To share or not to share?  
Risks and benefits of the external knowledge transfer

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Abstract

Knowledge management research has extensively covered the benefits of the availability and sharing of knowledge, which include efficiency gains, improved quality, and knowledge as the source to strategic advantages over competitors. However, knowledge management research usually takes a biased view, as disadvantages of knowledge transfer are often ignored. For example, competitive advantages are mostly based on advanced knowledge, which per se relies on knowledge asymmetries and therefore forbids the availability of knowledge.

We therefore introduce two opposing approaches for the design of knowledge transfer, highlighting different practices and interpretations and introducing possible benefits and risks.

1. Introduction

Knowledge transfer generally takes place between people. It can occur within or across enterprise borders. It can be enforced as a reflected act of will or it can happen by accident.

Fostering valuable knowledge flows, as well as the design and establishment and professionalization of these knowledge flows are typical goals of knowledge management approaches in general. The term knowledge flow or knowledge transfer can be criticized as knowledge is always related to context and a human mind and therefore does not flow. However, the constructivist view on knowledge sees its continuous (re)creation based on communication and information. Following this approach, both knowledge flow as well as transfer can be used but refers to knowledge externalization and internalization or recreation of similar knowledge.

In this contribution we present two different views of the external knowledge sharing and argue, that knowledge management does not only mean to enhance knowledge flows, but also to prevent knowledge transfers.

The next section introduces our research methodology. In section 3 and 4 we evaluate both, positive and negative aspects of knowledge transfer, presenting aspects of our research regarding open innovation and product counterfeiting. The summarized results are shown in section 5, whereas section 6 represents the conclusion and the limitations of our work as well as an outlook on future research.

2. Research approach and methodical aspects

In our work we focused on the knowledge and information sharing practices in enterprises.

We applied the concept of practice as a set of activities and understandings within firms, which are embodied in and constitute order of various human actors and objects. A practice we understand as “a routinized type of behavior which consists of several elements, interconnected to one another: forms of bodily activities, forms of mental activities, ‘things’ and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge.” [1].

In enterprises, practices are not limited to shared routines, rules and institutions, but also include actions on an individual level. In order to analyze the practices of knowledge sharing and to find out how they could be improved, we decided to use practice theory as theoretical approach. Practice theory is an umbrella term for a multitude of similar research approaches mainly in social sciences (e.g. [2, 3]), philosophy, cultural theory [4], and science and technology studies (e.g. [5, 6]) that focus on practices in their research. In the last decades, concepts of practice theory also entered the field of economic sociology [7].

In our research, practice theory serves as a theoretical framework guiding our analysis. Hence, we first map the knowledge transfer practices including the relevant internal and external actors and artifacts e.g. knowledge, information and technical systems. We focus on how the practices are embedded and what it
takes to substitute them with developed target practices. The analysis covers organizational structures and processes, by which knowledge and information are generated, stored, shared, communicated and enforced, including all formal and informal decisions on any of the above mentioned activities [8, 9].

Our research started with an extensive literature review, followed by the use of different research methods. In the following, we will briefly present the reasons for the choice of these methods in the course of our study.

2.1. Action research, including in-depth interviews and workshops

Given the project structure and aims, the research work was designed as an action research study. The exploratory character of the empirical investigation on the one hand and the shared interest of researchers and practitioners on the other hand make action research well-suited to the collaborative research approach.

“Action research simultaneously assists in practical problem-solving and expands scientific knowledge, as well as enhances the competencies of the respective actors, being performed collaboratively in an immediate situation using data feedback in a cyclical process aiming at an increased understanding of a given social situation, primarily applicable for the understanding of change processes in social systems and undertaken within a mutually acceptable ethical framework.” [10]

The close collaboration between the research team and the partner organizations provides us with the opportunity to verify the findings gained from the literature review and the theoretical analysis by comparing them with the real situation and challenges in organizational practice.

