

STRONG TIES, WEAK TIES AND THE MANAGEMENT OF INNOVATION

The case of Danish and German SMEs

Abstract

Dynamic changes in the structure of value-added chains lead to an enhancement of innovations of SMEs and therewith of SMEs for the national economies. In the European context the support of the innovation process of SMEs is a goal of the economic policy. In this context private as well as public consultancies shall provide advice for the innovation management of SMEs. This is to some extent politically introduced but the offer of advisory service is seldom used. This is allegeable through the lens of social network theory. The integration of consultancies leads to weak relations in the cooperating innovation network. Due to the fact that the innovation competences are critical resources for SMEs, the use of consultancies could lead to a dilution of the core competences. The empirical analysis of this contribution which compares Danish and German SMEs gives evidence that Danish SMEs manage to exploit the range of services offered by consultancies better.

Keywords: SMEs, Innovation, Networks, Public Policy

JEL-Classification: L14, L39, O32

1 Introduction

Economic operations and thus innovations are embedded in social relations and structures (Granovetter 1985; Hagedoorn 2006). Therefore, the organisational units that create innovations are not individual businesses, but usually networks. From a resource-oriented point of view, networks hold a variety of advantages for their members, such as access to material and immaterial resources, such as information and knowledge. Powell et al. (1996), for example, conclude in their study on innovation behaviour in pharmaceutical companies that companies which are not able to initiate networks or form a cooperation have strategic disadvantages on the market. In this context, especially small and medium-sized enterprises are considered to be dependent on the social capital of networks, due to the limited resources they have because of their size (Kaufmann & Tödting 2003). But innovation networks are not only relevant for participating SMEs, they also have an impact on the economy in general (Laforet & Tann 2006). On the one hand, because SMEs generate a large share of the economic performance, as well as of the innovations in economies which are characterized by small and medium-sized enterprises. On the other hand, because especially globalised SMEs that use innovation as competitive strategy ensure that new knowledge spreads and provide for the innovative capacity of the overall economy. In order to keep up in the competition with well-resourced businesses, SMEs inevitably depend on cooperation. Information even has to be collected beyond the borders of the cooperation network. "... Networks are vital providers of various kinds of knowledge not only from directly related relationships but also from indirect relationships (Tolstoy 2009, 207). At the same time, with the trends moving towards decentralisation and outsourcing in the past two

decades, SMEs have significantly gained in importance for innovative strength: as a result of the transformation of the value-added chain, innovations frequently shifted from large companies to small and medium-sized businesses and thus to networks (Asheim 2004).

These are good reasons for policy makers to support the development and especially innovations of SMEs. For that purpose, business development services provide general information for SMEs. But they also try to specifically arrange access to material and immaterial resources, to connect with network partners and to directly or indirectly integrate consultancies. Some of these measures might however be counterproductive. From strategic management's point of view – and on this all common approaches agree, from New Institutional Economics with the transaction cost approach through the market-oriented viewpoint of industrial economics to the resource-based view of the firm– it is essential to protect certain information and not feed them into the networks, through which it spreads uncontrollably.

To express it in the terminology of social networks analysis, SMEs need “strong ties” in the process of innovation – i.e. a dense network of trustworthy relations – to keep the innovation process under control. However, strong ties imply the weakness that they are little suitable to open up novel information (Granovetter 1973). This insight from network-analytical research holds a dilemma for the management of the innovation process: a balance of “strong” and “weak ties” needs to be created in the relation network of SMEs, without jeopardising the exclusiveness of the “strong ties” (Burt 2004; Fliaster & Spiess 2007; Stark & Vedres 2009; Uzzi 1997).

The resulting management problem of balancing out different information sources in the innovation process has lately been a frequent object of innovation research from a sociological, as well as a business economics viewpoint. There, research focuses on individual networks, strategic alliances and regional clusters. In contrast, the role of the public and private consulting system has attracted less attention (Tödting & Kaufmann 2002; Cornett & Freytag 2006). This role is the focus in our comparative study on the utilisation of the consulting system by SMEs in the innovation process. First evaluation studies on innovation policies in the European context suggest that the support provided by public institutions is used to varying degrees. In particular, a low degree of utilising the public consulting system to promote innovation is reported for Germany, compared to the Scandinavian countries (Cornett 2007; Latniak & Rehfeld 1994; Sounder & Jenssen 1999). In the Danish-German comparison we will address the question, which conditions initiate and impede the utilisation of the consulting system from a business point of view and whether these parameters differ for the SMEs in the countries we looked at.

We will develop this business perspective in the next section, referring back to central statements of strategic management, the “resource dependence approach” (Pfeffer & Salancik 1978) and what is known as the “relational view of the firm” (Dyer & Singh 1998) in particular. Based on this theoretical frame of reference on the relevance of “strong” and “weak” ties in SME innovation management, hypotheses about the utilisation of consulting systems in the innovation process will be derived. In

another section we will discuss commonalities and differences in Danish and German innovation management, which possibly influence the utilisation of the consulting system. The empirical part describes first the underlying survey study on SMEs in western Denmark and northern Germany (Cornett & Sørensen 2005). Multivariate analyses of successful and unsuccessful innovation processes provide information about factors of the utilisation of the consulting system in both countries. The article concludes with critical indications regarding the limits of the study and for further research on innovation management.

