Paper submitted to:
R&D Management Conference 2018 *"R&Designing Innovation: Transformational Challenges for Organizations and Society"*
June, 30th -July, 4th, 2018, Milan, Italy

Culture-based Open Innovation Approach: A Case Study of German SME

Dieter Spath[1,2], Georg Nawroth[3], Lisa Kurz[4], Lukas Keicher[5], Peter Ohlhausen[6]

[1] Institute for Human Factors and Technology Management IAT, University of Stuttgart, Nobelstraße 12, 70569 Stuttgart, Germany, dieter.spath@iat.uni-stuttgart.de
[2] Fraunhofer Institute for Industrial Engineering, Nobelstraße 12, 70569 Stuttgart, Germany dieter.spath@iao.fraunhofer.de
[3] Institute for Human Factors and Technology Management IAT,University of Stuttgart, Nobelstraße 12, 70569 Stuttgart, Germany georg.nawroth@iat.uni-stuttgart.de
[4] Institute for Human Factors and Technology Management IAT, University of Stuttgart, Nobelstraße 12, 70569 Stuttgart, Germany lisa.kurz@iat.uni-stuttgart.de
[5] Institute for Human Factors and Technology Management IAT, University of Stuttgart, Nobelstraße 12, 70569 Stuttgart, Germany lukas.keicher@iat.uni-stuttgart.de
[6] Fraunhofer Institute for Industrial Engineering IAO, Nobelstraße 12, 70569 Stuttgart, Germany peter.ohlhausen@iao.fraunhofer.de

Abstract: Innovations are increasingly emerging from networks in which different competencies can be bundled with the help of Open Innovation (OI). As a result, also small and medium-sized companies (SMEs) have to deal with networking in the sense of opening up their processes. In addition, the opening of the culture and mindset is a central aspect in the dissemination of OI. This study investigates the knowledge about and the dissemination of OI, concentrating on German SMEs in the traditional sector of technical textile industry. A particular emphasis is placed on the influence of the employees' mindset, the organizational culture and on the readiness for OI. This study is the first of its kind to examine the link between OI in German SMEs and organizational culture. In addition, it gives an overview of the status quo in detail. It can make a significant contribution to the understanding of opportunities, risks and concerns regarding OI in SMEs.

1. Introduction

The opening of innovation processes offers companies great opportunities to increase the success rate and assertiveness of innovations and is already widespread among many larger companies. The subject of this case study are German small and medium-sized enterprises (SMEs) from the (very traditional) technical textile industry as well as the dissemination and knowledge of open innovation and the targeted integration of internal and external competencies into the innovation process.

A special emphasis of this study is placed on the influence of the attitudes and values of employees and corporate culture as well as on the attitude of managers towards developing an assessment tool for cultural willingness to open innovation. This article shows the concept of the culture-based open innovation approach, which is derived from a number of success factors that are of particular importance for SMEs in the field of technical textiles. The results

presented in this article are part of a study conducted as part of the futureTEX project funded by the German Federal Ministry of Education and Research. The objective of the futureTEX project was to prepare the technical textile industry in Germany, which is characterised by small and medium-sized enterprises (SMEs), for a successful future. A promising way for this preparation is the implementation of methods from and the dissemination of knowledge about Open Innovation (OI). Particular attention was focused on examining the relationship between corporate culture and open innovation.

1.1 Open Innovation and the need for cultural capability in SMEs

For over a decade, Open Innovation has been an increasingly popular approach to innovation management in research, science and business. The monograph "Open Innovation: The new imperative for the creation and use of technology", published by Chesbrough in 2003 (West et al., 2014) has given an important impulse here. Open Innovation stands for a paradigm shift and the idea that an opening of the innovation process is an important key to the improvement of own technologies in terms of idea generation, knowledge transfer and the conquest of different market access. (Chesbrough, 2003).

