

Collaborative Knowledge Management in University Alliances with Information Models

Claudia Doering^a and Christian Seel^b

Institute for Project Management and Information Modeling, University of Applied Sciences, Landshut, Germany

Keywords: Third Mission, Knowledge Management, Knowledge Transfer, Reference Modeling, Framework, Information Modeling.

Abstract: Alliances between enterprises, such as Star Alliance, are a well-known phenomenon and have been subject of research for the last decades. Today, universities are also beginning to form alliances among themselves. Especially in the area of knowledge transfer alliances matter, as they create synergies, increase the visibility and allow universities to carry out projects that cannot be done by a single university. However, a University alliance creates new processes and interfaces between the member Universities. The management of such an alliance is a knowledge management challenge on its own. Therefore, this paper gathers the requirements on a University alliance and outlines how the business processes, that are specific for a University alliance, can be structured in a framework. The framework indicates which processes are important for an alliance and on which level they have to be addressed, on the level of a single University, first at each University and afterwards in the alliance or on alliance level only.

1 INTRODUCTION

Besides the mission to teach and to conduct research, a third mission in form of knowledge transfer between universities, companies and society is gaining increasingly importance (Roessler Isabel, Duong Sindy, Hachmeister Cort-Denis, 2015). The changes in the last thirty years in the environment of universities show strong tendencies towards a greater focus on activities in collaboration with society (Roessler Isabel, Duong Sindy, Hachmeister Cort-Denis, 2015). Since at least the eighties, theoretical frameworks around this topic were created, e.g. the concept of “entrepreneurial universities” (Clark, 1998), “Triple Helix” (Etzkowitz and Leydesdorff, 2000) and “Mode 2” (Gibbons, 1994). What these frameworks have in common is, that universities are no longer seen as “ivory towers”, in which research is cut off from society, but rather as institutions with a deeper knowledge transfer. This engagement refers not only to collaborations with the economy, but includes also all forms of interactions with society (Roessler Isabel, Duong Sindy, Hachmeister Cort-Denis, 2015). In Germany, even the Framework Act

for Higher Education, defines knowledge and technology transfer explicitly in § 2 as the third mission of universities (Wissenschaftsrat, 2016).

This change has led to an even more competitive environment for universities of applied sciences. This arose mainly from the fact that universities are competing against each other for funding, students and projects. The competitive situation enhances with an increasing geographic proximity between the universities (Sturm and Spenner, 2018). This situation can be described as ‘Coopetition’, in which universities are at the same time competing and cooperating with each other (Bouncken *et al.*, 2015). This phenomenon was first described in the context of company alliances, to i.a. reduce R&D expenses and to gain a broader market share (Hamel, Prahalad and Doz, 1989). As universities are now establishing alliances, a framework for these collaborations needs to be consolidated, because universities face different internal and external conditions than companies. The reasons for cooperation in alliances vary and can bring multiple advantages for all involved parties, from which four points are outlined below: The first is the possibility to deal with complex topics and an increasing visibility through a common appearance

^a  <https://orcid.org/0000-0002-3727-8773>

^b  <https://orcid.org/0000-0002-1538-0152>

(1). In this way, projects can be carried out or concerns can be dealt with, which otherwise would not be possible to be handled by individual universities, as they are not able to cover every topic in research. This is also due to the fact, that universities of applied sciences are often smaller in size and have less research focuses and fewer resources than universities. So far universities of applied sciences were perceived as local 'knowledge transfer providers' (2), who can provide insights through e.g. transfer of personnel or theses from students with companies (Fritsch, Pasternack and Titze, 2015). As the competition is now changing from being local to a more global perspective, the establishment of alliances can help to gain broader global visibility (3) (Powell, Baker and Fernandez, 2017). Due to the fact, that universities are now also competing against consulting firms for e.g. governmental funding, they are building up alliances with other universities of applied sciences (4) (Jacobson, Butterill and Goering, 2004). We can see, as a conclusion, that alliances provide a greater impact and visibility. Also cost savings arise through synergy effects in cooperations.

