Abstract: Due to different factors, SMEs’ innovation processes nowadays are increasingly dependent on external sources. In this paper we discuss the open innovation paradigm and evaluate the characteristics of knowledge transfer in such open innovation processes. We start by analysing concrete innovation processes in three partnering organisations. Based on the results of the analysis, a target concept was developed in close cooperation with the investigated companies. The concept displays all phases of the innovation process with focus on the openness of this process to the external environment, taking into account the challenges and risks as well as requirements of the resource allocation in SMEs. The link between the innovation process flow, the knowledge flow and the tool support is essential for the success of the concept.

1 Introduction

At the end of the last century the closed innovation paradigm era came to an end due to various factors [GE06; GR99]. Chesbrough responded with the term “Open innovation”, which represents an eclectic approach regarding the opening up of innovation processes. In this context, constructing successful relations with external actors turns out to be both a promising opportunity and a big challenge for companies, SMEs in particular [Ch03].

This paper evaluates the characteristics of knowledge transfer in open innovation processes and discusses the development of a target open innovation process and a supporting management and IT-Tool. The procedure of the paper is as follows: first, a brief description of the theoretical background and past research is represented. Second, the methodological approach is characterized. Third, the project findings are described and their implications are discussed. The paper concludes with a summary and a brief outlook.
2 Open innovation framework

Shorter product life cycles, globalization, new market players and escalating R&D costs have led to the erosion of the closed innovation paradigm, where companies focused on their internal resources to innovate. Nowadays, enterprises rely increasingly on an open innovation approach to get returns on their investments and conduct the individual phases of the innovation process more and more co-operatively [Ch06; GE06; GR99; Ti97]. Company boundaries in the open innovation paradigm can be viewed as permeable towards the external environment, which allows for an increased knowledge flow between the focal firm and outside partners [KZ92; Tu77]. In contrast to earlier models that did not perceive external partners as equivalent, open innovation distinctively differs by its cooperative character, which is central to motivate innovation [Ac08; CG06; Ch06; WG06]. Firms choose their strategic partners within the same or across different industries. Depending on the innovation project, they can be customers, suppliers, research institutes, or even competitors. Consistent management along the entire project supports the success rate of the open innovation process. However, when engaging in open innovation, knowledge leakage becomes a big threat and companies fear getting fleeced by their business partners [Ch09]. Due to this background, it is essential for companies to develop a well-balance innovation strategy representing both closed and open innovation approaches. Furthermore, a SME-specific innovation management tool which supports open innovation processes has not been developed yet. Hence, this paper describes the analysis of the innovation processes and the internal and external knowledge environment in three SME as a basis for the development of tailored open innovation IT and management tool.

3 Research design and methods

We collected data during a three year project in which two university partners and three pharmaceutical SME explored the opportunities to improve innovation management practices and to identify and apply suitable open innovation approaches.

Following the project aims, the exploratory character of the empirical investigation and the shared interest of researchers and practitioners, we used different research methods: action research, KMDL and online survey [Ad09]. Based on the specific results of these methods, we were able to analyze the existing innovation processes as well as to gain insight regarding the company’s culture, communication structures, competencies and social behaviour.
We started our work using the method of action research to identify the relevant topics, e.g., knowledge and project management in the partnering companies. Action research assists practical problem solving and expands scientific knowledge at the same time by working collaboratively and using prompt data feedback in a cyclical process [HL80]. At the beginning of the project, the strengths, weaknesses, opportunities and threats were summarized in order to point out the core areas for a general research concept. Furthermore, in-depth interviews and workshops during the entire project supported the team work especially by the validation of preliminary results, the discussion about the next project steps and the identification and further research of new project topics, e.g., IP Management, competence management and collaboration.

Furthermore we used the Knowledge Modeling and Description Language (KMDL®) to model the knowledge intensive innovation process flows in order to analyse the current situation in the project partners’ organisations. The KMDL is a method for modeling and analysing of knowledge activities in business processes which aims to overcome the deficiencies of traditional business process modelling techniques, taking into account the aspects of explicit and tacit knowledge. Its development, promoted by the University of Potsdam, Germany, has led to a well-proven process model and the corresponding mechanism for analysing process potentials [BH09, Po09, Gr09]. KMDL includes a procedural model, which consists of nine phases and facilitates two interrelating views: the process view and the activity view. The process view aims to describe the logical sequence of the innovation process from the perspective of the process steps in order to show which task should be completed before the next task begins and which alternatives exist. The activity view provides a more detailed description and analysis of the knowledge conversion in selected knowledge-intensive process tasks [BH09, Po09]. The models of both the process and the activity view and the results of the free potential analysis, which is also part of the KMDL, establish the basis for a target-actual-comparison and the development of managerial implications regarding an appropriate open innovation concept.