According to a recently published study, the dissemination and implementation of open innovation in SMEs poses difficulties and shows that SMEs in particular face major challenges in implementing open innovation processes that seem less accessible to SMEs (Brunswicker, 2014). However, open innovation also offers promising advantages to SMEs. The bundling of knowledge and competencies with the help of the OI paradigm opens up many opportunities with regard to the efficiency and quantity of new innovations and the development of new business fields and markets (Chesbrough et al. 2006; Nawroth et al., 2017).

Networking – both internally and externally – is one of the fundamental elements for improving the innovative capabilities of companies (Dhanaraj & Parkhe, 2006; Tsai, 2001). In this context, for external openness to new cross-industry impulses (Gassmann et al., 2010) and for the integration of innovation-relevant external competencies and knowledge. In addition to the external cooperation, internal cooperation can also lead to competitive advantages and increased generation of ideas through cross-divisional cooperation and internal bundling of competencies and knowledge (Freytag & Young, 2014).

In the OI paradigm, in overcoming the organizational and structural perspective of opening up innovation processes, there is another elementary component: the corporate culture forms the basis for the dissemination of open innovation among all employees of a company. This means that an open mindset of employees and managers can dramatically improve a company's ability to innovate (Lindegaard, 2010). Since a company's ability to innovate is strongly related to its corporate culture, this study examines the influence of corporate culture on OI in medium-sized companies in the German technical textile industry.

1.2 From a manufacturing company to an innovative one

In March 2016, a workshop was held in Chemnitz, Germany, with 35 participants from the technical textile industry, in order to understand the challenges SMEs which they are currently facing. This workshop allowed an insight into the subjective and individual perceptions of current challenges in SMEs in the textile industry and allowed a subject-oriented exploration of the current baseline conditions.

From an economic point of view, the German technical textile industry is challenged by strong competition and strong competitive pressure, especially from Asian low-wage companies. This rivalry results in high price pressure on the international market, which is a particular challenge for German low-wage SMEs in this sector. Based on this current situation, companies' innovation efforts focus exclusively on high-quality and high-tech products. The vision of German medium-sized textile companies is to evolve from a manufacturing to an innovative company
.
However, this vision is contrary to the dominating impression: technical textile SMEs currently feel uncomfortable and insecure due to a lack of knowledge about the future workplace and the contents in the textile environment. In the meantime, these companies also have the feeling that they are lagging behind technological trends. One of the most influential global trends - digitization - is often unknown and underestimated in the textile industry.

2 Performing a cultural approach: research design and methodology

In addition to the workshop in Chemnitz, an online questionnaire with 130 questions, bundled in 18 different thematic areas, was developed and in-depth interviews followed. For the questionnaire and the in-depth interviews, the corporate culture, based on one of the first anthropological definitions of culture, was understood and interpreted as the "complex whole" of "human habits" within an organization (Tyler, 1871). This simple interpretation of the corporate culture reveals that on one side there are describable, individual habits within an organization, on the other side it allows the measurement of organizational homogeneity (Rathje, 2010). This is the core of established, usually much more detailed corporate culture definitions of the last three decades. It also stands for the equal inclusion of both manifest and cognitive elements (Rathje, 2010).

2.1 Quantitative and qualitative analysis in combination

The companies for this study were questioned between November 2016 and February 2017 using an online survey. The 18 different topics of the questionnaire are addressing strategic goals, challenges or membership in networks. Some of the questions were designed and defined as key questions that lead to one or other topic depending on the answer to the key question. This means that a two-step approach was chosen for the online questionnaire: For example only enterprises that have already implemented OI and answered the question accordingly were asked about the methods used, the benefits they see in these methods and the difficulties in their implementation. As a result, the questionnaire is more user-friendly, as the participant is only asked about relevant issues (e.g. only if an SME is active in a cluster or network can it answer questions about this participation). Most of the questions and responses to the survey were based on a Likert scale with five possible answers. In addition to the above, for a few questions (if necessary) there was a three-step answer scale or the possibility of a free text answer. In the design of the questionnaire, care was also taken to ensure that the survey results are comparable between SMEs and the large companies already examined in other studies. Access to the online questionnaire was given to around 300 SMEs from the technical textile industry in Germany. More than 50% of these SMEs (170 in total) replied to the questionnaire. Of the 170 questionnaires received, 56 records could be used as data input for the study - the remaining questionnaires were incomplete or basic metadata was missing. However for this study approx. 20% of the entire German technical textile industry could be questioned and examined. This makes the study a relevant presentation of this sector.