To facilitate the work in university alliances, structural and organizational changes in the single universities are needed. This would lead from a state in which transfer is dependent upon the motivation of single researchers to a state in which the whole university would commit to it. Until now, research has mainly focused on knowledge transfer from or to individual universities and not on model based knowledge transfer within and out of university alliances. However, these differ significantly from individual universities and need a greater support through coordination and harmonization. In order to visualize these circumstances, consistent processes, organizational forms and harmonized documents are needed, which will be defined in this article in a business process information model. This framework for knowledge transfer in university alliances will ensure the sustainability of research and its results. Therefore, the following research questions arise:

RQ 1 What are the specific requirements on knowledge transfer in university alliances?

RQ 2 How can the processes of knowledge transfer in university alliances be presented in a structured framework?

The goal is to enable knowledge transfer within university alliances, in order to allow for transfer with companies or other protagonists.

This article is divided in the following sections: at first the relevant research methodology is outlined. Basic principles are then presented in the related work

section. RQ1 is answered in the section *Requirements on University Alliances*. The next section covers RQ2 and demonstrates the framework for knowledge transfer in university alliances. An evaluation of the results completes this contribution.

2 RESEARCH METHODOLOGY

The chosen research questions and the research aim guide the selection of the research methodology. A research methodology must be defined for every single research project and is derived from the research questions (Seel, 2010). Because of its research questions this paper follows the design science research paradigm proposed by HEVNER et al., as this research focuses on the creation of new methods and artifacts (Hevner and Chatterjee, 2010). The seven guidelines for Design Science in Information Systems Research are implemented in the following ways:

1. Design as an Artifact: as a result of the design-science process an information model for knowledge management in university alliances is created.
2. Problem Relevance: The identified gap in research and the current problem statement display the relevance of the problem.
3. Design Evaluation: to ensure that the information model and the shown processes display the reality of collaborative knowledge management adequately, expert surveys were carried out.
4. Research Contributions: Due to the identified research gap, the information model represents a contribution to the research.
5. Research Rigor: The creation of the information model according to MEISE ensures the rigor of research (Meise, 2001).
6. Design as a Search Process: The iterative search process will be ensured through the comparison of the deductive and inductive research findings.
7. Communication of Research: The purpose of this article is to publish the research results and thus to communicate them to the target audience via a conference.

3 RELATED WORK

Knowledge Transfer is traditionally defined as an interface between science and economy (Froese, 2014). Today, knowledge transfer describes all forms of communication between an expert and a layperson

(Pircher, 2014). THIEL goes even further and defines knowledge transfer as a targeted transfer of knowledge from one transfer partner (sender) to another transfer partner (receiver), whereby the transfer partners can be individuals or collectives (Thiel, 2002).

Nowadays, various definitions constitute third mission and transfer as synonyms see e.g. (Henke, Pasternack and Schmid, 2017; Noelting *et al.*, 2018). Although transfer has been incorporated in universities for quite a long time, universities were still defined as teaching and research-based institutions and have therefore incorporated organizational barriers which restrain the transfer of knowledge. Several authors documented a lack of administrative support concerning even basic aspects of knowledge transfer e.g. creating contracts, support concerning legal aspects or the supply of resources etc. (Jacobson, Butterill and Goering, 2004). The shift from teaching and research-based institutions to universities which engage in the third mission, comes along with the expectation, that university-based researchers should engage under third mission conditions, while the infrastructure at the universities continues to consist of former conditions (Vorley and Nelles, 2008).

Various authors have already described knowledge transfer between organizations, see e.g. HOFFMANN, who constitutes a framework for intraorganizational knowledge transfer between companies (Hoffmann, 2009). RAUTER, for example, illustrates main contents of knowledge transfer between companies and research institutes, without giving model based recommendations (Rauter, 2013). An existing model for knowledge transfer between a specific discipline in universities and companies describes exemplarily the procedure for knowledge transfer, without giving general and evaluated recommendations (Seel and Dreifuß, 2014). Nevertheless, there is still no widespread, accepted, and tested model based framework for knowledge transfer between companies and university alliances.