Since the focus of our research is the open innovation paradigm, special attention was paid to the interactions with external actors and the interface between the organisation and its environment. Our analysis focused on the current relationships structure and on the importance and the impact of the external sources in the innovation processes.
4 The handling of external knowledge - presentation and discussion of selected research results

During the first research steps – the qualitative research, we find out that to a certain degree all partnering companies involve external partners into their innovation processes. However, these interactions as well as the innovation process as a whole are rudimentarily structured and formalized, e.g. important steps are missing or their frequency is not clarified. Furthermore, the methods in use regarding the project and portfolio management are standardized good-practice quality guidelines and regulations. The companies display different actual strengths, e.g. the experience of long-serving staff members as a basis for almost all project and execution competencies and the implementation of various methods particularly to assess ideas in the early phases of the innovation process (checklists, portfolio analysis and business plans). To address these challenges, a qualified general concept and a reference process were developed and the necessary organizational and IT-changes were pointed out as project goals.

Subsequently, two important results for the knowledge management in the partnering companies will be discussed in particular - the role of informal communication processes and the role of trade secrets.

4.1 Informal knowledge flows

In order to analyse in detail the internal and external knowledge transfer we used the KMDL activity view. Furthermore, the activity view models were used as a basis for the development of relevant competence profiles of employees involved in the innovation process.

Figure 1 displays a small extract of one example of an informal communication process in one of the partner companies.

![Figure 1 KMDL Modeling Example](image_url)

For more KMDL details [Po09]
The example shows the role of external knowledge for the process of idea generation by customer request. Due to the lack of internal expertise, the company – represented by Employee A – has two possibilities: to decide against the project or to look for other knowledge resources, e.g. (in the modeled case) to contact external experts of known identity. The model shows that the collaboration and the discussion of the ideas have not been articulated into explicit concepts (lack of externalization) – all the gained knowledge remains tacit. The Employee A will probably implement the new knowledge in order to develop the product for the customer and will be able to use the new gained knowledge in a similar situation. However this knowledge will remain in the personal and not in the organisational memory. After the analysis of this situation some recommendations regarding the process improvement can be generate, e.g. [VA09]:

- Externalisation (e.g. documentation) of all discussion details and contact partners;
- Teamwork at every step – in this case the recommendation to involve Employee B in the communication with the external experts, in order allows this employee to share directly process experiences and contacts.

A short online-based survey (n=16) aiming to broaden the view on challenges and problems of SMEs in different industries has been conducted. The results show the important role of the informal knowledge transfer in the process of idea creation and development as well as the lack of externalization rules in the companies. The most important communication partners are well-known external partners (12 answers). All interview participants evaluate the informal knowledge transfer as “very helpful” or “helpful”. In one case all informal communication details/relevant results must be documented. Two other companies have rules to document at least the contact details. And in eight companies there are no documentation rules at all.

4.2 The role of trade secrets in open innovation processes

Furthermore, the topic of knowledge transfer within R&D collaborations was also addressed by our research. The first results are based on in-depth interviews with senior level managers in the partnering companies and a questionnaire pre-test evaluating 12 inter-firm R&D collaborations. These results show that the main reasons for initiating and therefore for engaging in collaborative arrangements are process related trade secrets and cost sharing as well as market entry. Consequently, trade secrets can be used as strategic bargaining chips to attract collaboration partners. However, knowledge must be distributed evenly, any opportunistic behaviour during collaboration can lead to an immediate abandonment. SMEs have limited legal knowledge and if they cannot trust a potential partner they will rarely agree to co-operate. To overcome these issues, firms should advertise their competences and build their reputation as trustworthy collaboration partner [BM09].
Furthermore, in iterative collaborations these characteristics which are linked with trust and information sharing play a more prominent role. Consequently, the open exchange of trade secrets during collaborations can be utilized to create trust and strengthen the partnership effectively beyond the actual collaboration. Once a potential partner is identified, the constitution phase starts with a confidential disclosure agreement (CDA), followed by a letter of intent (LOI) and ends with a collaboration contract (CC) defining the objectives and resources. The CDA enables to share trade secrets and to intensively negotiate [BM09]. During collaboration, knowledge sharing is crucial to maintain trust. Some firms even define the frequency and form of knowledge exchange in the CC. Untimely or stagnation of information flow damages the trust relationship and can lead complete project stop [BM09].