2 Innovation in SME networks

2.1 Innovation, knowledge and networks

Knowledge is a central variable in the process of “creative destruction” and implementation of “new combinations” of production factors (Schumpeter 2006). Schumpeter’s elements in the definition of the innovation process clearly show that knowledge can be perceived in different ways here. Business-related innovation research emphasises in particular the aspect of creativity that is linked to human capital. Drucker (1999), for example, speaks of the “knowledge worker” in this context. But when the aspect of “new combinations” is accentuated, the perspective changes and the relational level of the entrepreneur – on the individual or the corporate level of the organisation – becomes the centre of attention. In other words, from this point of view it is not only the human capital, but also the social capital of the organisation that is of interest (Matiaske 1999).

This shift in problem is, on the one hand, the result of the theoretical and empirical development in sociologically characterised network research. With his prominent study on the relevance of the individual social capital in job search, Granovetter (1973) pointed out that for the job seeker it is not only helpful to fall back on a dense network of relatives and friends for social support, but that it is especially distant acquaintances who give access to new information and job offers. The strength of weak ties in social networks is to grant access to new information pools. This insight can be used strategically. Burt (1992) in particular worked out the position of brokers in his theory of “structural holes” in networks. There is an arbitrage for them for bridging several densely closed networks, whereby they create connections between them or communicate information. These developments in sociological network research have not only extended the term of social capital, which has so far been restricted to close and trustful relations (Coleman 1990), but has also created a link to business-related organisation, and more specific innovation research (Burt 1999). On the other hand, the trends towards decentralisation and outsourcing in the previous decades, which have, for example, been taken up in organisation research under the heading of the hybrid organisation or “relational contracting” (Williamson 1985), have contributed to a change in perspective in business research. At first, the network organisation as a phenomenologically new type – e.g. as strategic alliance, associations or

joint ventures – attracted empirical and theoretical attention (Duschek 2004). Recently, business research has also linked up with the methodology of social network analysis (e.g. Ebers 1997). As in sociology, the question of knowledge generation in networks is gaining in importance in organisation and innovation research (Perry-Smith & Shalley 2003). Unlike in the classical job search example, the reciprocity of information transmission in networks turns out to be problematic in the context of innovation research. While it is usually convenient for the job seeker when the signal of his or her concern starts to spread, this is not the case for innovating businesses. Instead, the chance of gaining new information via network connections is opposed to the risk of losing knowledge (Fliaster & Spiess 2007, 114f.). This risk exists, for example, for companies working together with partners who are interested in technological novelties. In the case of SMEs, due to their role as suppliers of large companies, there is also an unequal balance of power, which allows the stronger partner to absorb innovations easily (Katila et al. 2008). Another hazardous situation that Katila et al. (2008) point out is the cooperation with consultancies that also work in other companies at the same time. Consultants utilise the barriers between closed dense networks as brokers, the way Burt sees them, and diffuse information from one social circle to another. This might be useful for the macroeconomic development, but is certainly not in the interest of the “exploited” sub-networks or their member companies. In this context, though, Cohen and Levinthal (1990) point out that innovation knowledge is thus not easily transferable. In order to be able to absorb innovation knowledge, the competitor would first need to have the compatible “absorptive capacities” (Cohen & Levinthal 1990). But the barrier of a company’s inhomogeneous basic knowledge alone does not provide protection from the transfer of strategic know-how by brokers in the medium to long term.

Yet, also an isolation from central network partners, other businesses or organisations in general and from consultancies in particular carries risks (Fliaster & Spiess 2007; Li & Atuahene-Gima 2001; Xu 2008): innovative solutions are found either too late or not at all and resources might be lacking to establish an innovative solution on the market. In summary, Katila et al. (2008, 322) do not generally consider it appropriate to avoid risky relationships: “By examining multiple types of partners, we find that firms swim with sharks rather than safer partners when they need the unique resources that sharks possess and can protect themselves...Conversely, firms avoid relationships that offer too little resource benefit or entail too much risk.”

The following argumentation runs along these lines, i.e. we leave sociological network research which, in a way, observes a complete network from “bird’s eye view”. Certainly it needs to be considered whether specific combinations of strong and weak ties are appropriate for specific types of innovation processes or phases thereof. With the question we focus on it is of particular interest which determinants prompt corporate actors, or SMEs to be precise, to seek or avoid specific partnerships in innovation processes. That means we ask from the egocentric point of view, to take up the terminology of network analysis, for the companies’ networks in the innovation process. In the following sections

the unit of analysis is not the network, but the decision of the individual company and the question, thus, a problem of strategic management.

2.2 Strategic partners in the innovation process

Strategic management refers to a number of central theoretical frames of reference. In this study the reference point is the “research dependence approach” (RDA) (Pfeffer & Salancik 1978), which seems to be particularly suitable for a number of reasons. Not only is the RDA considered theoretically well developed and empirically sound (Nienhüser 2008), but it is also specialised in the question of external relations of organisations. Following the criticism of the contingency approach, which has long dominated organisational theory (Pfeffer & Aldrich 1976), Pfeffer & Salancik (1978) fall back on a power-theoretic argument (Emerson 1962) in order to clarify which situational determinants govern the behaviour of organisations. With this theoretical foundation they attain in a way a meta-criterion that limits the arbitrariness of situational influencing factors and explains why the environment has an influence: the resource dependency of the organisation is the basis of external exertion of influence. As opposed to other resource-oriented approaches, resources are here defined not only as input but also as output factors, i.e. the access to pre-product markets can be considered as a resource, just like the one to the final sales market.