4 REQUIREMENTS ON UNIVERSITY ALLIANCES

Due to the emergence of university alliances the system boundaries between single universities and their environment were softened. This phenomenon is comparable to the creation of the European Union. The merging of individual countries to form the European Union softened the national borders of the

member states and has shifted the previous system boundary (Bux, 2008). By considering the system of universities and their environment, it is noticeable that the system boundary between individual universities and their environment is equally softened by the emergence of alliances. Between a single university and its environment, one can now note the alliance. According to the system theory by ROPOHL, one can notice this change due to the emergence of alliances (Ropohl and Lenk, 1978). Furthermore, a new form of cooperation arises from the emergence of alliances. Universities are now cooperating both internally with each other and externally in form of alliances with companies or social protagonists. From this form of cooperation special requirements can be derived (cf. **RQ 1**):

Req.1: A framework should shape the general procedures, but must also allow for the single universities to carry on their own processes.

Req.2: It should be possible to identify processes, which are labelled differently in the single universities in the alliance, to simplify the collaboration and identify interfaces.

Req.3: Processes, which are heterogeneous should be harmonized within the alliance.

Req.4: It must be recognizable which documents are needed in the defined processes and the contents which these documents need to contain.

Req.5: The framework must be easily understandable and applicable for future users, to enable the possibility to restructure own processes. Working in alliances can bring structural influences to the structure of the single universities. As collaborations come along with sharing information and granting access to resources facilities and funding, it is necessary to transparently display the responsibilities and accountabilities in each institution to effectively collaborate. Since the organizational structure of the collaborating universities tends to diverge strongly from each other, it can be challenging to find the right contact person or division in a collaborating university. To enable these processes and the transfer of knowledge a structured framework is needed. The framework will guarantee to bring together all needed persons and division and ensure comprehensive knowledge transfer.

5 FRAMEWORK FOR KNOWLEDGE TRANSFER IN UNIVERSITY ALLIANCES

According to HOLSAPPLE and JOSHI, knowledge management models can be divided into the groups

of descriptive and prescriptive models (Holsapple and Joshi, 1999).

Descriptive models try to cover and describe the characteristics of knowledge management, whereas prescriptive models define the elements and methods and hence model knowledge management. This research will go further than just analysing the current status. As it intends to shape the target state of knowledge transfer in university collaborations, it can be described as a prescriptive model.

Due to the high complexity of knowledge transfer in university collaborations, the information model shown in figure 1 (cf. **RQ 2**) was created according to the proposed structure by MEISE (Meise, 2001). This information model, represents an artifact of the Design Science process. The intended purpose of the information model is to enable knowledge transfer in university collaborations. According to MEISE, the intended purpose of a regulatory framework is to represent the elements and relations of subordinate levels (Meise, 2001). Nevertheless, the intended purpose is more than just a representation of processes, the framework intends to establish

transparency and creates a common understanding of all needed processes to enable knowledge transfer within university alliances.

The structural design is based on the reference design of a house. The level of agreement of this representation facilitates the interpretation by the target groups. These are primarily internal target groups within the collaborating universities, e.g. technology and knowledge transfer offices, research and administrative departments and researchers. The arrangement in management, core and support processes in the roof, body and foundation of the 'house' creates a memorable image, which is of great importance as the design of a framework contributes decisively to the understanding of the structure described by it (Meise, 2001). The framework for knowledge transfer in university alliances consist of two structural dimensions, the specification-content and the specification-view (processes, organization, documents). The specification-content outlines the individual processes of knowledge transfer across higher educational institutions. Three different types of

