 2003). Most researchers refer to a widely cited typology of organizational knowledge as it is proposed by Spender (1996). These typologies distinguish between tacit or explicit knowledge and individual or social knowledge. Cook and Brown (1999) criticize the view that organizational knowledge rests on an epistemology of possession, or when it is treated as something people possess. They propose an additional epistemology, an epistemology of practice. This emphasizes the relevance of knowing as "something that is a part of action (both individual and group action)" (Cook and Brown 1999:387). Another discussed aspect of organizational knowledge is that knowledge often exceeds organizational boundaries. Firms are importing knowledge (also in the sense of knowing) from outside their boundaries (Leonard-Barton, 1995). Learning and managing knowledge across organizational boundaries has become a prominent research topic (Inkpen, 1998 and 2000; Khanna et al. 1998; Matusik, 2002; Holmquist, 2003). In an advanced knowledge-based view of the firm, the organizational boundaries are defined by knowledge creation processes, which in turn leads to a "concept of the firm as the boundary of its knowledge-creation activities" (von Krogh and Grand 2002:177).

According to both the epistemology of practice and the aspect of boundary crossing knowledge, the knowing of external individuals, e.g. highly skilled contractors, adds to organizational knowledge. Highly skilled contractors are part of the so-called contingent work force (Polivka, 1996; Barker and Christensen, 1998; Hipple, 1998; Burton-Jones, 1999). In a simplified view, the contingent workforce consists of all kind of workers who are not in a traditional employment relationship. Highly skilled contractors, as part of the contingent workforce, work as independent freelancers or dependent employees of a third company. They perform professional services, i.e. a knowledge intensive service for business clients, for example engineering services, software development etc.

Despite the lack of a large amount of empirical data, there is some literature evidence for a rise of contingent work in the highly skilled area (Kunda et al. 2002; Mallon and

Duberley, 2000; Matusik and Hill, 1998; Purcell and Purcell, 1998). Storey et al. (2002) agree, that "the most rapidly increasing component part of the trend to contingent work is that comprised of professional and technical labor" (Storey et al. 2002:5). Moreover, some general evidence exists: Firstly, as the overall amount of professional services is rising, an increase in the utilization of professional services becomes self-evident. Secondly, in many industries a trend towards a project-based organizational design (Miles et al. 1997; Hughes, 1998) and a disappearance of organizational boundaries is observed. The innovation in such project-based and permeable organizations often relies upon resources from other organizations (Gann and Salter, 2000). Therefore projects are not only staffed with members of the organization, but also external contract workers.

This paper focuses on managing organizational knowledge within networks of highly skilled contractors (Contractor Networks = CN). Although, CN are a widespread phenomenon and present in everyday life in business, only minimal research has been done in this field (Matusik and Hill, 1998; Kunda et al. 2002; Nesheim, 2003). This paper aims to explore and understand the utilization of highly skilled contractors with regards to organizational knowledge. The paper proceeds as follows. Firstly, we review and explore the concept of social capital (Coleman 1990; Burt, 1992, 2001; Adler and Kwon, 2002) as a theoretical background for managing knowledge (Nahapiet and Ghoshal, 1998; Yli-Renko et al., 2001, 2002). Secondly, we introduce in the methods of our research. Thirdly, we describe a grounded theoretical framework for utilizing highly skilled contractors and organizational knowledge. Finally, we discuss the theoretical and managerial implications as well as limitations of our research.

2. Theory: Social capital and organizational knowledge

According to von Krogh and Grand (2002) managing knowledge refers mainly to the management of those conditions, which enable the creation of knowledge. Furthermore, scholars have begun to emphasize social capital as a central condition for the creation of knowledge (Nahapiet and Ghosal, 1998; Lesser, 2000; Cohen and Prusak, 2001; De Carolis, 2002; Yli-Renko et al. 2001 and 2002). In their analysis, Nahapiet and Ghoshal (1998) discovered that "it is the interaction between social and intellectual capital that underpins organizational advantage" (Nahapiet and Ghoshal 1998:259). Putting the above arguments together, the concept of social capital is a promising theoretical background for managing knowledge. Moreover, in the context of CN the social capital approach to managing knowledge seems advantageous as the concept is not only related to network

theory, but also supposed to unify the existing network theory (Gabbay and Leenders, 2001).