External control can be exercised by those actors that control resources which are significant for the organisation’s effectiveness. The level of the organisation’s demand determines how powerful the partner is: the greater the interest of the focal organisation in resources that are under the control of an external actor, the greater the power and also the influence of just this external player on the focal organisation. It applies, furthermore, that the better the external actor manages to monopolise the interesting resources, the more influence he can exert. To put it the other way round: the more difficult it is for the focal organisation to obtain the interesting resources outside the relation to the external actor, the greater his power in the focal organisation. It is particularly useful for the influence on the organisation if the external player controls resources that are vital for the focal organisation. In this case, Pfeffer & Salancik (1978) talk about “critical resources”.

In that situation actors, i.e. organisations, act under uncertainty: the RDA transforms this proposition according to the action-theoretical concept of power with the assumption of an intended rational behaviour or “bounded rationality” (Simon 1955). As a rule, the conception of the actor operates with the simplified assumption that the organisation behaves like an individual actor.

These assumptions characterise the RDA as the strategic management approach. In practical application and normatively shortened, the core idea of the approach is that organisations should avoid uncertainty and power dependencies in order to secure their effectiveness and long-term survival. In developing this argument, the RDA looks at different strategic options, such as avoidance or change of external dependencies through e.g. warehousing or diversification, the co-optation of partners or influencing the environment via marketing measures or lobbying (Gretzinger 2008). Beyond these

strategic options for reducing uncertainty and power dependence, the RDA avoids to specify the argumentation, though, possible critical resources in particular. Pfeffer and Salancik do not want to repeat the mistake of the “old” contingency approach to list random influencing factors, but argue for a specification of the power-theoretic core argument according to the object of investigation or rather of the suspected interests of organisations in specific situations, as resources become critical resources because of the demand from an organisation.

A suitable frame of reference for assessing the interests of businesses in an innovation process is in our context the “relational view of the firm” (RV) (Dyer & Singh 1998; Foss 1999). In extension of the better known “resource based view of the firm” (RBV) (Wernerfelt 1984), which focuses on individual businesses and their core competencies, the RV identifies the relevance of networks for the companies’ resources and for generating a competitive advantage. Just like the RBV, the RV is so far predominantly phenomenologically or normatively oriented (Duscheck 2004; Freiling 2008).

However, the descriptive integration of business networks, competitive markets and core competencies of the individual businesses is here sufficient to derive specific constellations of interests. To explain these we refer back to the power-theoretic argumentation of the RDA.

The argumentation of the RV aims at expanding core competencies in networks which are, analogous to Katila et al.’s (2008) request, supplied by complementary material and social resources of network partners. Dyer & Sing (1998) argue that it is the task of the network members, according to their interests and position of power in the innovation network, to negotiate appropriate governance mechanisms that allow a market-oriented cooperation. That means that the internal cooperation of the network partners in the innovation process is directed at gaining competitive advantages externally, i.e. on the market. The ideal structure of an innovation network is, from this perspective inwardly-directed, described as a network of “strong” ties. Agreed and assertive norms, on the one hand, and trust on the other hand provide the innovation network with stability. Outwardly-directed the network appears accordingly as a cooperation, which controls “weak” ties in view of enforcing innovation on the market (Fliaster & Spiess 2007).

So, the paradox of the social structure is also clearly shown from the RV’s point of view. The close and trustful cooperation structure in the network creates advantages, which can, to quote Duschek (2004) and Kogut (2000), be called the Coleman rent, as Coleman’s conception of social capital focuses on the close relations in networks. Accordingly, the arbitrage from utilizing weak ties to spread innovations is known as Burt rent. Possibly, the structural paradox can be solved by introducing time as additional variable. Dynamic analyses (Ahuja 2000; Stark & Vedres 2009) suggest that weak ties can lead to an expansion of networks: “A firm’s knowledge therefore provide it with access not just to the knowledge hold by its partners but also to the knowledge hold by its partners’ partners” (Ahuja 2000, 430). The utilization of indirect communication channels results in an intensified relation and weak ties turn into strong trust relations. In view of the comparative statistical analysis, which is our focus in this study, this argumentation cannot be pursued further.

From the RDA's perspective the restriction to strong ties in the innovation process can be explained as a result of the mechanism for avoiding dependence and uncertainty. Strong ties can also be better controlled through formal mechanisms and contracts than informal norms and trust (Matiaske 1999). It should be noted that trust in the understanding of the power-theoretic argumentation is with Coleman (1990) considered a risk assessment of making profits or avoiding losses in a relation. There are good reasons to do without the affective component of trust, which the authors of the RV emphasise. Even if there are no human actors free of affects in business networks, they do act in the role of members of a purposeful organisation (Kieser 1997).