Following the analysis of the online questionnaire, in-depth interviews were conducted with individual companies and scientists in an attempt to achieve a deeper understanding of the interpretation of the survey results and to supplement the quantitative analysis with a subject-oriented interpretation of the research question. In these interviews, the companies were asked about the results of the online questionnaire. For example, why there is fear of working with large companies, especially those from West Germany.

3 Findings

This study shows that OI is an increasing trend. Half of the SMEs analysed – which have made use of (parts of) OI – had their first work experience with OI methods prior to 2004, the other half of SMEs post 2004, well ahead of those Chesbrough (2013) has examined in larger companies and enterprises. The background to this is that the technical textiles sector consists mainly of medium-sized companies, which are often highly specialized. These highly specialized companies are not capable of developing new and ever more complex products themselves in times of digitization. They have to therefore cooperate with other companies in their innovation activities. In other respects, 50% of SMEs that do not use OI methods state that they intend to use them in the future. These results show that Open Innovation is establishing itself more and more in the technical textile industry and that the subject does not only affect large companies.

3.1 Open Innovation is gaining in importance

OI has great potential for improving innovation activities in SMEs and is widespread among these enterprises. However, a closer look at the use of the term "open innovation" indicates that the number of previously unreported cases of SMEs in the field of technical textiles using open innovation may be very high. This could be proven by the result of only 17.6% of the questioned companies that they consider cooperations with regard to co-creative innovations as a component of open innovation.

This survey showed that – in line with the OI definition for this survey – 63% of the SMEs surveyed are currently using or applying OI methods and a further 18.5% intend to become active in this area in the future. This is a low 63% share compared to large enterprises, at the level of low-tech industries and the financial services sector, both of which are the lowest in larger enterprises (Chesbrough, 2013). At least in this area the textile industry, which is seeking high-tech market leadership, does not meet its own aspirations.

In addition, 90.9% of the companies in the survey stated that open innovation activities had not been discontinued in the past and will continue in the foreseeable future. This is basically an indicator for the successful implementation of open innovation. The remaining ten percent represent a considerably more audible value of the planned or already completed termination compared to large companies. The main reason for ending OI activities is the search for matching partners, lack of resources and OI management.

3.2 Balanced information flow is key success factor for the continuation of OI activities

The most frequently cited reasons for the termination of OI activities were the difficulty of managing the OR processes and the lack of input from the partners. With 9.1% of the SMEs surveyed who planned or implemented the discontinuation of OI activities, the results for the SME-based technical textiles industry are significantly higher than for large companies. In 2013, it was shown that none of the large companies that operated Open Innovation discontinued its activities in this area (Chesbrough, 2013). From the point of view of medium-sized textile companies, experience has shown that large companies have fewer problems with these challenges. For many SMEs it is a great challenge to find the right partners, to manage open innovation as such and to use the corresponding resources. The future goal must be to create a framework that reduces the number of companies that do without open innovation. The information flows and the communication culture in the companies and the individual partners involved play a particularly important role here. In the context of open innovation, the most targeted communication possible should be aimed at both internally and externally. The in-depth interviews showed that the internal, informal flow of information in particular has room for improvement in many areas and that there is a desire for greater transparency with regard to the activities of other departments.

3.3. Networking activities lead to an opening of innovation processes

The active acquisition and participation in networks is from the perspective of the companies surveyed very important. Participation in corresponding networks is seen as an elementary success factor for the future innovation opportunities of the entire industry.

