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Managing the knowledge leveraging paradox
Governance for the intended transfer of knowledge
in the consultant industry

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Albert Einstein.

Erstgutachter: Prof. Dr. Thomas Mellewig

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ABBREVIATIONS

EFA	Explorative Factor Analysis
GM	Governance mechanism
KBV	Knowledge based view
KMO	Kaiser-Meyer-Olkin criterion
KN	Knowledge
KNT	Knowledge Transfer
LV	Latent variable
MNC	Multi-national enterprise
MSA	Measure of sampling adequacy
NIE	New institutional economics
PM	Project manager
RBV	Resource-based view
SEM	Structural equation model
SME	Small and medium enterprises
TCE	Transaction cost economics
ToWP	Theory of work performance

1 INTRODUCTION

1.1 *Problem statement and objectives of the thesis*

Knowledge is considered a motor of economic development and prosperity in the 21st century.¹ The first three production factors – labor, ground and capital – have become less important for our society than the fourth production factor of “knowledge,” which defines the knowledge-based economy.² “The foundation of industrialized economies has shifted from natural resources to intellectual assets.”³ The radical, economy-wide shift towards information and knowledge-intensive professional services is indicative of this trend.⁴ In industry sectors like consulting, research, or education, knowledge is the resource that defines entire businesses. If knowledge *is* the firm, then strategic management must be fundamentally concerned with knowledge management processes like knowledge identifying, creating, storing, sharing, and applying.⁵

Since gaining revenue from knowledge is the business concept, executives are compelled “to examine the knowledge underlying their businesses and how that knowledge is used.”⁶ In the complex knowledge society, competitive advantage does not result from using knowledge by just applying it, but especially by effectively and efficiently transferring knowledge to employees, customers, or partners. For example COHEN AND LEVINTHAL (1990) suggest that knowledge transfer is a critical factor of a firm in its ability to rapidly respond to change, innovate, and achieve competitive success. Managing and controlling the knowledge transfer from one firm to another therefore is one major challenge in the knowledge society, rendering the topic very

¹ Albert & Bradley (1997); Bell (1973); Benkler, (2006); Bresnahan, Brynjolfsson & Hitt (2000); Castells (2000); Huber (2004); Machlup (1980); Powell & Snellman (2004); Sunstein (2006); Teece, (2003).

² “Wissen ist der entscheidende Produktionsfaktor unserer Zeit“ (Fredmund Malik); In 1996, the Organization for Economic Co-operation and Development (OECD) defined the term “knowledge-based economy” in recognition of the place of knowledge and technology in modern OECD economies.

³ Hansen et al. (1999), p. 106.

⁴ Drucker(1993); Greenwood & Empson (2003); Heckscher & Adler (2006); Maister (1993); Teece (2003); Webster (1995).

⁵ Cluster of knowledge management processes cf. Davenport and Prusack, (1998).

⁶ Hansen et al. (1999) p. 106.

popular not only in politics, businesses, and economics but also in organizational studies.

Applying different management and controlling mechanisms to secure the success of knowledge transfer is defined as governance in organizational research.⁷ By applying efficient and effective structures and mechanisms to the transfer (e.g. “organizational routines, control and co-ordination mechanisms, and systems”⁸), governance manages the transaction process in order to gain the desired outcome and limit the costs.

The success of knowledge transfer depends (aside from other context factors) on “how easily the underlying knowledge sources can be communicated, interpreted, and absorbed.”⁹ In other words, the success of knowledge transfer is impeded by certain knowledge characteristics themselves.¹⁰

While these knowledge characteristics are obstacles to knowledge transfer between organizations, they also contribute to protecting knowledge from being imitated by rivals.¹¹ Consequently, in the knowledge economy, the governance of knowledge transfer has to solve the “knowledge leveraging paradox because of its simultaneous difficulty to be interpreted, assimilated, and applied to commercial ends.”¹²

Accordingly, practitioners and researchers alike consider not only governance of knowledge transfer but especially the so-called governance of knowledge as a very important capability for organizations in this century.¹³ This motivates the following question in this thesis:

What are effective governance mechanisms for different characteristics of knowledge?