2.3 Avoidance of uncertainty and dependence

Following these considerations, some hypotheses can be derived regarding the utilisation of public, as well as private consultancy services in the innovation process. The term 'innovation', as we use it in this study, emphasises the aspect of re-combining production factors. In anticipation of the operationalisation, we generally assume that SMEs tend to resort to their customers' knowledge, on the one hand, and to that of suppliers or network partners on the other, to detect problems or generate solutions, rather than drawing on the knowledge provided via the weak ties of the consulting system. Possibly, customer needs will rather be picked up on in the context of product innovations, while supplier know-how is in demand when it comes to process innovations. Still, SMEs will not reject the services of the consulting system in principle. If they revert to public or private consultancies, then most likely if the company can easily control the uncertainties and potential power dependencies linked to it. This is easier for businesses that are strong in resources and therefore generally larger than for the smaller ones which are weaker in resources. Stated as a hypothesis:

Hypothesis 1: *The better a business is equipped with resources, the more likely it is that consulting services are used in the innovation process.*

However, different reasons can lead to the utilisation of "weak" ties, in this case the consulting system. If critical resources have a high level of monopolisation, the focal company needs - from the RDA's point of view - to tap alternative resource repositories outside these power relations. So, the consulting system can be useful in this situation. Because of the number of external contacts that varies with the size of a business, smaller companies will probably have more difficulties in getting access to alternative resource repositories. The reasons leading to the utilisation or neglect of "strong" or "weak" ties cannot be empirically determined here. Following the argument of size, the reason for having to open up new resource repositories via weak ties should rather be valid for small businesses, though. The interrelation stated in Hypothesis 1 does, therefore, not have to be tested for non-linearity, as smaller businesses are possibly using the consulting system to avoid a monopolising dependency. It can, in contrast, be generally assumed that the use of formal and informal control mechanisms lowers the risk of the outward flow of information through consulting in the innovation process.

Particularly contracts with the implication of binding legal norms rank among the formal control mechanisms. However, legal norms and contracts also depend on trust due to their incompleteness. Trust in this context implies that, according to the assessment of a risky decision for or against a cooperation partner, a gain can more likely be expected than a loss. Following Coleman (1990), this expectation depends on experience from another specific or generalised relation, i.e. previous profitable transactions facilitate trust in specific transaction partners or in an anonymous system, respectively. These thoughts support our general assumption that businesses in an innovation process will rather cooperate with customers and suppliers or network partners than with the consulting system, as with the first two groups there is generally far more opportunity to develop a relation that is “resistant to disappointment” (Luhmann 1973) than with the consulting system. Regarding the utilization of the consulting system in the innovation process this leads to two hypotheses that complement each other:

Hypothesis 2: *The better the contractual agreement of the consulting service, the more likely it is that consulting will be utilized in the innovation process.*

Hypothesis 3: *The stronger the trust in the consulting system, the more likely it is that consulting will be utilized in the innovation process.*

The RDA as well as the RV indicate with the terms “critical resources” and “core competencies” that not all resources or relations are equally important for organisations. Referring to the innovation process, it therefore needs to be differentiated to which extent the innovations are of main, strategic or just of minor importance. Strategically important innovations must rather be protected against information outflow than innovations of minor importance. These thoughts motivate the following hypothesis:

Hypothesis 4: *The more important the innovations for the business, the less likely it is that consulting will be utilized in the innovation process.*

2.4 Innovation management in Denmark and Germany

Just like for the European Union as a whole (Borrás 2003) it is also true for Denmark and Germany that the public authorities have intensified innovation policy as a means of promoting the national economy. With new consulting and organisation concepts it is not only the innovation process, but also small and mid-size businesses as the bearer of innovations that are to be supported. SMEs are of central significance for both the Danish and the Germany economy.¹ This is even more valid as

¹ With regard to the comparative analysis of innovation management in Danish and German SMEs it is significant that both countries are characterised by small and medium-sized companies: 99.7% of the Danish and 99.5% of the German companies in the non-financial sector of the industrial economy (NACE sections C to I and K) are SMEs with less than 250 employees in 2008 (Schmiemann 2008, 3). These companies provide work for 58% of all employees in Denmark and 63% of the German employees. They generate 64.8% of value added in the industrial sector in Denmark and 53.2% of the Germany value added (OECD STI 2008). The figures show that Danish SMEs are more productive than German businesses with less than 250 employees. For 2005 Eurostat found that 100 employees in Danish SMEs generate a value added of € 59 million, while only € 45 million are generated by 100 employees in German SMEs (Schmiemann 2008). Regarding strategic investments in innovations we can see that in Denmark SMEs invest 9% of the “Industry Added Value” in research and

SMEs increasingly become the initiator for innovations in large businesses, too (Cooke & Wills 1999; Cornett 2007; Keeble & Wilkinson 1999; Nauwelaers & Wintjes 2003). “In this perspective, innovation policy became a tool in regional policy – or to put it in another way, regional policy adapted innovation policy as an integral part of business development policy” (Cornett 2007, 231). Public consulting and funding institutions, research parks and “innovation clusters” that have recently been initiated in Denmark are typical forms of appearance. However, referring to Germany, Reinhard (2001), for example, draws a critical balance. Although new structures to support knowledge and technology transfer were also created in Germany, their success fell short of expectations. Reinhard states that in order to overcome existing deficits a change in behaviour needs to be initiated among businesses, and for this purpose, he demands more transparency of information in the technology transfer system, e.g. by setting up contact platforms or initiating networks.² Latniak & Rehfeld (1994) substantiate in a somewhat older study the information deficit that is criticized, based on a representative survey among SMEs in North Rhine-Westphalia. According to that, only 0.4% of the interviewed SMEs made use of public technology transfer institutions. Other public consulting centres were used just as little with 1.3% as private consultancies with 0.8%. According to this survey, SMEs will rather make use of direct informal (31.8%) or formal contacts (19.4%) to other businesses as a source of information when it comes to innovations.