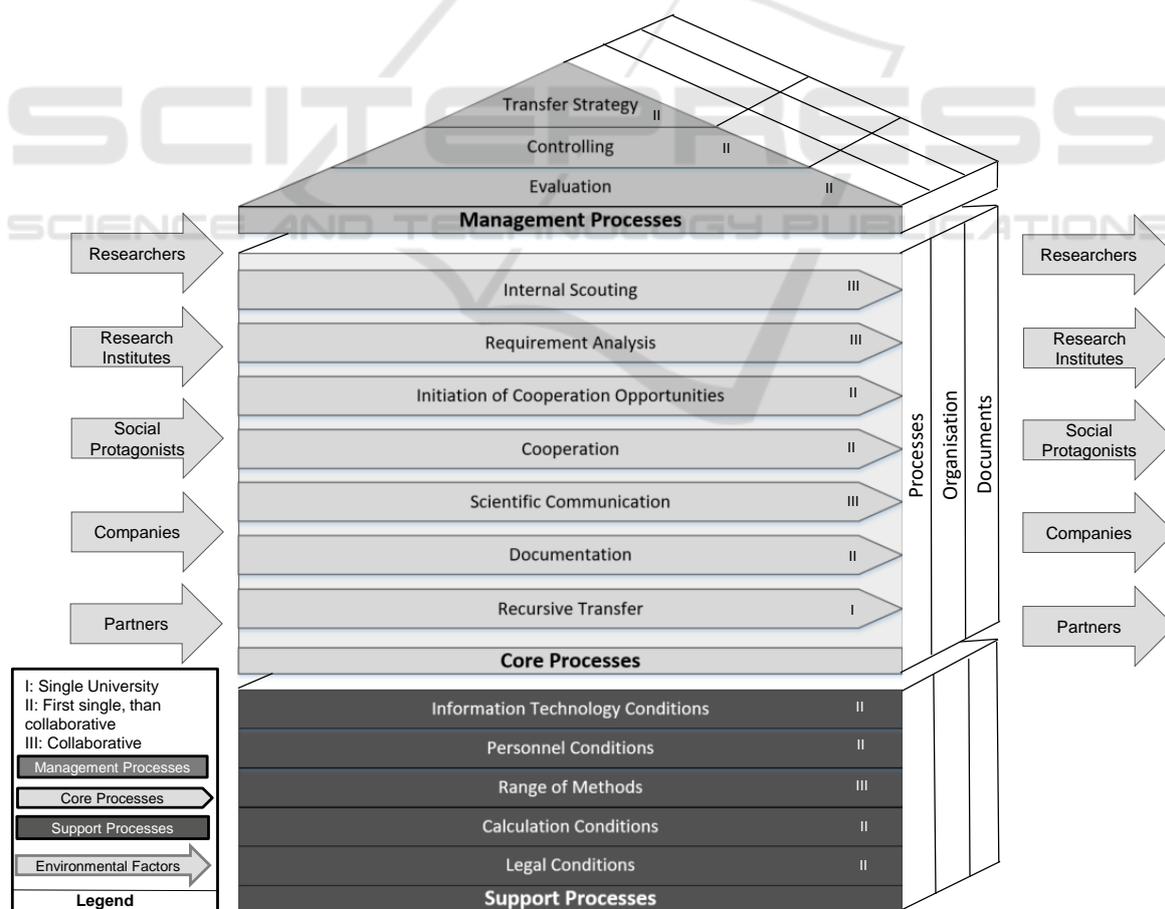


Figure 1: Framework for Knowledge Transfer in University Alliances.

processes can be distinguished there:

- I. Processes, which are solely carried out by single universities.
- II. Processes, which are first carried out by single universities and then collaborative in the university alliance.
- III. Processes, which are solely carried out by the university alliance.

Examples for this classification are: In a university alliance each individual university will conduct a recursive transfer process from research to teaching (I). The transfer activities therefore shape the teaching contents of the single researchers. The controlling of all activities and projects will first be carried out by all single universities and then brought together into collaborative controlling (II). In this way, every university can conduct its own controlling procedures, but it contributes also to the controlling of the alliance. An example for processes, which are solely carried out by the university alliance, is the use of a common range of methods (III). These consist of a range of competences, which are intended to support transfer activities (e.g. problem-solving or modeling techniques) in the alliance. These methods are available for all collaborating universities.