2.2. Knowledge Modeling and Description Language

Knowledge Modeling and Description Language (KMDL) is an approach to process oriented knowledge management, which, analogous to business process management, analyses actual processes and draws up set-point processes [11]. Contrary to classical approaches of business process modeling, KMDL focuses not only on procedural and information aspects but also on personal knowledge. The original goal of KMDL is the improvement of processes through the conception of demand-oriented measures using the knowledge management method. Semi-formal models are used to visualize and analyze processes. In particular by modeling the activity view, which shows concrete tasks and knowledge related activities within business processes, the information and knowledge transfers which are informal and often run laterally to the specific business processes become transparent.

We used this method to explore both the advantages and the risk from knowledge sharing, analyzing different knowledge-intensive business processes. In the following, we show the importance of knowledge sharing within the context of the open innovation paradigm. As a next step, some results of our research in the field of product piracy will show, why the uncontrolled knowledge sharing may jeopardize the economic power of a producing company.

3. To share

Increasing the efficiency of product development and companies’ own capacity for innovation has always been an important prerequisite for success. By utilizing ideas and technologies in innovations, companies are able to tap new markets and maintain their competitiveness. Whereas large enterprises have the necessary financial and human resources to carry out their own research and development projects, meager resources and limited know-how characterize small and medium-sized enterprises (SMEs). It therefore proves difficult for them to find new ways and tackle challenges created by changing market conditions on the one hand and the realignment of large enterprises on the other hand (cf. [12]). In this context, companies and SMEs are particularly dependent on the involvement of external resources and know-how for increasing their capacity for innovation and therefore their competitiveness in cross-linked cooperation [13].

In the context of knowledge management, Sveiby concedes that external players have a significant role in a company and refers to the acquisition of new knowledge as “intangible income” [14]. In the search for appropriate solutions, the company is able to use external know-how for the purposes of improving profits and growth (cf. [14, 15]).

The open innovation approach provides companies with new opportunities for structuring external relationships and the flow of knowledge, but also sets new challenges for innovation management [16]. In the past, companies preferred to use internal research and development (R&D) and innovation resources for developing and marketing new products, and did not really involve the external environment (cf. [17, 18]). A wide variety of factors, such as globalization, new market participants, shorter product life cycles, smaller R&D budgets and rising R&D costs superseded this ‘closed innovation’ strategy at the end of the last
The new innovation strategy is defined by Chesbrough as follows: “Open Innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology” [17]. Chesbrough extended this definition in 2006 as follows:

“(...) open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively” [21].

A comprehensive open innovation strategy offers companies many opportunities, but also poses new challenges. The knowledge-intensive innovation processes must to some extent be reorganized to include external players and the knowledge gained to be transferred to the organizational knowledge base.

The focus in innovation management by companies is increasingly changing against the background of these developments. Incorporation of the external environment increasingly needs to become an integral part of the entire innovation management concept. New opportunities then arise for medium-sized enterprises to strengthen their capacity for innovation and long-term competitive position. In order to make use of these opportunities, companies need to control, speed up and optimally plan their own (open) innovation process using a variety of methods. Similarly, individual core skills should therefore be enhanced and concepts developed for protecting intellectual property.

3.1. Case studies

Against this background, we worked together with three pharmaceutical enterprises in order to analyze and improve their open innovation processes:

- Company A employs around 180 employees and is a partner for healthcare market services. The company offers the complete value chain from product development up to market supply.
- Company B employs around 200 workers and is a manufacturer of different types of healthcare offers such as pharmaceutical and medical products, dietary supplements and cosmetics.
- Company C’s main business area is the production of solid and liquid pharmaceuticals. The main business divisions are contract manufacturing and proprietary pharmaceutical products. The company employs around 125 employees.

The first means of the analysis of the current situation in the project partners' organizations includes the modeling of the innovation process flows with KMDL. Due to the fact that 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 organization and its environment. Having this in mind, we identified process steps for closer investigation, e.g. steps including knowledge activities aiming at idea creation and idea development as well as internal and external knowledge transfer.