While the significance of supporting innovations has been recognized in Denmark as well as in Germany and new institutions have been established to provide this support, there are differences in kind and scope. Based on the data on the German-Danish comparison, which will be introduced in more detail later on, initial descriptive analyses show distinctive differences: Danish SMEs use opportunities for consulting significantly more often, in particular the offers of private consultants. While roughly 16% of the SMEs call in private consultancies when it comes to innovations, this is only true for 7.5% of the German SMEs that were interviewed.

The question of why Scandinavian companies in the innovation process are more open towards consulting was investigated by Sounder & Jenssen (1999). They suspect cultural reasons or rather reasons in the difference in organisation culture between Danish and US-American businesses. Ultimately, they ascribed the differences in communication behaviour to cultural differences. According to that, employees in Scandinavian companies work more independently and self-organised than in US-American businesses. Moreover, the innovation process in Scandinavia is run in a less authoritarian manner. This allows employees of Scandinavian businesses a more spontaneous communication behaviour and to make new contacts autonomously, if it is appropriate.

development, while German SMEs invest only an average of 3% in this field. Comparing the output of “New-to-market-product-innovations” Danish businesses do better with 22% successfully innovating SMEs than the German SMEs with only 8% (OECD STI 2008).

² The demand regarding the initiation of networks and more transparency in the communication process ignores the dialectics of “strong” and “weak” ties: Burt rents can only be generated if information does not diffuse randomly. Therefore, brokers and mediators are highly interested in keeping up the information gradient (Gretzinger & Matiaske 200).

Culture is certainly a significant influencing factor on the socialised behaviour of individuals. Therefore, there is always the risk in cross-cultural comparative analyses that the analysis of economic, social and legal marginal conditions is terminated too early with reference to different mentalities. From an organisation theory perspective, these references to cultural differences are in any case an unsatisfactory reasoning, as they allow little room for opportunities. Without wanting to continue this discussion it can be noted that so far, there is hardly any indication for an explanation of the different usage patterns when it comes to opportunities for cooperation in the innovation process of Danish and German businesses. However, if Danish SMEs are more successful in dealing with the dilemma of “strong” and “weak” ties, this would be a good reason to take a closer look at the behaviour of these organisations. It might moreover be useful to cast a glance at Denmark in order to improve the efficiency of the consulting system elsewhere as well. Business opportunities for increasing efficiency depend, however, on the set-up of organisational structures and behaviour, and not in changing national cultures. In the empirical analysis we therefore want to examine potential differences in the cooperation behaviour of Danish and German SMEs without deriving a hypothesis, for lack of a logical connection.

3. Empirical Study

3.1 Data basis and operationalisation

Data base of this study are postal (Denmark) and telephone (Germany) surveys on the innovation behaviour of SMEs and on the utilization of the consulting system in both countries. In both countries there were two surveys each: one in businesses, the other in public and private organisations offering innovation consulting. According to the focus of this study only the business data are used here.³

number of employees	country				innovation available		total	
	DK		D					
5-9	165	43.5%	42	11.1%	101	20.5%	207	27.3%
10-49	121	31.9%	196	51.6%	202	41.1%	317	41.8%
50-99	40	10.6%	53	13.9%	67	13.6%	93	12.3%
100-199	29	7.7%	45	11.8%	61	12.4%	74	9.7%
200-499	15	4.0%	37	9.7%	46	9.3%	52	6.9%
≥500	9	2.4%	7	1.8%	15	3.0%	16	2.1%
total	379		380		492		759	

Table 1: Size categories and innovation behaviour

The population of SMEs was limited by the target criteria location, size and industry. On the Danish side, businesses from Jutland and Funen were included, while it was SMEs from the

³ The surveys were carried out within the scope of the Danish-German research project “Innovation behaviour of SMEs” of the University of Southern Denmark and the University of Flensburg, which was funded by the EU (duration 10/2002 – 03/2006). Field phases were in 2003. Surveys on the Danish side were carried out by the University, on the German side TNS Emnid was instructed to do the telephone survey (cf. in detail Dannenberg & Thaysen 2005).

federal states of Mecklenburg-Western Pomerania, Hamburg and Schleswig-Holstein in northern Germany. Businesses from the population do not employ less than 5 and not more than 500 members of staff and are from the goods-producing industry.⁴ Both partial surveys were carried out based on random samples. The return rate of the postal survey in western Denmark was roughly 12%. In Germany, approximately 31% of the interviews with businesses from northern Germany could be used. Only members of executive management were interviewed.

Table 1 provides information about the distribution according to size and innovation behaviour. Usable information is available for 759 SMEs in total, half of which are based in Denmark and Germany, respectively. The distribution between size categories shows a significantly higher share of very small businesses with 43.5% of all Danish SMEs, compared to the German partial sample, where 11.1% of the businesses employ between five and nine persons. The few businesses with 500 and more employees are those that had slightly exceeded the limit at the time of the survey, deviating from the directories of the population. Micro-enterprises with less than 5 members of staff, which were registered in the directories with a larger number of employees, were left unconsidered in the evaluation and the telephone survey. According to their own information, approximately two thirds of the businesses that were interviewed could record at least one innovation in the past three years. These 492 businesses are the data base for further analyses.