2.1 The concept of social capital

The concept of social capital is said to be an umbrella-concept gathering various phenomena (Adler and Kwon, 2002). Therefore, social capital has by no means been uniformly defined. Yet despite several controversies (Lin, 2001), scholars of the social capital mutually argue, that better 'connected' people enjoy higher returns: "Social capital is the contextual complement to human capital. The social capital metaphor is that the people who do better are somehow better connected" (Burt 2001:32). Thus, analysts of social capital are mainly concerned with the "significance of relationships as a resource for social action" (Nahapiet and Ghoshal 1998:242). In such a network perspective of social capital, the structured network of relationships constitutes a valuable resource for the conduct of social affairs. In other words, the social structure conveys social capital (Gabbay and Leenders, 2001).

However, within the network perspective of social capital there are two basic and quite distinctive views concerning the creation of social capital (Burt, 2001): Firstly, the closure argument is that social capital is attributed to a network of strongly interconnected elements (Coleman, 1990). Such dense networks improve communication efficiency and facilitate sanctions and trust. Secondly, the structural hole argument is that social capital is "created by a network in which people can broker connections between otherwise disconnected segments" (Burt 2001:31). The structural hole argument draws on the strength of weak ties as proposed by Granovetter (1973). Basically, structural holes provide an opportunity to access non-redundant information from weakly tied people. In his recent publications, Burt (2001) argues in favor of an integrating view on both arguments. His analysis shows that performance is highest, where in-group closure is high and there are many non-redundant contacts beyond the group.

2.2 Linking social capital and managing knowledge

As mentioned in the beginning of this section, the analysis of Nahapiet and Ghoshal (1998) speaks in favor of a strong link between social capital and intellectual capital. In their analysis, they argue that social capital enhances the creation of knowledge based on

- structural (network ties, network configuration, appropriable organization),

- cognitive (shared codes and language, shared narratives) and
- relational (trust, norms, obligations, identification) dimensions.

Overall, they mainly rely on the closure argument of social capital as closure is seen as one condition for the relational and cognitive dimension of social capital (Nahapiet and Ghoshal 1998:258). However, a closer look at the analysis allows the assumption that it is in particular the structural dimension, which accounts for the creation of new intellectual capital. This is because the structural aspect forms the pre-condition for access to individuals' knowledge. Hence, with regards to managing knowledge, a focus on the structural dimension of social capital is required. The focus on structural aspects clarifies the sophisticated role of social capital concerning the creation of knowledge. Firstly it can be argued that the closure and structural holes perspective, respectively strong and weak ties, may have a different impact on the creation of knowledge. Secondly, it is suggested that situational contingencies have to be taken into account before drawing implications for managing knowledge (Hansen et al. 2001). Thereby, it is agreed upon that it depends on the context as to whether strong and direct ties are more productive than weak and indirect ties (Ahuja 2000:450). Hansen (1999), for example, studied 120 new-product development projects undertaken by divisions in a large electronics company. He uses a social-networks perspective in looking at intentional knowledge transfers across subunits. He argues that weak network ties are positively related to the search for new knowledge if the knowledge which is to be transferred is not complex. However, weak ties impede the transfer when the knowledge is complex. Transfer of complex knowledge tends to require a strong tie between the two parties. Furthermore, Hansen (1999) describes that with increasing degrees of interconnectivity, the feasibility of product innovation decreases due to the network inertia.

3. Methods

The purpose of our research is to explore and understand the utilization of highly skilled contractors with regards to organizational knowledge. The nature of the research question (exploratory) and the objective (understanding the utilization of contractors) requires a qualitative research methodology. Furthermore, the paper is based on theoretical reflections. Both, empirical findings and theory are combined and continually reinterpreted to create new knowledge in the course of the research process.

The empirical findings are obtained from different sources. One method of collecting data was by conducting semi-structured interviews. Most of the interviewees were project managers in the field of information technology, software and technical engineering. The sample of interviewees is not meant to be a representative one. It was built as progress was made and interviewees were chosen according to information needs (Glaser and Strauss, 1967: 58) However, with regard to external validity the sample included interviewees from different firms and industries. Moreover, not only clients but also individual contractors were interviewed to modify and verify the results from another point of view. Secondly, a workshop about utilizing contractors' knowledge was carried out. The participants were project managers and central staff of an information technology company.