Furthermore, we organized workshops on the topics innovation, IP management and collaboration. In these workshops, we jointly reviewed current strategies and practices, and improved them accordingly. As a next empirical step, we analyzed applicable documents as well as collected data from more than 50 interviews with innovation managers [9].

One relevant aspect of the project were the existing IP management practices. Especially the results regarding the commercialization and reinforcement practices are one important factor for this contribution:

- **IP Commercialization practices**: Nowadays, firms have a variety of channels and routes to exploit both newly obtained and old IP externally. However, regarding IP commercialization practices at the organizational level, we found that the researched SME lack experience in fully assessing their options available for generating value through patenting. [9].
- **IP Reinforcement practices**: The level of patent protection and enforcement measures are low. Also, none of them have engaged in trying to invalidate or actively infringe the patents of others. But protection measures to secure trade secrets are high. [9].

Further results of our Open Innovation project will be shown in section 5.

4. Not to share

The described Open Innovation Paradigm aims in general at the free knowledge sharing between internal and external actors. However, there are downsides in making knowledge freely available, even within closed groups or among the actors in a value chain. This is not only the risk of information overload, which may result in confusion and employee frustration and ultimately the inability to decide.

An aspect even more severe is, that competitive advantages have their foundation mostly on advanced
knowledge. They require more advanced knowledge than competitors. Therefore, these competitive advantages are at risk if knowledge is shared widely.

This can be summarized in a (from the perspective of the innovator) knowledge misuse. Knowledge misuse can happen both legally and illegally. In many cases competitors monitor each other closely and try to imitate each others success factors.

Additionally, product piracy or counterfeited products have become commonplace [22, 23]. Product piracy has progressed enormously due to increasing levels of organization of counterfeiters and growing profitability [24]. Various studies estimate the damage caused by piracy as between five and nine percent of the trade volume [24, 25].

Knowledge management typically focuses on the identification and sharing of knowledge among groups of people, e.g. the employees of a company, with the ultimate goal of increasing process efficiency and the quality of the results. However, there are also downsides to making knowledge freely available, even within closed groups (e.g. within an enterprise) or along the value chain. A company therefore needs to manage information and the flow of knowledge. "Brain drain" could put the company in danger of losing its competitive advantage with regard to information and knowledge. Therefore, the enterprise should recognize the difference between intentional and unintentional knowledge transfers and act accordingly [8]. For the company, the negative impacts of product counterfeiting could result in a direct loss of turnover and earnings on the one hand, and on the other hand, the image of a company could suffer on account of cheap copies or even potentially face legal claims [23]. In addition to this, pirated copies are often of poor quality, which may damage the reputation of a brand even further.

4.1. Case studies

In order to analyze the risks of external and internal knowledge sharing especially with focus on product piracy, we collected data working together with diverse companies, and the case studies of two organizations will be presented here.

- Organization A is a medium sized industrial company possessing about 500 employees and a domicile in South Germany. It has been active in the engine building market for more than 50 years. The main objectives of the company are to produce innovative and high-quality goods, to maintain market leadership, and to produce differentiated products. For this reason, the company is working together with well known supplier partners, and besides its regular customers, it also continuously attracts new customers.

- Organization B is a medium sized industrial company possessing about 400 employees and a domicile in South Germany. It has been active in the engine building, automobile and food industry market for more than 50 years. The main objectives of the company are to produce innovative and high-quality goods and to operate in an international market. It works closely together with the customers in order to develop individual products.

Because of its leadership position, both companies have to deal with competition pressure and the fear of know-how leaks, which could eventually result in imitation products and copycats on the market.

Therefore we focused on the starting points for acquisition of know-how on behalf of product forgers, especially any attainable information and know-how, and also on the knowledge holders themselves and in turn on the existing knowledge sharing culture, including all of the practices and norms regarding the flow of knowledge within the company and beyond the organizational boundaries.

Based on an initial literature research in the area of knowledge loss and product counterfeiting, the research team designed an initial version of a method for structuring and rating Information and Knowledge Interfaces (IKI) based on the risks involved. The team also applied methods of process oriented knowledge management (see next section) to capture and describe these IKIs. The models enabled deconstruction of the IKIs and the development of a structured framework for specifying influential factors based on objects involved in the transfer of knowledge [8].