Table 2 lists the operationalisations of the variables that were used in the hypotheses. In the survey we asked in detail about cooperation in the innovation process. One series of questions dealt in general with the cooperation, the last innovation process in the past three years being the anchor point. Two other series asked in more detail about the last successful resp. unsuccessful innovation in the time period. “Strong” ties with cooperation partners in the innovation process are operationalised into relations to customers and suppliers. The tie-groups are usually mentioned jointly in the underlying multiple answer ($r = .40$). 52.8% of the businesses cooperated solely with customers and suppliers in the innovation process. Accordingly, cooperation with public or private consultants are subsumed as “weak” ties. Apart from few exceptions, these businesses have both “strong” as well as “weak” ties. The two consulting categories correlate with $r = .31$. 34.3% of the enterprises did not enter any partnership in the last innovation process. With 14.7% Danish SMEs utilised weak ties slightly more often in the innovation process than the German ones, where public or private consultancies were used in only 11.3% of the cases.

⁴ The industry classification is defined by the NACE-code numbers 15-41.003, excluding publishing 22.1-22.15.0. This corresponds mainly to the sectors of food, beverages and tobacco, textiles, wood and furniture, rubber and plastic, iron and metal, electronics, as well as means of transport.

name of variable	operationalisation
“strong tie”	cooperation with customers and suppliers in the innovation process
“weak tie”	cooperation with public or private consultants in the innovation process
size	number of employees
contract	1) Was the partner subjected to specific test criteria before entering the cooperation? (yes/no) 2) Was a contractually binding agreement entered with the partner? (yes/no) 3) Was the partner subjected to specific test criteria after the completion of the cooperation? (yes/no)
trust	1) Does your partner trust you? (4 fully, 1 not at all) 2) Do you trust your partner? (4 fully, 1 not at all)
Hauschildt-Schlaak index	novelty of the innovation (Likert scale, 7 items, Cronbach’s $\alpha = .91 / .95$)

Table 2: Operationalisations

The variables regarding the contractual agreement and trust in the partner in the innovation process are obtained through questions which describe the relation with the cooperation partner in more detail. We surveyed whether the partner was checked by the SME ex ante or ex post with specific criteria and whether there was an explicit contractual relationship with the partner in the innovation process. Furthermore, the trust relationship was reciprocally surveyed in self-assessment and the expected third-party assessment. This item set was subjected to a principal component analysis and was rotated orthogonally. As a result we receive to independent components, one of which depicts predominantly the contractual agreement, the other the trust relationship with the partner.

Another item set, which is known as the Hauschildt-Schlaak index, measures the degree of novelty of the innovation for the company. The items refer to the applied technology, channels of distribution, suppliers and production, the culture and structure of the organisation and marketing costs (Hauschildt & Schlaak 2001). To determine an anchor point for this scale, the interviewees were first asked to describe in an open answer the most successful, as well as the least successful product innovation of the past three years. For each of these innovations, if available, we obtained the Hauschildt-Schlaak index. The reliability of the scale is remarkably high, with $\alpha = .91$ for successful innovations and $\alpha = .95$ for the unsuccessful ones.

3.2 Findings

To test the hypotheses we solely used the datasets of those businesses which enter “strong” cooperation ties – with customers or suppliers. This way we lose only few cases, six to be exact. This means that all remaining SMEs, which enter weak ties to consultancies in the innovation process, have “strong” cooperation relations at the same time. Technically speaking, these different cooperation forms are a Guttman scale.⁵

⁵ Cooperation partners could be organised according to a Guttman scale or Mokken scale and correspondingly one could chose a regression model for ordinal target variables for the analysis.

For those cases that cannot be classified we can, based on the RDA, assume among others that they counteract a monopolised power relation by establishing alternative sources of supply. However, the dataset does not include the information to support this assumption sufficiently. With regard to Hypothesis 2 and 3, the remaining dataset corresponds exactly to the argumentation that was developed here. Only SMEs that have close relations to their partners in the cooperation process will also enter the risk of additional weak relations. Therefore, the available data can already be assessed as an indication for the conclusiveness of the presented arguments regarding the utilization of weak ties.

Binary logit estimations are applied for the modeling. Target variable in all models is the utilization of weak ties in dummy coding. Corresponding to the hypotheses we developed, the models successively take on the variables for business size as proxy for resource equipment, the indices for contractual agreements and trust between the cooperation partners as well as the country in dummy coding (0 = DK, 1 = D). Extended models with additional control variables will not be reported here, as the variables of organisation demography, which have so far been considered, do not lead to findings that are fundamentally different.

Table 3 reports the findings for the last innovation process in the past three years⁶. The Table shows the marginal effects, as those allow a direct interpretation of the direction and impact of effect. The signs of the marginal effects show the predictor's direction of effect, i.e. a positive sign indicates that the risk of the SME entering weak relations in the innovation process goes up with marginal increase of the independent variable. Along these lines it applies to the country dummy that the direction of effect needs to be interpreted with regard to the reference value – here Denmark. So a negative sign implies that Danish SMEs will rather build up ties with consultancies than German businesses.