Since knowledge topics – above all lack of knowledge – might be a taboo subject, the interviews were conducted face to face and with a commitment to confidentiality. The purpose of interviewing was to gather anecdotes and accounts of past experiences instead of general considerations. Data collection and analysis ended where new interviews only gave marginal information with no influence on results. Of course, the grounded theoretical framework developed in this research is exploratory. It is to be confirmed by further research.

4. Results: a grounded theoretical framework for utilizing highly skilled contractors and organizational knowledge

The interviews conducted for this research suggest different contingencies for the utilization of contractors' knowledge. Contractors perform different types of services and firms have different aims for utilizing contractors. Consistent with the concept of social capital and an epistemology of practice our data argues for a utilization of contractors' knowledge by connecting of know-who, i.e. knowing individuals. From the contingencies and from the idea of connecting of 'know-who', specific strategies of utilizing contractors' knowledge are derived. Firstly our interviews suggest these strategies vary in the course of time and secondly that the overall balance of the strategies is influenced by the dynamics of the environment. In the following we describe the framework for utilizing highly skilled contractors in detail and formulate illustrative propositions from data analysis as well as from theoretical reflections.

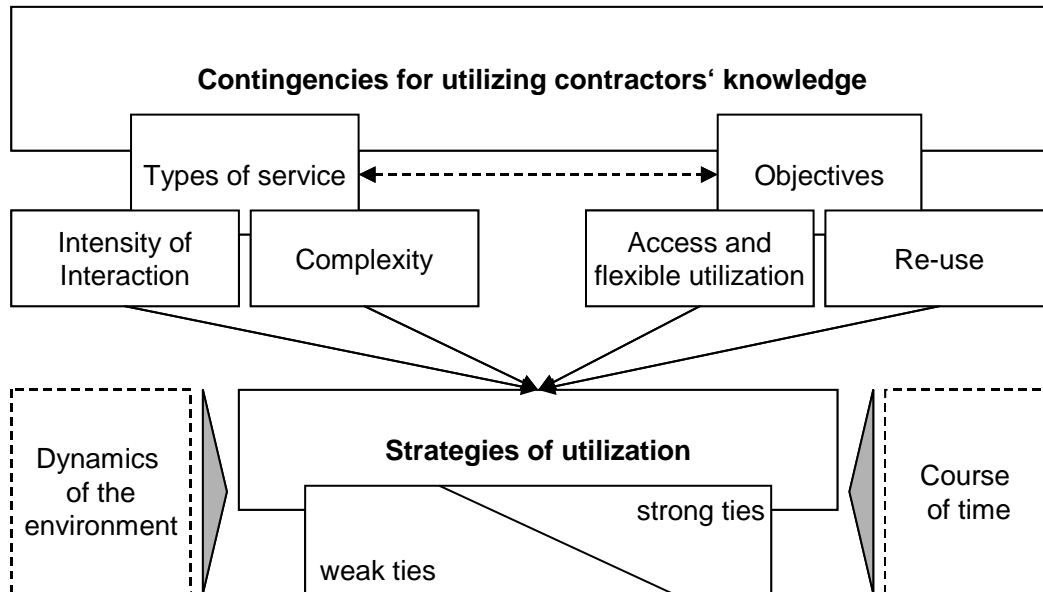


Fig. 1. Utilizing contractors' knowledge: a grounded theoretical framework

4.1 Contingencies for utilizing contractors knowledge

As outlined in earlier research, situational and task contingencies have relevant implications for the management of knowledge (Hansen et al., 2001). Compared to products, professional services are mostly associated with confidentiality, intangibility and interdependency (Glückler and Armbrüster, 2003). However, our data suggests that single services may, in certain respects, differ from each other. Besides we discovered that firms have varying objectives in the utilization of highly skilled contractors. Both, types of services and firms' objectives become relevant contingencies for utilizing contractors' knowledge.