Asked about OI activities, 80.9% indicate that they are networked, another 12.8% are planning more network activities for the future. With regard to the most relevant reasons for participating in networks, there are three factors that are valued almost equally (approximately 80% each): "The search for partners for innovation projects" is the most frequently cited, followed by "news from industry" and "exchange of know-how". Only 6.4% of the SMEs surveyed are not involved in any network and do not plan to become active. Two reasons have been given for not participating in networks: On the one hand, there is the fear of a loss of knowledge within networks and, on the other hand, there is the fear of competitors who could gain a knowledge advantage by opening up their own innovation process. In connection with this, the vast majority of 91% of companies are open to new (international) partners. At this point it becomes clear that the attitude towards networks on the part of the management has a great influence on the actual network activities of the entire company. At the same time, however, 40% of companies see different languages as the biggest obstacle. In addition to networks and networking, publicly funded projects and the sale of market-ready products were named as the most important OI activities.

3.4 Open Innovation is a strategic corporate decision

Looking at the strategic orientation of OI, a distinction is made between inbound and outbound activities (Chesbrough & Crowther, 2006). These two concepts explain the flow of information (e.g. technical knowledge) between the organizations, which either leaves the company (outbound) or flows into the company (inbound). The survey showed that 46.35% of the innovation results of their innovation projects have gone to other organisations (outbound), while 55.12% of their projects (inbound) received external information. These near-balance shares represent a significant difference from larger companies and groups in which only 8% of projects had outbound activities (Chesbrough, 2013).

On second reading of inbound activities, the SMEs surveyed considered publicly funded projects to be the most critical factor. Informal networking was classified as the second most important factor, followed by contract research and customer-integrated product development. On the other, SMEs rated the sale of market-ready products as the most important outbound activities.

In order to generate a research and development budget for these activities, the development of new products is considered the most important strategic orientation of OI activities. With regard to the relevance of the strategic goals, the picture was not as clear as with regard to the orientation of the open innovation activities. The diversity of strategic objectives for OI activities, which were considered very important by companies, indicates high competitive pressure and the willingness of SMEs to make major changes in the field of technical textiles.

3.5 Technical textile industry has to face its specific cultural challenges

The identification of cultural challenges in the technical textile industry is not about the isolated consideration of individual causalities, but rather about the reproduction of subjective interpretation and action approaches of employees as well as the understanding of complex connections of the examined SMEs, e.g. the interaction between employees and company management, the lived management culture, the openness towards cooperation with other companies and the exchange with other industries. In the basic assumption that the nature of organisational culture is determined by the subjective patterns of action and interpretation of the individual employees, the employees are the central source in the study of organisational culture (Götz & Moosmüller 1992). To a certain extent, the employees are the interface of cultural dynamics resulting from the networking of social context and organizational cultural patterns as well as individual courses of action (ibid.). The SMEs studied house a complex fabric of meaning whose individual elements - such as reception and application of open innovation - can only be understood in their overall context (Götz & Wittel 2000).

The in-depth interviews and the workshop showed that many companies are confronted with mental blockades when it comes to change. However, mental and imaginative flexibility is one of the most important cultural prerequisites for the successful introduction and implementation of open innovation. Mental blockades of thought contradict an open attitude towards new topics. Besides these mental blockades, an attitude according to the principle "we have always done it this way" dominates. On the one hand, this lived principle stands for a rejection of change processes and on the other hand it conveys that there is a great desire for safety in SMEs in the German technical textile industry. Management and employees tend to use tried and tested methods, which have worked well in the past, rather than exposing themselves to the risk of new approaches and thus to the risk of failure. Despite this awareness, change processes are not started and thinking outside the box is not a widespread practice. This is another major obstacle and barrier to creativity and innovation, e.g. by combining one's own knowledge with knowledge from other sectors.