The results show that the model estimates are altogether significant throughout the analysis, but that explanatory contributions for the SMEs' decision behaviour are, however, low. Pseudo R^2 values are between 3% and just above 6%. The variance explanation can hereby almost solely be referred back to the variables size and country. Compliant with the hypotheses, a better resource equipment of the business, represented here by business size, is accompanied by a greater usage of the consulting system. The variables of contractual agreement and trust in strong cooperation relations to customers and suppliers, which are significant from a theory perspective, do not have an influence on the utilization of consulting in the innovation process according to these analyses. This holds also true if the consulting system is not analysed as a single unit with regard to the target variable, but separately for public and private consultancies. In contrast, the differentiated analysis shows clearly that the significantly higher utilisation of the consulting system in Denmark can be referred back to the more frequent involvement of private consultancies in the innovation process. In this respect, German SMEs are comparatively reserved, as already mentioned in the description of the data.

⁶ In a more elaborate version of the estimations we use multiple imputations (ICE Royston 2004, van Buuren et al. 2006) to handle missing values. The results do not differ substantially, so we present the standard models.

Similar results can be recorded for the analyses of the most and least successful innovation of the past three years, which is compiled in Tables 4 and 5. First of all, it can be noted that nearly all SMEs that generally reported an innovation in the relevant time period did also have a successful innovation. In contrast, a less successful innovation can only be found in roughly half of the SMEs with innovations. As before, we successively extend our base model by the variables size, contract, trust and the dummy for the differentiation of the countries. Contrary to Hypothesis 4, the relevance of the innovation process, measured with the Hauschildt-Schlaak index, does not change the usage pattern of the consulting system by SMEs. Only in a differentiated analysis do we find a significantly higher utilization of public consulting institutions in the case of less successful innovations. Spontaneously, this effect could be interpreted in such a way that in innovation processes which are important but where success is jeopardized, public consultancies are called in as “friends in need”. However, this single finding should not be overrated. For the country dummy, on the other hand, we find the familiar pattern. In contrast to German businesses, Danish SMEs utilize the consulting systems significantly more often. In the case of less successful innovations this holds only true for private consultancies, though, and not anymore for the consulting system in general.

predictors	(1) basic model	(2) + contract	(3) + trust	(4) + country	(5) + public consultancy	(6) + private consultancy
size	0.0467*** (0.0010)	0.0487*** (0.0012)	0.0489*** (0.0012)	0.0511*** (0.0006)	0.0255*** (0.0020)	0.0380*** (0.0029)
contract		-0.0262 (0.2500)	-0.0263 (0.2480)	-0.0361 (0.1170)	-0.0144 (0.3010)	-0.0148 (0.4630)
trust			0.0086 (0.7080)	0.0127 (0.5760)	-0.0031 (0.8170)	-0.0002 (0.9910)
country				-0.1020** (0.0273)	-0.0109 (0.7000)	-0.1140*** (0.0036)
constant	-0.3990*** (0.0000)	0.4050*** (0.00000)	-0.4060*** (0.0000)	-0.3540*** (0.0000)	-0.2490*** (0.0000)	-0.2910*** (0.0000)
<i>n</i>	323	288	288	288	288	288
LL	-154.24	-135.75	-135.75	-133.29	-72.61	-113.71
<i>p</i>	0.0010	0.0015	0.0044	0.0013	0.0151	0.0021
<i>R</i> ²	0.0323	0.0432	0.0437	0.0605	0.0657	0.0633
Logit: Marginal effects for all SMEs with at least one innovation and cooperation partners Probability <i>p</i> in brackets *** <i>p</i> <0.01, ** <i>p</i> <0.05, * <i>p</i> <0.1						

Table 3: Probability of utilization of “strong” vs. “weak” ties (all enterprises)

predictors	(1) basic model	(2) + contract	(3) + trust	(4) + country	(5) + public consultancy	(6) + private consultancy
size	0.0445*** (0.0043)	0.0422*** (0.0090)	0.0421*** (0.0093)	0.0446*** (0.0052)	0.0257*** (0.0021)	0.0325*** (0.0161)
Hauschildt-Schlaak	0.0012 (0.8760)	-0.0044 (0.5820)	-0.0046 (0.5640)	-0.0028 (0.7220)	-0.0056 (0.2400)	0.0013 (0.8500)
contract		-0.0322 (0.2070)	-0.0322 (0.2060)	-0.0426* (0.0951)	-0.0201 (0.1630)	-0.0154 (0.4860)
trust			-0.0057 (0.8180)	0.0003 (0.9910)	-0.0077 (0.5800)	-0.0089 (0.6700)
country				-0.121*** (0.0137)	-0.0136 (0.6310)	-0.136*** (0.0011)
constant	-0.402*** (0.0000)	-0.332*** (0.0026)	-0.329*** (0.0031)	-0.290*** (0.0082)	-0.181** (0.0104)	-0.277*** (0.0038)
<i>n</i>	284	257	257	257	257	257
LL	-139.86	-123.58	-123.56	-120.59	-64.32	-101.79
<i>p</i>	0.0165	0.0252	0.0520	0.0084	0.0145	0.0051
<i>R</i> ²	0.0271	0.0348	0.0350	0.0582	0.0846	0.0696
Logit: Marginal effects for all SMEs with a successful innovation and cooperation partners						
Probability <i>p</i> in brackets						
*** <i>p</i> <0.01, ** <i>p</i> <0.05, * <i>p</i> <0.1						