Types of services offered by highly skilled contractors: Regarding the services performed by highly skilled contractors, the data suggests that two dimensions are of particular relevance: the intensity of interaction between the contractor and the employees of the firm and the overall complexity of the service performed.

Intensity of interaction: Performing services, by definition, integrates an external factor i.e. the service client (Corsten, 1985). Thus, contractors have to interact with employees of the firm (and in many cases with other contractors) in some way. The intensity of the interaction however differs and is subject to the type of interdependence between contractor and client, the variability of the service situation and the level of individualization. In the first instance, data suggests that the higher the presence of

interdependence in the service-process, the higher the degree of interaction. Thompson (1967) has distinguished three basic types of interdependence - pooled, sequential and reciprocal. In the case of professional services, both lower sequential and higher reciprocal interdependencies are observed. Secondly, consistent with past research (March and Simon, 1958) there is evidence that the more variable the service situation, the greater the reliance on coordination by mutual adjustment. So, the process of service may involve a higher or a lower level of communication (or interaction) to achieve this coordination. Moreover, the individualization or standardization of the performed service influences the level of interaction. The more individualized (and as a result firm specific) the service, the more intensive the interaction and communication between contractor and client.

Consequently, highly skilled contractors have to interact and communicate with their clients to different extents. For example, highly interactive relationships can be seen between the engineering consultants and employees at the research and engineering centers of car manufacturers. Both, the client and the contractor are experts in certain engineering fields. They work together in the same place, for several months, in order to solve specific technical problems. Contrary to this however, is the fact that pure selling relationships (Tordoir, 1995) are also found. The installation or support of standardized software and computers provide examples of this. Here, the services become a 'sort' of product.

Complexity of performed service: A second relevant aspect of performed services is their complexity (Benkenstein and Güthoff, 1996). Professional services are, in comparison to others, complex by nature. Yet, as the findings of our interviews show, the (perceived) complexity of a professional service may differ. It is argued, that the overall complexity of a professional service is determined by several factors, all of which are linked. Firstly, complexity is subject to the number of elements and their relationship (Ulrich and Probst, 1988). That is, the complexity of a service is due to the number of partial performances and their combination. Furthermore, the complexity of services is related to the complexity of the required knowledge. Despite the focus on the highly skilled contractor, deployed knowledge has varying levels of complexity. The knowledge of a contractor can be multi-faceted. Moreover, the complexity is due to the knowledge-gap between contractor and client. Finally, the complexity of services depends on the level of intangibility. Every service is regarded as being intangible. However, the intangibility may be defined depending on whether the service is well defined or not. Three variables influence how a

service is defined: the possibility to structure the problem, to isolate potential solutions and to predetermine service processes (Pfaffmann, 2001).

Consistent with past conclusions (Tordoir 1995:26) data suggests that the more complex a service, the more information asymmetry occurs and the more uncertainty there is in the relationship between contractor and client. Consequently, the client faces different levels of uncertainty about the appropriateness and the quality of the service (ex ante and ex post). In a similar context, Das and Teng (2001) refer to that as performance risk. Additionally, an aspect of transactional uncertainty (Glückler and Armbrüster, 2003) is associated with complexity, namely the contractor's opportunity to act opportunistically in the course of a service relationship. This relational risk (Das and Teng, 2001) increases with the complexity of service.

Proposition 1: The types of services differ with respect to intensity of interaction and complexity. Intensity of interaction is positively associated with interdependence in the service process, variability of service situation and individualization of services. Complexity of services is positively associated with the number of partial performances and combinations, complexity of required knowledge and level of intangibility.

In order to be complete, it should be pointed out, that there is an interrelation between interactivity and complexity of services. The mentioned transactional and relational risks alone cause a high intensity of interaction during the performance of highly complex services (and vice versa).

Objectives for utilizing contractors' knowledge: Interviews show that two basic, but conflicting objectives, affect the utilization of knowledge within CN. On the one hand, the utilization of highly skilled contractors is a flexible way to access external knowledge. An interviewee stated that the contractors are "individuals who possess a lot of specialist knowledge which presently is not available in our company". On the other hand, highly skilled contractors are often stars and key players e.g. in the process of product development. Therefore, firms are economically dependent on individual contract workers. To the extent that sometimes "without them we could not even handle small problems. The reason for this is that only the contractors know all of the information". Consequently, firms tend to reuse existing contractors' knowledge.