The SMEs involved also describe the restriction of innovations to product innovations as a special cultural challenge. The great potential of process innovations and service innovations is not exploited by focusing and limiting resources on product innovations. In addition to these "internal" challenges, there is an external challenge that has to do with demographic change in Germany: It is becoming increasingly difficult for these SMEs to find qualified trainees.
The results of the surveys show that the corporate culture of the SMEs examined from the technical textile industry in Germany is characterized by mistrust and distrust towards the opening of processes towards external partners. One of the reasons for this fear could be the experience gained after the reunification of East and West Germany, when qualified employees from West Germany took over management positions in companies from East Germany and skilled workers from East Germany emigrated to West Germany (Bluhm & Jacobs, 2016).

Another sign of the protective behaviour and way of thinking is the internal organisational structure of SMEs: a top-down approach is the dominant type of innovation and decision. This means that the managers of medium-sized companies decide on innovations and bring in new ideas. In the innovation process, there are strict responsibilities of the individual departments and the managers usually make the final decisions. This means that in addition to refusing to open processes to external partners, there is also no opening of internal processes. In addition, conservative and protectionist behaviour on the part of management can be observed.

An interesting result of the survey is the fact that the SMEs surveyed do not consider cooperation with external partners to be very important. However, companies of similar size are the preferred partners when working with external partners. Current research supports this behaviour, as it shows an imbalance in the flow of information in cooperation

with large companies. Large companies absorb more external information than they pass on to smaller partner companies (Chesbrough & Brunswicker, 2013; Nawroth et al., 2017).

Furthermore, the investigation revealed that many of the SMEs are struggling with the English language and the wording of OI. The results show that many of the SMEs use OI methods such as participation in networks and similar methods, but do not know that they are part of the OI paradigm because they do not know the English names of these methods. Although SMEs are prepared to cooperate with international partners, they also fear language barriers to cooperation with these partners. However, as already described, an elementary prerequisite for the successful use of OI is the opening of internal and external processes and the integration of different external knowledge and experiences into the innovation process. This opening of processes requires a certain corporate culture. The corporate culture prevailing in medium-sized companies in the German technical textile industry, which is characterized by clear hierarchies and strict responsibilities as well as distrust and distrust of external partners, makes it difficult to spread the idea and the advantages of open innovation in the industry.

All these specific challenges identified and the experience of SMEs lead to the assessment that cultural change is the greatest challenge.

Conclusion: Practical implications and further research need

This study is the first of its kind to examine the use and knowledge of OI in German SMEs and to provide an overview of the status quo. The results can thus make a significant contribution to understanding the opportunities, risks and concerns associated with open innovation in SMEs. Up to now, this understanding has only existed for larger companies and groups. Furthermore, necessary support options are pointed out and the strengths and weaknesses of the industry with regard to open innovation and corporate culture are identified.

SMEs in particular benefit from these results, as they gain an overview of the use and dissemination of OI in a traditional industry and are able to position themselves in the market and compare. With this knowledge and the combination of soft corporate cultural factors, they are able to develop new strategies. In addition, they gain insight into the evaluation of the potential of OI, the difficulties in its introduction and implementation and how it can be solved. This offers interested SMEs a range of solutions. In addition, the present study will help to raise SMEs' awareness of open innovation and show how OI can increase their ability to innovate. Finally, SMEs - especially from and in the technical textile industry - benefit from the establishment of new networks that have emerged during the project. All these results will help SMEs, particularly in the field of technical textiles, to focus on a successful future.

The German SMEs examined are very diverse and harbour different strengths, weaknesses and optimisation potentials. Therefore, future research should focus on reconciling the main indicators of success factors with the specific characteristics of the SMEs studied. As our study shows, the biggest challenge for medium-sized companies in the German technical textile industry is the process of changing corporate culture. Therefore, new ways, methods or instructions for successful cultural change must be researched and developed. Another interesting research gap is the comparison of corporate culture in SMEs from the technical textile industry with SMEs from various sectors. This could provide an opportunity to learn from each other and lead to a sustainable improvement of the economic system.