In contrast to other reference models, recommendations for the organizational design can be given, since in Germany basic features of the organizational design of universities are predetermined (see e.g. the Bavarian Higher Education Act (BayHSchG, 2006)).

The document view shows the flow of relevant documents in a university alliance. Thus recommendations on which documents should be created or used in relevant processes can be given. Modeling the document view is especially important in university alliances, as all processes require precise and harmonised specifications. This also supports the existing infrastructure in its change to the conditions associated with the third mission.

In addition, the information model consists of several levels of details, which describe the essential core processes and functionalities of the transfer processes. The information model (level 0) serves as a mean to structure all subordinate processes. The core processes (level 1) describe via value chain diagrams the control and data flow (level 2) of the required processes, which are modeled in detail in BPMN 2.0 and described in greater detail in process descriptions, to simplify user understanding.

The representation of the processes in value chains is suitable since in these processes, analogous to e.g. producing companies, the value, hence the knowledge, is created. The core processes are thus in the centre of

the information model and enable the alignment of all processes towards value creation.

The environment of the framework is described by the stakeholders 'researchers', 'research institutes', 'social protagonists', 'companies' and 'partners'. They can collaborate with the university alliance through the framework and use the proposed structures to e.g. pursue research or commercial projects.

6 EVALUATION OF REQUIREMENTS

The design science process aims to create artifacts to solve practical problems (Hevner and Chatterjee, 2010). The evaluation of the key findings is one of the core activities of the Design Science Process and aims to prove and justify the artifacts. In order to prove the usefulness of the chosen requirements, expert interviews, in the context of a transfer project, were conducted. These interdisciplinary expert interviews were carried out in the context of a transfer project with two universities and four universities of applied sciences in Bavaria, Germany. These universities have joint together to a university alliance in January 2018. The experts had different backgrounds and experiences with transfer projects, as they came from different positions within the universities and universities of applied sciences. Chosen experts are employees in technology and knowledge transfer offices, research funding departments, finance and legal departments and researchers, who conduct research in collaborative projects. All experts were chosen due to their responsibility and experience in cross-organizational knowledge transfer and their possession of privileged information (Meuser and Nagel, 2009). Through the expert interviews, comprehensive insights in knowledge transfer could be acquired. The intention was to ensure that the information model and the shown processes display the reality of collaborative knowledge management adequately. Thereby all requirements were evaluated. The key findings of these interviews are as follows.

A first indicator for the correctness of the requirements is that the framework provides a general overview and provides harmonized procedures of all needed processes, but allows adjustment at the same time (Req.1). All single universities in an alliance can decide whether they want to take over all harmonized processes or just parts of them. With giving generally understandable labels of the processes, it is possible that all universities in an alliance are able to identify themselves in the framework, even if they label their

own processes differently (Req.2). An example is that the process ‘Scientific Communication’, is also labelled as ‘Press and Media’ or even ‘Marketing’ in the single universities of the alliance, but the general label in the framework clarifies the meaning easily. This ensures the simplification of the collaboration and helps to identify interfaces, connecting factors and colleagues in other universities in the alliance. As the organizational structures of the single universities in the alliance diverge immensely, it can be hard to identify corresponding organizational units or processes in other universities in the alliance. General understandable labels and the matching of business processes and organizational units within the framework support and facilitate the collaboration and the knowledge transfer. The documented lack of administrative support concerning even basic aspects of knowledge transfer is currently a status quo at most universities of applied sciences (Jacobson, Butterill and Goering, 2004). Processes and documents, which can be difficult to pursue or acquire can be delivered and supported through the alliance (Req.3). For example, the legal conditions and documents are usually generated when needed, which can take a lot of time and effort. The framework for knowledge transfer helps to support these processes and enables the sharing of best practices and documents within the alliance. Harmonized documents and procedures can be used in the university alliance to support the transfer (Req.4). The structure and design of the framework contributes decisively to the understanding of it and delivers a great recognition factor (Req. 5). Due to its resemblance to other models e.g. the Retail-H by BECKER and MEISE, it is easily understandable (Becker and Meise, 2008). The levels of the framework support the understanding of its contents, as every level gives greater detail of the level above. Future users are also able to use these detailed levels to restructure their own processes, as they represent harmonized procedures.