Access and flexible utilization of contractors' knowledge:. In a dynamic business environment, problem solving requires temporary and flexible access to specific knowledge of contractors e.g. engineering or computer experts. Consistent with past conclusions (Atkinson, 1984) the interviews done for this research suggest that it is possible to distinguish a numeric and a functional flexibility. The argument of numeric flexibility is relevant in two cases. Firstly, it is important in the case of temporal fluctuating tasks. Cohen-Mason (1996) for example describes the temporal use of contractors in the course of a product launch. Secondly, temporal flexibility is also useful in the case of specific tasks, which require a small capacity of manpower. An example is the weekly utilization of an on site computer support.

With respect to knowledge, the utilization of contractors provides not only numeric but also functional flexibility to access the required external expert knowledge. In other words, the utilization of highly skilled contractors increases the functional flexibility of the organization's knowledge base. The organizational knowledge base is regarded as being flexible, if new challenges can immediately be accomplished. This is of particular relevance if the firm is situated in a dynamic environment with rapidly changing tasks. Therefore, the utilization of contractors is especially prevalent in dynamic industries (Matusik and Hill, 1998). For example, the low validity of knowledge in the IT-industry may be one reason for the intensive utilization of highly skilled contractors (Menez et al. 2001).

CN are not only a way to access expert knowledge; the low commitment to a specific contractor's knowledge also makes the organizational knowledge base reversible and flexible. For example, an interviewee stated: "In the terms of new technologies we have to mainly ensure that we do not run into a dead-end street". According to our interviews and consistent with the concept of real options (Amram and Kulatklaka, 1999), it can be suggested that CN work as a strategic platform for flexible growth in an uncertain business environment.

Re-use of existing contractors' knowledge. In opposition to this view, many interviewees argued that their companies are highly dependent on the reuse of existing contractors' knowledge. For example, one project manager guessed that about 80 percent of the highly skilled contractors are repeatedly deployed as knowledge dependencies accrued during the first contact. In theory, this effect is explained by experience-based learning (Kolb, 1984) and thus firm-specific investments in knowledge. The firm-specific investments in knowledge transform the initially non-specific relationship to a very specific one (Williamson 1990:70). Both the knowledge of client and that of contractor co-evolve

(Eisenhardt and Galunic, 2000) and synergies between complementary knowledge become possible.

In this manner, the repeated contact between client and contractor is a type of lock-in-situation, which is characterized by reciprocal ties and interdependencies (Kaas and Schade 1993:75). Therefore, every single further contact with the contractor promises an additional economic benefit compared to the first one (Weiber, 1996). This economic benefit is explained by the concept of quasi-rents, which "are defined as the difference between the value of an asset in its first best use and its value in its next best use" (Castanias and Helfat 1991:161). Dyer and Singh (1998) transfer a similar argument to inter-organizational relationships by introducing so-called relational rents. They argue that there is "supernormal profit jointly generated in an exchange relationship that cannot be generated by either firm in isolation and can only be created through the joint idiosyncratic contributions" (Dyer and Singh 1998:662). Subsequently, breaking off the relationship with an existing highly skilled contractor may jeopardize the relational rents: "at the moment one contractor leaves and a new contractor is engaged, we are completely starting over" (statement of interviewee).

Proposition 2: Two basic, but conflicting objectives affect the utilization of contractors' knowledge. Firstly, the utilization of contractors is a flexible way to access external knowledge. Secondly, firms reuse existing contractors' knowledge to generate relational rents (Dyer and Singh, 1998).

Whereas the fore mentioned objective speaks in favor of long-term and stable relationships, the other objective supports the flexible access to new external knowledge and therefore more short-term and unstable relationships

4.2 Creating organizational knowledge as connecting of 'know-who'

Managing knowledge refers to the management of conditions that enable the creation of knowledge (von Krogh and Grand 2002:177). Social capital in turn is a relevant condition for the creation of knowledge. Hence, implications for managing knowledge within CN can be found by referring to the concept of social capital. Nahapiet and Ghoshal (1998:257) further this argument, as they claim that inter-organizational networks may also become relatively well endowed with social capital.