These initial findings were complemented concerning pharmaceutical SMEs in Germany. In particular, we surveyed the pharmaceutical and other knowledge intensive industries such as life sciences to advance the understanding of the use of trade secrets in collaboration. All results were used to develop an open innovation process framework for pharmaceutical SMEs.

5 Development of an open innovation IT and management tool

5.1 Reference management concept and process development

Based on the results of the analysis, a reference management concept and process were developed in close cooperation with the partnering companies. This concept includes all phases of the innovation process with focus on the openness of this process to the external environment, taking into account the challenges and risks as well as requirements of the resource allocation in SMEs. Thus, special attention was paid to the possibilities of involving external actors and the knowledge and information exchange with these actors during the innovation process. Furthermore, the aim of the developed reference concept is to structure the existing “closed” innovation processes in the partnering companies.

The target concept includes three views regarding the management of open innovation process in the company:

- The operational process level, which includes the project management during the stages and gates of a concrete innovation process. The stages describe the logical sequence of an innovation process and include all relevant activities [Co02]. The gates are relevant for the decision-making process: before starting a new stage, the company can make a decision, regarding e.g. resource allocation. Thus, the gates are on immense importance for the openness of the innovation process.
The strategic level, which addresses the aspects of business concept, knowledge management, intellectual property, product portfolio and controlling. These factors represent the basis for the success of the activities on the operational process level. They are also the starting point by the implementation and the development of the companies (open) innovation processes.

The general conditions for the success of the innovation process, e.g. internal and external communication, corporate culture, personal development.

Theoretical and practical descriptions, recommendations, examples have been developed for the partnering companies and as a part of a generalized concept for all of these levels. We took into account all three levels of the knowledge management: organization, people and technical solutions. Regarding the technical solutions, one of the project aims has been the development of an open innovation IT-tool.

5.2 The PharmaInnovationsLotse (Philo)

As a next project step, an IT-Tool for the use in open innovation processes has been developed and is at the moment in the phase of validation and pilot use. Its practical requirements and specifications emerge from the close cooperation with the partner companies in the project, from the analysis of their innovation processes. They address especially the developed reference open innovation process. This software solution enables SMEs to control their innovation processes on the operational as well as the strategic level (business processes, cooperation and knowledge management). Moreover, the one of the features of the tool allows the configuration of company-specific frameworks, such as communication, cultural and personal, secures an effective performance of the innovation processes. It also incorporates the personalization of the organisation's internal operationalization of the innovation processes as well as the inter-organisational cooperation in innovation networks.

The tool is not a project management instrument. Most companies have already implemented such project management tools and the preliminary results have shown that partnering SMEs prefer own tailored and non complicated project management tools. As a respond to the project requirements and results, the developed IT-tool aims to support the project manager as well as of the team members regarding activities, decision processes, staff requirements and specifics in every stage or gate of the innovation process. Furthermore, the strategic level and the general conditions will be also taken into account – various methods, guidelines and check lists will support the open innovation team.
7 Conclusions and Outlook

In this paper, we show selected results which influenced our analysis and the development of an open innovation concept for pharmaceutical SMEs. Decisive in this context are the discovered unstructured processes such as informal internal and external communication. The two roles of this communication – the social and the production-oriented role – demand a well-balanced communication structure that should meet the needs of both of them. Furthermore, as for the implementation of an open innovation, it is important to know the worth of the relevant internal knowledge and the importance and benefits of the company’s trade secrets.

Due to different factors, SMEs’ innovation processes nowadays are increasingly dependent on external sources. But in order to be able to efficiently integrate the potential of external knowledge, companies first need to structure their internal ties and processes [BH02]. Furthermore, the chances and risks of the openness of this process to the external environment are to be pointed out. To be adequately organised, the innovation process and the knowledge flows within this process have first to be analysed and the tailored solution regarding the different levels of the process have to be implemented. This includes the gates and stages of the firm-tailored process flow as well as the organisational culture and strategy. Furthermore, organisations need to establish rules and structures which facilitate different ways of internal and external collaboration and allow the knowledge transfer from a personal towards a collective knowledge basis. This analysis and the target innovation process build the basis for the development and the knowledge flow and the implemented IT-tool is essential for the success of the concept.

References

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