By creating the knowledge transfer framework, the effort for the administration and maintenance of processes can be reduced, because the processes in only one framework must be maintained.

7 CONCLUSION AND OUTLOOK

In this paper the two research questions RQ1 and RQ2 have been answered. The first question dealt with the requirements for knowledge transfer in university alliances. With the help of expert interviews, the identified requirements were proven and justified (cf. **RQ 1**). It was found that knowledge management in university alliances is often difficult to pursue as

organizational structures of the single universities in an alliance can diverge strongly from each other. Nevertheless the creation of alliances and the third mission in collaborations between universities of applied sciences is gaining increasing importance (Roessler Isabel, Duong Sindy, Hachmeister Cort-Denis, 2015). This can not only be seen in the rise of research projects in the field, but also in the current need of companies to conduct transfer projects with universities (IHK Bayern, 2017). The created artifact, the framework for knowledge transfer in university alliances, can enable this transfer and give a neutral, networked and generally accepted presentation (cf. **RQ 2**). The evaluation shows that the framework can be a means for knowledge transfer in university alliances. The documentation of knowledge transfer and its corresponding processes is essential to collaborate in an alliance of universities. Also errors in existing process definitions of the single universities can be identified and potentials for optimization can be recognized through the implementation of the suggested framework.

Table 1: Core Processes and corresponding Subordinate Processes of knowledge transfer.

Core Processes	Subordinated Processes
Internal Scouting	Make Contact, Scout Researchers, Assess Needs, Collect Demands
Requirement Analysis	Define Target Groups, Make Contact, Visit Company/Social Protagonist, Identify transfer potential, Collect Demands
Initiation of Cooperation Opportunities	Matching of needs and demands, Establishing of contact between researcher and company/social protagonist
Cooperation	Implementation of projects (e.g. research projects, commercial projects, thesis in collaboration with e.g. companies, dissertations)
Scientific Communication	Traditional Journalism, Online Interaction and Social Media, Organization and Documentation of Events
Documentation	Project Documentation, Calculatory Documentation, Legal Documentation
Recursive Transfer	Transformation of teaching contents due to research results.

Limitations are given due to the conducted evaluation in one university alliance. Future work includes an evaluation in other university alliances.

The shown framework is the result of a revision of former versions. Due to the results of the evaluation, iteratively changes were made according to HEVNER (Hevner and Chatterjee, 2010). The current version will be developed and re-evaluated further in future. Table 1 shows the currently identified processes for future work. This list was created as a result of the expert interviews, without making claims in being complete.

Future work includes detailing the core processes of knowledge transfer in form of value chains and the modeling of relevant processes in BPMN 2.0. Part of future work is also an examination of the process of harmonization within university alliances. Within the scope of the future work, an adaptive reference model for interorganizational knowledge transfer will be created.

ACKNOWLEDGEMENT

The transfer project "Transfer and Innovation East-Bavaria" is funded by the "Innovative University of Applied Sciences" East-Bavaria 2018 – 2022 (03IHS078D).