The most central argument of the social capital concept concerning knowledge creation in CN, is the access to and utilization of knowledge of connected contractors.

Referring to an epistemology of practice (Cook and Brown, 1999), the connecting of 'know-who', i.e. knowing individuals, is consequently in the center of creating knowledge. Such a 'know-who' based approach to knowledge management takes advantage of leveraging personal networking to accelerate the process of knowledge creation (Harryson, 2002). As Demsetz (1988) argued that direction substitutes for the transfer of knowledge, similarly, the connecting of 'know-who' substitutes for 'complete' knowledge transfer between client and contractor. Just by performing the service, the contractor participates in the creation of organizational knowledge. Therefore, in order to access and utilize 'know-who', it is not necessary to completely understand or possess the knowledge of the contractor.

Nevertheless, data suggests that there has to be a basic idea of the existing knowledge within the CN, or as Cross et al. say: "For other people to be options we must have at least some perception of their expertise" (Cross et al. 2001:105). The conducted interviews show that this idea or perception largely comes from single individuals of the client firm: "we have about two or three colleagues in our department, who are very technically oriented and that have contacts spanning organizational boundaries. They have a very good overview of the field of highly skilled software engineers". Finally, data suggests that creating knowledge as connecting people is based on personal networks. This corresponds with the concept of special boundary roles, or specialized gatekeepers who are strongly connected to external sources of information (Allen, 1970; Tushman, 1976).

Proposition 3: The creation of organizational knowledge in CN occurs by connecting of 'know-who'. The success of connecting depends on single individuals in the client firm and is mainly based on personal networks.

4.3 Firms' strategies of utilizing contractors' knowledge

Based on the concept of social capital and consistent with our data, creating knowledge within CN means predominately a connecting of 'know-who'. However, more aspects influence the management of knowledge within CN. As noted before, general evidence in literature states that task contingencies may influence the management of knowledge. With regard to this, the type of performed services becomes relevant. In addition, it can be suggested that the strategies of a firm will deal with the conflicting objectives of utilizing highly skilled contractors. Described below are different strategies which depend on the type of performed services and the conflicting objectives. The strategies differ with respect

to the strength of ties between the connected people, the number and role of gatekeepers, the rate of co-evolutionary learning and the length of the connection.

Strategy of weak ties. The first strategy is the use of weakly tied CN. In a weakly tied network contractors and clients see one another infrequently and their relationships are rather casual (Granovetter, 1973). Data suggests that the strategy of weak ties is most suitable for the access and flexible utilization of contractors performing less complex and less interactive services. Firstly, by using a weakly tied network it is possible to access new contractors' specialist knowledge. This knowledge is non-redundant to existing knowledge and a source of added value (Burt, 2001). As the performed service is less complex, weak ties are sufficient to appraise the knowledge of the new contractor. Secondly, the flexible utilization of this knowledge is less problematic and the danger of opportunistic behavior is relatively low. Subsequently, strong ties for efficient sanctions are not necessary.

The conducted interviews show that the number of gatekeepers is rather small, as the performed service is neither highly complex nor highly interactive. Only a small percentage of traditional employees can be regarded as being weakly tied boundary spanners. As these gatekeepers are not supposed to intensively interact with the contractor, they do not have to engage in co-evolutionary learning. Overall, the strategy of weak ties supports the objective of access and flexible utilization of external knowledge.

Proposition 4: A strategy of weak ties to contractors is suitable for the utilization of less complex and less interactive services. Weak ties support the objective of access and flexible utilization of contractors' knowledge.

Strategy of strong ties. The second strategy is the use of strongly tied CN. Frequent contacts and intensive communication characterize a strongly tied network. As an interviewee stated, concerning contractors performing highly complex services; "(...) people are sitting together in one room. They work together in mixed teams. Yes, friendships emerge (...)". In this case, the utilization is based on a high rate of co-evolutionary learning which is not equal to a transfer of knowledge between client employees and the contractor, but equal to a good perception of the others' knowledge. With the social capital concept in mind, the development of strong ties between contractors and client employees is required. Thus, it is suggested that the strategy of strong ties is suited to for the (re-)utilization of highly complex and interactive services. The strong ties are critical for realizing the value of the highly complex and interactive services, since in a network characterized by closure, effective sanctions based on trust

and norms are possible. Thus the described economic dependencies on the individual contractors' knowledge and the danger of opportunistic behavior by the contractors become more manageable.