These factors were investigated further via multiple formal and informal interview sessions with representatives of the companies, all of whom hold mid or top-management positions, in order to identify potential risks or threats. Besides this, previous cases of counterfeited products known to these companies were jointly reviewed. One finding that was mentioned multiple times is the case of frustrated employees that have either opted to work for competitors or have started their own company with similar business concept as a new competitor. Another finding in both companies indicates the uncertainty of the employees regarding aspects of external knowledge sharing. Furthermore, in both companies, central organizational rules and norms are missing, and the employees therefore have to decide how to communicate with external partners by themselves.

The team worked together for three years to create a new method for analyzing knowledge and developing
The first step included the definition of relevant positions and tasks within the organization. We defined the role of an Intellectual Property Manager as the main responsible person within each organization. He acts as a knowledge manager as well as a knowledge protector. However, this position of Intellectual Property Manager is hard to find in enterprise practice. The tasks in the project could be not only fulfilled by a single person but also by teams with different tasks and aims. In this case, the most important challenge is to integrate and represent all interest-groups in the enterprise. In our cases, the researcher team, including member from the management of the companies, acted in the role of an Intellectual Property Manager [8]. Therefore permanent (active and passive) integration of the management level and the department representatives in both companies was given during the entire project duration.

For illustrating information and knowledge transfer relationships in business processes and networks, the team used the method and modeling language of KMDL [11]. Furthermore, to meet the demands of the relationships here in question, the concept of information and knowledge interface (IKI) was developed. The IKI describes the mono-directional transfer of information and knowledge from one sender to one receiver [8].

For the specific case of product piracy also new assessment and analysis procedures have been developed. The essential difference between the original use of KMDL and the concept of the IKI is the change in the objectives of analysis and evaluation, because the access to flows of information and knowledge is now to be hindered and not facilitated. Further differences exist in the type of questioning. In the process analysis with the goal of improving information and knowledge flow, it is wise to question all of the sides involved. In the case of product piracy this is not possible, because pirates cannot be assumed to give reliable answers. For this reason, the questioning focuses on those parts of an enterprise that are responsible for the transfer of information and knowledge. In the approach, the actors, information and knowledge could be put together in a relationship according their belonging to a concrete activity.

The IKI are the basis for different evaluation views [8]. From the perspective of the organizational culture, the evaluation of the trustworthiness of an actor (organizational member or external) is of importance. This is assessed from the perspective of the sender. Main factors are the motivation and chance to profit from information and knowledge misuse as well as the ability for product counterfeiting. This includes a specific set of evaluation for employees.

For this specific case of knowledge and information protection, there were tools missing in both companies. Thus, the Knowledge Firewall Designer was developed to support development of the analysis and measures described [8]. The Knowledge Firewall Designer is a tool that facilitates modeling of Information and Knowledge Interfaces and the creation repositories for actors and information and knowledge.

The Knowledge Firewall Designer can be applied during all project phases. No special modeling skills are required to use it. This tool enables diverse knowledge and information transfer activities to be visualized and the relevant actors, knowledge, and information to be identified. As a result, all of the relevant models and the actors, knowledge and information repositories involved are able to be collected and analyzed during the evaluation phase. Furthermore, the Knowledge Firewall Designer provides the user with the opportunity to analyze data quickly and view instant reports. The modeling and evaluation process results in an overview of concrete activities, actors, information, and knowledge, as well as the basis for the measurements that are derived. For the development of measurement in the next step, a catalogue of measurements is implemented. Furthermore, an actor-specific "to do list" can be generated automatically [8].

The use of the developed method and of the Knowledge Firewall Designer helps organizations find out which practices and norms have a positive impact on the current process of knowledge creation and sharing, and which existing practices and norms could jeopardize key competences. Furthermore, creating measures and "to do list" appropriate knowledge sharing practices have been found and made explicit. Thus, challenges in both companies regarding social, organizational, and managerial cultural context have been addressed.