Without an answer to this question, the management of inter-firm knowledge transfer can neither apply effective nor efficient governance mechanisms to a relationship. In

⁷ Li et al. (2010), p.272.

⁸ Meier (2010), p. 15 with reference to Gray (2001).

⁹ Van Wijk et al. (2008), p. 844, cf. also Kogut and Zander (1992).

¹⁰ Cf. Simonin (1999a,b).

¹¹ Cf. Coff et al.(2006); Van Wijk et al. (2008).

¹² Van Wijk et al. (2008) p. 844, cf. also Coff et al. (2006).

¹³ Cf. Foss et al. (2007).

conclusion, the strategic management of knowledge transfer characterized by different characteristics can be seen as gambling.

Past research prioritized knowledge transfer in strategic alliances or joint ventures but neglected the processes between buyer and supplier in knowledge-intensive industries.¹⁴

The former might be prioritized because knowledge transfer is a strong motivation for engaging in such cooperation.¹⁵ Still, the question remains whether the motivation to

“buy” knowledge is less intensive than finding a partner to share such knowledge? DAWES, DOWLING, & PATTERSON (1992) examined the reasons why firms employ consultants and found that “knowledge transfer” is one of the major reasons to engage in those buyer-supplier relationships.

Whether to choose buyer-supplier relationships or other inter-organizational relationships to acquire knowledge is a popular topic of transaction cost economics-based papers but concerns a different research arena than this work. Moreover, this thesis is intended to explicitly address the research gap for the governance of knowledge transfer in buyer-supplier relationships.

Buyer-supplier relationships look at the transfer of knowledge from a very efficiency-driven perspective, because these relationships are positioned very close to the spot market. Thus governance for knowledge is supposed to be chosen for reasons of effectiveness and efficiency, which are most representative of professional transfer of knowledge in the knowledge economy.

In summary, the research question addressed by this thesis is:

How to govern knowledge transfer of different types of knowledge in buyer-supplier relationships?

In order to answer this question, this thesis takes a new approach in the inter-organizational relationship research. It applies the theory of work performance to knowledge transfer between firms and discusses the transfer from the perspective of the

¹⁴ Cf. Lawson et al. (2009), Bstieler/Hemmert (2010).

¹⁵ According to e.g. Inkpen (1996), Kale et al. (2000), and Simonin (2004), alliances are recognized as an organizational form to acquire and internalize the knowledge needed in the quest for a competitive advantage.

general social science model¹⁶. Thereby, it discusses the effects of governance mechanisms and knowledge types on the transfer of knowledge not only on the organizational but also on the personal level of the transfer. The system of hypotheses was tested on a data set of 101 consultancy projects of a medium-sized consultancy firm in Germany. Each project was analyzed from a consultant (supplier) and from a buyer (customer) perspective. Therefore, the data provides deep and differentiated insights into the professional transfer of knowledge.

The empirical results are gained through structural equation modeling. They provide advice on what type of governance mechanisms have to be applied when the knowledge transfer is specified by different knowledge characteristics. This advice might not only be helpful for managers of buyer-supplier relationships but also for the managers of inter-organizational relationships who want to professionalize their knowledge transfer. The goal of this thesis is not to present a comprehensive model of the determinants of successful knowledge transfer but instead to test the importance of a set of widely acknowledged governance mechanisms and their role in managing the difficulties of different types of knowledge in a transfer, respectively.

1.2 Structure of the thesis

In order to answer the above research question, this thesis departs from familiar approaches to explain the difficulties of different knowledge characteristics in the transfer process and familiar approaches to explain the application of different governance mechanisms. Chapter Two therefore starts off by defining knowledge, knowledge transfer, and governance in the light of this thesis' research question. In addition, it characterizes the different types of governance mechanisms, knowledge types, and explains difficulties arising with the transfer of certain characteristics of knowledge.