Obviously, the more complex and interactive the performed service, the more employees of the client have to engage as specialized gatekeepers. As these gatekeepers are supposed to co-evolve together with the contractor, the strategy of strong ties is suited to relatively long-term relationships with contractors and a relatively stable network. Therefore, the strategy of strong ties supports the objective of re-using existing contractors' knowledge and generating relational rents.

Proposition 5: A strategy of strong ties to contractors is suitable for the utilization of highly complex and highly interactive services. Strong ties support the objective of re-use contractors' knowledge.

Apparently, firms are embarking on both weak and strong ties strategies when utilizing highly skilled contractors. Weak ties are obviously suitable for flexible utilization and access to less complex services. However, which way do firms access new highly complex services and contractors' knowledge? In order to appraise the highly complex services and knowledge in advance strong ties ought to exist. But, such ties are not available when accessing services the first time. Our data suggests two ways of access: Either, firms engage in a trial and error procedure, or firms rely on rather private strong ties, of which the firm did not take advantage beforehand. In this context the conducted interviews show that the variation of strategies in the course of time is relevant.

Strategy variation in the course of time Organizational learning literature (March, 1991) describes two generic strategies - a strategy of exploring and a strategy of exploiting. Recent literature on organizational learning even suggests that exploitation and exploration are complementary (Knott 2002). It is suggested that finding the correct balance of generic strategies is achieved over time. In developing a dynamic model of organizational learning, Holmquist (2003) proposes dynamic transformations from exploitation to exploration and vice versa. Moving from exploitation to exploration is known as "opening-up" and moving from exploration to exploitation as "focusing". Regarding the utilization of knowledge in CN, similar transformations from weak to strong ties, and vice versa, are apparent.

Focusing: Our data suggests that a transformation from exploration to exploitation occurs in two particular situations. Firstly, focusing might occur after accessing (trial and error) a highly complex and interactive service. A relatively weak tie can be used to gain this access, despite not having a sufficient perception of the contractors' knowledge. Utilizing the service in an efficient manner leads to the development of strong ties. Secondly, focusing is necessary if less complex services become highly complex services. For example, less complex services become highly complex if the contractor adopts firm specific knowledge while performing the service. If so the strategy of weak ties switches to a strategy of strong ties.

Opening up: The 'opening up' argument is strongly linked to models of organizational life cycles (Greiner, 1972). The strategy of strong ties leads to so-called path dependencies (Arthur, 1994) in the organizational knowledge base at some point in time. In order to overcome the associated structural inertia (Hannan and Freeman, 1984) the CN has to be reconfigured. This occurs firstly, by finishing the reutilisation of contractors knowledge and the exploitation of long-term relationships (strong ties) and secondly, by exploring contacts to new contractors via weak ties.

Proposition 6: In the course of time strategies are changing from weak to strong (focusing) and from strong to weak (opening up) ties. The change of strategies is influenced by emergent and deliberate changes concerning the utilized type of service.

Strategies according to dynamics of the environment. Our data suggests that strategies vary not only in the course of time, but also that the overall balance of strategies is influenced by the dynamics of the environment. This is consistent with conclusions of past research (Matusik, 2002; Matusik and Hill, 1998). A more dynamic firm-environment demands a more flexible knowledge base. An indicator for a flexible knowledge base is the variability of the knowledge network (Herrmann-Pillath, 2002). Hagedoorn and Duysters (2002) propose, with regard to inter-firm networks, that "strategies associated with learning through so-called exploratory networks appear to generate a greater impact on technological performance in a dynamic environment than efficiency strategies through exploitative networks" (Hagedoorn and Duysters 2002:525). Rowley et al. (2000) similarly argue that strong ties in the dynamic semi-conductor industry affect performance negatively. However, in the less dynamic steel industry, a positive effect can be seen. With respect to CN, the variability of the network ties in with

the strategy of weak ties. The more dynamic the environment the more a weak tie strategy is adopted and vice versa.