Table 4: Probability of utilization of “strong” vs. “weak” ties with successful innovation

predictors	(1) basic model	(2) + contract	(3) + trust	(4) + country	(5) + public consultancy	(6) + private consultancy
size	0.0671*** (0.0007)	0.0616*** (0.0022)	0.0610*** (0.0026)	0.0608*** (0.0025)	0.0297*** (0.0163)	0.0410*** (0.0088)
Hauschildt-Schlaak	0.0062 (0.4750)	0.0071 (0.4280)	0.0069 (0.4400)	0.0079 (0.3790)	0.0096* (0.0774)	0.0030 (0.6810)
contract		-0.0174 (0.5880)	-0.0175 (0.5840)	-0.0330 (0.3260)	-0.0023 (0.9190)	-0.0147 (0.5860)
trust			0.0080 (0.8030)	-0.0030 (0.9250)	0.0214 (0.3140)	-0.0343 (0.1710)
country				-0.0928 (0.1720)	-0.0104 (0.8130)	-0.1160** (0.0357)
constant	-0.541*** (0.0000)	-0.534*** (0.0000)	-0.530*** (0.0000)	-0.498*** (0.0000)	-0.392*** (0.0000)	-0.345*** (0.0007)
observations	174	161	161	161	161	161
LL	-85.43	-77.54	-77.51	-76.58	-47.70	-60.47
<i>p</i>	0.0023	0.0104	0.0235	0.0236	0.0752	0.0085
<i>R</i> ²	0.0645	0.0657	0.0660	0.0773	0.0846	0.1081
Logit: Marginal effects for all SMEs with less successful innovation and cooperation partners						
Probability <i>p</i> in brackets						
*** <i>p</i> <0.01, ** <i>p</i> <0.05, * <i>p</i> <0.1						

Table 5: Probability of utilization of “strong” vs. “weak” ties with less successful innovation

4. Discussion

The importance of innovations in SMEs for an economy that is characterized by small and medium-sized businesses like in Denmark and Germany motivates a policy promoting innovations. However, SMEs in an innovation process use by far rather the “strong” ties to customers and suppliers to initiate and enforce innovations than the “weak” ties to the consulting system. From the perspective of resource-oriented strategic management this cooperation behaviour in the innovation process is coherent, as knowledge of potential or concrete innovations might diffuse via the “weak” ties and possibly drift to competitors. The study we present here also proves this decision behaviour empirically: both Danish and German SMEs utilize far more the “strong” than the “weak” ties when it comes to choosing the cooperation partners in the innovation process.

In order to improve the utilization of the consulting system, a deeper understanding of the SMEs’ cooperation behaviour is essential. Here we argue with reference to the RDA that organisations will generally try to stabilise their external relations to other actors in order to avoid power dependencies and the influence associated with that. As a result, SMEs will only use the “weak” ties of the consulting system if they can control them as far as possible or if they see a chance of evading power dependencies by using the consulting system. Based on the data that were used here, it is almost exclusively the first case that can be observed empirically: generally SMEs will only build relations to the consulting system if they have strong cooperation relations at the same time. In contrast, it is only in exceptional cases that relations to the consulting system are recorded if there are no strong cooperation relations at the same time.

Based on the RDA a number of arguments were developed to provide a better explanation of the cooperation behaviour of SMEs. The first assumption is that the supervision of external relations depends on the resource equipment of the organisation, i.e. larger organisations should rather see themselves as being able to enter weak relations than comparatively smaller businesses. While this hypothesis is well confirmed in the analysis with the underlying data, the more specific hypotheses are not confirmed in the same way. The argumentation that those SMEs that cannot secure their “strong” cooperation relations with formal (test criteria or contracts) or informal (mutual trust) control mechanisms will rather enter “weak” ties is not supported by the data analyses presented here. It is rather the mere presence of “strong” cooperation relations that will suffice to enter also weak relations. Neither is our further argumentation that the novelty and the uncertainty of the innovation process that is linked to it influence the cooperation behaviour confirmed by the multivariate analysis. Comparing Denmark and Germany, however, the results of the multivariate analysis show that Danish SMEs utilize the consulting system, especially private consultancies, comparatively more often than German SMEs.

Practically these findings imply that the consulting system has difficulties in reaching smaller SMEs. That means that a considerable effort is required from public consultancies in particular to support

innovations in SMEs. Based on this study it could not be clarified to which extent the decision behaviour of SMEs indicates how the consulting system might be improved in other ways. This implies a need for research, as it would need to be clarified under which conditions SMEs would wish for and utilize consulting. To answer these questions a more differentiated argumentation might be necessary that also deals directly with the relations between SMEs and consultancies, not only indirectly with the cooperation relations with other partners. This argumentation was tailored to the research strategy of secondary analysis that was pursued here and which also accounts for part of the limits of this study. Certainly, the response to more profound questions requires another, extended database which provides more information about the behaviour of SMEs in the innovation process and the utilization of the consulting system.

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