5. Overcoming the challenges in creating knowledge-sharing culture

We were able to show that the appropriate knowledge management culture, including the motivation and sensibilisation of the employees and organizational knowledge sharing rules, is essential for the enterprise in order to improve its economic power and no to jeopardize its position on the market.
In the next two sections, the most important implications of our work, as well as concrete recommendations regarding the use of the developed practices and the accompanying tools, will be presented in detail.

5.1 Implication for practice and management – Open Innovation

The results of the project work show that the most SMEs already have a structured innovation process. Furthermore, partly as a result of the limited resource capacities, to some extent, suppliers, customers and external experts have already been integrated in the innovation process. However, due to the fear of unintended knowledge leakages, companies clearly prefer the outside-in direction of the open innovation process [26] and pay limited attention to knowledge transfers inside-out as well as to the benefits of the procedure of coupled processes (e.g. in form of cooperations).

Some important challenges for the (open) innovation practices could be identified in the investigated companies [26, 27]:

- Management of external interfaces: In SME, external relationships and knowledge exchange are often dominated by key persons, e.g., the CEO, manager, and experts responsible for different innovation phases. The knowledge exchange is often in the form of ( uncontrollable) informal knowledge flows within the company and over the organizational borders.
- Decision making within the innovation process: In SME, decisions regarding the chance of success of ideas are often made by few people, and the CEO usually makes the ultimate decision(s). Thus, employees are sometimes not able to relate to the reasons for negative decisions regarding their own ideas and may feel demotivated.

Handling of unrealized ideas within the innovation process: In many cases, partly as a result of limited resources, good and promising ideas could not be followed (for the moment). In such cases, a clear strategy and ongoing practice with these ideas are missing.

In order to face these and other challenges, a holistic concept has been developed, including a structured stage-gate open innovation process, a strategic level as well as general framework conditions (e.g., cultural and organizational aspects) [28]. The concept provides the basis for the appropriate tool development. Furthermore, an enterprise guide has been published [29]. The process model can be used as a starting point for the further identification of the challenges mentioned above. This way, existing innovation processes can first be visualized and structured and can build the basis for appropriate organizational changes. As a result, the enterprise can act more strategic and consciously through the phases of idea finding/creation, evaluation, development and realization.

The developed methods and tool can be demonstrated through the example of the idea creation and evaluation:

The implementation of the tool provides all employees as well as external partners with the opportunity to present their ideas using a default scheme. Furthermore, the guide and the tool include examples of different creativity and team building methods, which can be used in order to motivate and organize the idea creation. As a next step, ideas could be evaluated by the CEO and by department representatives, e.g., sales/marketing, science, finances. The evaluation process is open, the reasons for the decision pro or contra one idea are transparent and the results are well visualized. Furthermore, ideas that cannot be realized remain in the idea data bank. After a predefined time span, the calendar function reminds responsible innovation managers about the idea. A search function within the idea data bank can be used in order to test the idea's degree of originality before making it public. In order to control external relationships, all contacts can be registered. This includes important details, as well as internal notices about the person and about the contact character.

These are just a part of the tool functions. However, we believe and the enterprise practice shows, that a technical solution is not enough when dealing with knowledge management issues. For this reason, the tool can only be used as a supporting instrument for structuring the processes and guiding through the methods and recommendations during the different open innovation phases.

Even if open innovation is very promising for SME enterprises, it seems difficult to put into practice due to a shortage of financial and human resources as well as the fear of losing valuable IP, especially in industries with strong IP regimes and expensive R&D [28].

One promising research implication we are currently working on is the impact of informal and formal relationships on the innovation strength of the enterprise.

Open innovation can only be successful if the approach is understood as an integral part of a well structured internal innovation management. The strategic opening of the innovation process only makes sense and is advisable if the company internal structures are prepared for this process.
5.2 Implication for practice and management – Product counterfeiting

The results of the project work show that most companies, especially SMEs, are unaware of potential risks through knowledge transfer. Nevertheless, management within these companies has an indistinct feeling that some parts of the knowledge, mostly related to core technologies, should be prevented from being shared with possible product counterfeiters or competitors. However, the decision on sharing or not is often left to individuals interacting with a respective counterpart (e.g. a supplier).