REFERENCES

- BayHSchG (2006) 'Bayerisches Hochschulgesetz'.
- Becker, J. and Meise, V. (2008) 'Strategie und Ordnungsrahmen', in *Prozessmanagement: ein Leitfadens zur prozessorientierten Organisationsgestaltung*: Springer.
- Bouncken, R.B. et al. (2015) 'Coopetition: a systematic review, synthesis, and future research directions', *Review of Managerial Science*.
- Bux, U. (2008) 'Grenzschutz an den Außengrenzen: Kurzdarstellungen über die EU'.
- Clark, B.R. (1998) 'The Entrepreneurial University: Demand and Response', *Tertiary Education and Management*.
- Etzkowitz, H. and Leydesdorff, L. (2000) 'the Dynamics of Innovation: From National Systems and "Mode 2" to a Triple Helix'.
- Fritsch, M., Pasternack, P. and Titze, M. (2015) *Schrumpfende Regionen - Dynamische Hochschulen*.
- Froese, A. (2014) 'Wissenschaftliche Güte Und Gesellschaftliche Relevanz Der Sozial- Und Raumwissenschaften'.
- Gibbons, M. (1994) *the New Production of Knowledge: the Dynamics of Science and Research in Contemporary Societies*.
- Hamel, G., Prahalad, C.K. and Doz, Y. (1989) 'Collaborate with Your Competitors - and Win', *Harvard Business Review*.
- Henke, J., Pasternack, P. and Schmid, S. (2017) *Mission, Die Dritte: Die Vielfalt Jenseits Hochschulischer Forschung Und Lehre*.
- Hevner, a.R. and Chatterjee, S. (2010) 'Design Research in Information Systems Theory and Practice', *Integrated Series in Information Systems Volume 22*.
- Hoffmann, a. (2009) *Entwicklung Eines Ordnungsrahmens Zur Analyse Von Intraorganisationalem Wissenstransfer*.
- Holsapple, C.W. and Joshi, K.D. (1999) 'Description and Analysis of Existing Knowledge Management Frameworks', in *System Sciences*.
- IHK Bayern (2017) 'Innovationsreport Bayern'.
- Jacobson, N., Butterill, D. and Goering, P. (2004) 'Organizational Factors That Influence University-based Researchers' Engagement in Knowledge Transfer Activities', *Science Communication*, 25(3).
- Meise, V. (2001) *Ordnungsrahmen Zur Prozessorientierten Organisationsgestaltung. Modelle Für Das Management Komplexer Reorganisationsprojekte*. Münster.
- Meuser, M. and Nagel, U. (2009) 'Das Experteninterview - Konzeptionelle Grundlagen Und Methodische Anlage'.
- Noelting, B. Et Al. (2018) 'Nachhaltigkeitstransfer Von Hochschulen'.
- Pircher, R. (Ed.) (2014) *Wissensmanagement, Wissenstransfer, Wissensnetzwerke: Konzepte, Methoden, Erfahrungen*.
- Powell, J.J.W., Baker, D. and Fernandez, F. (Eds.) (2017) *the Century of Science: the Global Triumph of the Research University*.
- Rauter, R. (2013) 'Interorganisationaler Wissenstransfer: Zusammenarbeit Zwischen Forschungseinrichtungen Und KMU'.
- Roessler Isabel, Duong Sindy, Hachmeister Cort-Denis (2015) 'Welche Missionen Haben Hochschulen?' CHE.
- Ropohl, G. and Lenk, H. (1978) *Systemtheorie als Wissenschaftsprogramm*: Athenäum Verl.
- Seel, C. (2010) *Reverse Method Engineering: Methode und Softwareunterstützung zur Konstruktion und Adaption semiformaler Informationsmodellierungstechniken*.
- Seel, C. and Dreifuß, F. (2014) 'Induktive Entwicklung eines Vorgehensmodells für Wissenstransfermaßnahmen in der Wirtschaftsinformatik'.
- Sturm, N. and Spenner, K. (2018) *Nachhaltigkeit in der wissenschaftlichen Weiterbildung*: Springer Fachmedien Wiesbaden.
- Thiel, M. (2002) *Wissenstransfer in komplexen Organisationen: Effizienz durch Wiederverwendung von Wissen und Best Practices*.
- Vorley, T. and Nelles, J. (2008) '(Re)Conceptualising the Academy: Institutional Development of and beyond the Third Mission', *OECD Higher Education Management and Policy*.
- Wissenschaftsrat (2016) 'Wissens- und Technologietransfer als Gegenstand institutioneller Strategien | Positionspapier'.