References

Bluhm, M. and O. Jacobs. 2016. Wer beherrscht den Osten? Ostdeutsche Eliten – ein Vierteljahrhundert nach der deutschen Wiedervereinigung, [online], University of Leipzig, https://www.mdr.de/heute-im-osten/wer-beherrscht-den-osten-studie-100-downloadFile.pdf [15.04.2018].

Brunswicker, S. and V. Van de Vrande. 2014. Exploring open innovation in small and medium-sized enterprises. New frontiers in open innovation, 135-156.

Chesbrough, H. 2003. Open Innovation: The new imperative for creating and profiting from technology, Harvard Business School Press, Boston.

Chesbrough, H. and S. Brunswicker. 2013. Managing Open Innovation in large firms, Berkeley, CA: Fraunhofer Verlag.

Chesbrough, H. and A.K. Crowther. 2006. "Beyond high-tech: early adopters of Open Innovation in other industries." In: R&D Management 36 (3), 229–236.

Chesbrough, H., Vanhaverbeke, W. and J. West. 2006. Open innovation: Researching a new paradigm. Oxford University Press on Demand.

Coras, E. L. and A.D. Tantau. 2013. "A risk mitigation model in SME's open innovation projects". In: Management & Marketing, 8(2), 303.

Dhanaraj, C. and A. Parkhe. 2006. "Orchestring innovation networks. In: Academy of management review, 31(3), 659-669.

Freytag, P. and L. Young. 2014:"Introduction to Special Issue on innovations and networks: Innovation of, within, through and by networks." In: Industrial Marketing Management, 43(3), 361-364.

Gassmann, O., Zeschky, M., Wolff, T. and M. Stahl. (2010). „Crossing the industry-line: breakthrough innovation through cross-industry alliances with 'non-suppliers." In: Long Range Planning, 43(5), 639-654.

Götz I. and A. Moosmüller. 1992. "Zur ethnologischen Erforschung von Unternehmenskulturen. Industriebetriebe als Forschungsfeld der Völker- und Volkskunde." In: Schweizerisches Archiv für Volkskunde 88:1–30

Götz I. and A. Wittel. 2000. Arbeitskulturen im Umbruch. Zur Ethnographie von Arbeit und Organisation.Münster: Waxmann.

Katz, R. and T.J. Allen. 1982. „Investigating the Not Invented Here (NIH) syndrome: A look at the performance, tenure, and communication patterns of 50 R & D Project Groups." In: R&D Management, 12(1), 7-20.

Lindegaard, S. 2010. The Open Innovation Revolution. Essentials, Roadblocks, and Leadership Skills, Hoboken, John Wiley & Sons.

Nawroth, G., Wingartz, N., Spitzley, A. and J. Warschat.. 2017. Open Innovation in der technischen Textilbranche, Stuttgart: Fraunhofer Verlag.

Rathje, S. (2010). Gestaltung von Organisationskultur. Ein Paradigmenwechsel. In: Barmeyer, Christoph I./Bolten, Jürgen (Ed.): Interkulturelle Personal- und Organisationsentwicklung: Methoden, Instrumente und Anwendungsfälle. Verlag Wissenschaft & Praxis, Sternenfels, 15-30.

Tsai, W. 2001. "Knowledge transfer in intraorganizational networks: Effects of network position and absorptive capacity on business unit innovation and performance." In: Academy of management journal, 44(5), 996-1004.

Tyler, E. 1871. Primitive culture – Researches into the development of mythology, philosophy, religion, language, art and custom. London.

West, J., Salter, A., Vanhaverbeke, W. and H. Chesbrough. 2014. "Open innovation in the next decade." In: Research Policy, 43(5), 805 – 811.

Wynarczyk, P., Piperopoulos, P. and M. McAdam. 2013. "Open innovation in small and medium-sized enterprises: An overview." In: International Small Business Journal, 31(3), 240-255.