It is therefore key to first create awareness for these risks, both with management as well as on the operational level. In our workshops we often discovered prior knowledge transfer related incidents that resulted in smaller damage. We found these incidents are a good starting point for creating awareness.

The second step involves implementing a system and processes that manage which knowledge should not be shared. In order to support the initiative, we suggest implementing an organizational role, such as an intellectual property manager.

In order to design the system, one important element is to assess knowledge domains that should be protected. Within the companies of our case studies, a four level classification scheme was implemented. Based on the level of threat, requirements for protection can be defined.

These protective measures include technical aspects, such as strict access rights or copy or forward prevention. We found that the design of organizational rules is important to provide guidelines and limit the unwanted transfer of knowledge. These rules help to shift the ultimate sharing decision from the individual to a reflected company decision. In our solution based on the Knowledge Firewall Designer, we encourage participation of employees throughout the enterprise. In our cases we found that the value and threat assessment often depends on the perspective, e.g., an engineer judges knowledge on a technology different than employees in sales. The participial approach results in a balanced perspective.

In order to design such a system we suggest the Knowledge Firewall Designer. This tool intends to support assessment of knowledge protection levels, the identification of organizational as well as technical risks of unwanted knowledge transfer, and it also includes a database of possible countermeasures. However, the tool can only be seen as support; therefore, the change has to happen both in processes and culture.

6. Conclusion, limitations and outlook

The results of our investigation are summarized in the following table, using the categories of [30], and can be used in the praxis of producing enterprises.

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<tr>
<th>Context</th>
<th>Open Innovation Case studies</th>
<th>Product Piracy Case studies</th>
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<tbody>
<tr>
<td>Social context</td>
<td>Measures aimed at motivating and enabling communication within the company and with external actors. If idea creation and development and the use of external knowledge sources are a main goal, then chances for informal knowledge transfer, e.g. conferences or trade show visits, advanced training courses, and qualification should be available.</td>
<td>Measures aiming aimed at the sensitisation of organizational members with regard to the importance of key knowledge, and at the protection of this knowledge in every formal and informal communication situation, especially when communicating with external actors; clear rules for the organizational members regarding the use and the protection of key knowledge and information.</td>
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<tr>
<td>Managerial context</td>
<td>Increased transparency regarding decision making pro or contra innovative ideas. Measures for motivating employees (intrinsically and extrinsically) to create and share ideas. Respect for and acceptance of different ideas.</td>
<td>“Practicing what is being preached” regarding the protection of knowledge and information; measures for punishing employees who jeopardise key knowledge and information; measures for creating the position of an “Intellectual Property Manager”.</td>
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Upon first examination, the measures regarding knowledge sharing, in the context of both open innovation and knowledge protection, seem to be completely different, so that a company should embrace either the openness or the protection of this information. However, each company is able to combine both knowledge sharing strategies, if all norms and practices are clearly determined and categorized. For instance, in the presented case studies a company could use the developed IKI method in order to distinguish between key knowledge and “common” knowledge, as well as between truthful communication partners and potential product pirates. In this way, appropriate knowledge sharing behavior might be chosen.

In this contribution we have shown two opposite approaches and interpretations of external knowledge sharing. They originate from a company’s quest to create or maintain competitive advantages based on knowledge. Both approaches find their manifestation in culture, processes and procedures as well as in technical systems. However, they both represent a single minded view.

Both, in practice and in research theory a balanced approach, that enables an evaluation of both, benefits and risks of knowledge transfers is missing. However, modeling of knowledge transfer can provide a common ground. As outlined, we used KMDL based models to assess knowledge transfers within the case studies. Our future research will focus on merging these strings of research and enhancing the modeling language to reflect both the risks and benefits, with the end goal of providing an evaluation framework of existing and potential knowledge transfer.

7. References