Proposition 7: The overall balance of strategies is influenced by the dynamics of the environment. A more (less) dynamic firm-environment is positively associated with a strategy of weak (strong) ties.

To complete the picture of utilizing contractors' knowledge, the size of the network in relation to the size of the firm, must be considered. The relative size is therefore the ratio of contractors to traditional employees. The investigated firms had different sized CN. The interviewees guessed (there are rarely exact numbers) that the ratio was between 20 and 50 percent. In most of the cases, the relative size of the CN was oscillating. This oscillation might be interpreted as a sort of balancing of strategies. For example, a strategy of strong ties might lead to a complete internalization of external services.

5. Discussion and conclusion

The purpose of the present research was to explore and understand the utilization of highly skilled contractors with regards to organizational knowledge. The analysis resulted in the development of a grounded theoretical framework and seven illustrative propositions.

5.1 Implications for theory

Beside the grounded theoretical framework, the theoretical conclusions and implications of this research are threefold. Firstly, our data suggests that the utilization of highly skilled contractors occurs not only for flexibility reasons, but for generating relational rents. Thus, we confirm past research (Nesheim, 2003; Matusik, 2002; Matusik and Hill, 1998). Highly skilled contractors are used in value-creation areas. In an advanced view our research points at the relevance of a relational view (Dyer and Singh, 1998) when discussing the creation of knowledge across organizational boundaries.

Secondly, this research throws some more light upon social capital as a factor of success in creating organizational knowledge. Social capital theory and the epistemology of practice (Cook and Brown, 1999) lead to a creation of knowledge by a connecting of 'know-who', i.e. knowing individuals. In this respect it may be a valuable and complementary perspective, that managing organizational knowledge across boundaries

does not necessarily imply joint learning and complete knowledge transfer. Our research supports this perspective and similar research (Grunwald and Kieser, 2003; Borgatti and Cross, 2003). Furthermore our data and analysis speak strongly in favor of a consideration of contingencies, e.g. the complexity and interactivity of performed service. In some respects this corresponds to the findings of Hansen (1999), who argues that strong ties are effective for the transfer of complex and tacit knowledge, whereas weak ties are suitable for explicit knowledge.

Finally, we have to consider that the creation of organizational knowledge is a permanent process. Associated with that the required structure of social capital changes. This calls for a dynamic extension of the social capital theory. A dynamic social capital theory can provide deeper insights into the creation of organizational knowledge. For example, such a dynamic theory of social capital ought to explain how weak and strong ties develop over time and influence the creation of organizational knowledge.

5.2 Managerial implications

The grounded theoretical framework for the utilization of contractors' knowledge also has implications for management practice. Firstly, when utilizing knowledge within CN, a trade-off between flexibility and dependence must be made. Secondly, with reference to the social capital concept and an epistemology of practice, the management of knowledge within CN is mainly a management of 'know-who', i.e. a management of knowing individuals. Therefore firms must not concentrate on a complete transfer and sharing of knowledge but on managing the relations with and between knowing individuals. Thereby, managers can support the development of strong or weak ties. Thirdly, the decision whether to utilize strong or weak tie strategies should be made according to the type of services and the intended objectives. Finally, firms are supposed to balance both strategies over time and according to the dynamics of the environment. Subsequently, a permanent transformation from strong to weak ties and vice versa is likely. This transformation ought to be based on an examination of the relations in the CN and will in turn lead to a permanent reconfiguration of the CN. Such reconfiguration activities are a central part of managing knowledge in CN.

5.3 Limitations and further research

Of course, this research has significant limitations as well. The data of our research results from a specific context. The conclusions of the research are merely exploratory.

Further research is needed to confirm them. Also, the description of utilizing contractors' knowledge calls for elaboration. Moreover many 'managerial' questions are unexplained. For example, it will be difficult to determine the type of performed service or the point of time to strengthen or abandon ties to individual contractors. Despite the empirical limitations and unsolved managerial questions, we hope that our research provides a platform for further theorizing on social capital and knowledge creation processes across organizational boundaries. For this purpose a more dynamic theory of social capital as a factor of success for knowledge creation is required.

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