In order to identify any advice for the effective combination of governance and knowledge characteristics, Chapter Three analyzes the theoretic and empirical state of the art research.

¹⁶ The general social science model was developed by Coleman (1990).

Based on these insights, Chapter Four develops the theoretical basis for the governance of knowledge transfer characterized by different types of knowledge and derives the respective hypotheses. Afterwards, Chapter Five introduces the empirical method to test the hypotheses and defines the operationalization of the variables.

Given the fact that knowledge transfer is the major motivation for buyer-supplier relationships in which consulting companies are involved¹⁷, Chapter Six of this thesis tests the hypotheses by analyzing the projects of a consulting company. Knowledge is the subject of the knowledge transfer in this industry – i.e. it is at the heart of the buyer-supplier relationship. Thus the management of different types of knowledge is central for successful management of knowledge transfer in this industry.

Chapter Seven discusses the results and derives the findings of the thesis. Finally, the thesis closes in Chapter Eight with a summary of the main findings, the theoretical and practical implications, limitations of this research, and suggestions for future research

¹⁷ Cf. Dawes, Dowling & Patterson (1992).

2 DERIVING THE GOVERNANCE CHALLENGE TO TRANSFER KNOWLEDGE

The following subchapters introduce the central subjects of the research question, differentiate the focus of this thesis from related research and introduce the theoretical foundations in order to develop the research question. Subsequently, this chapter introduces a framework that will serve as reference to the reader throughout the course of the discussion.

2.1 *Knowledge*

This thesis considers knowledge in an organizational context which means knowledge is a factor for gaining competitive advantages in business.

Knowledge is the individual knowledge set of a firm, responsible for its success. It consists of two main knowledge types¹⁸:

- 1) Process knowledge defined as “the means, behavior, or processes by which organizational goals are accomplished”¹⁹ and
- 2) “Outcome Knowledge defined as the end or outcomes of the processes, which are the goals (objectives or targets) themselves.”^{20 21}

When talking about knowledge in this thesis, the term knowledge refers to both types. In other words, knowledge in this thesis means organizational knowledge (process + outcome knowledge).

This definition of knowledge contains special characteristics that are central to the understanding of the construct “knowledge” within this thesis²²:

- Knowledge is based on information and data – it is not limited to them.
- Knowledge puts information in a specific task or problem context.

¹⁸ Turner, Makhija (2006), p. 198.; cf. Eisenhard (1985);Kirsch (1996); Snell (1992); Snell,Yound (1995).

¹⁹ Turner, Makhija (2006), p. 198.; cf. Eisenhard (1985);Kirsch (1996); Snell (1992); Snell,Yound (1995).

²⁰ Turner, Makhija (2006), p. 198.; cf. Eisenhard (1985);Kirsch (1996); Snell (1992); Snell,Yound (1995).

²¹ This consideration refers to the knowledge-based view of the firm.

²² Cf. Al-Laham (2003).

2. Deriving the governance challenge to transfer knowledge

- Knowledge contains theoretical knowledge (cause and effect relationships) as well as knowledge about rules of practices and behavior (abilities).
- Knowledge contains abilities related to persons as well as networked information, able to be bound to material but not to sources.
- Knowledge is partly implicit (intuitive, difficult to express) and partly explicit (conscious, easy to express and document).
- Knowledge results from many different learning processes.

These characteristics clarify that knowledge is a company-specific resource that is an individual composition of many different objects²³ and processes used to gain competitive advantages for the company. Therefore the definition of knowledge in this thesis can be summarized as follows:

Definition:

Knowledge is a company-specific resource containing all information and abilities each member uses consciously or intuitively to solve tasks and problems.

24

As this definition of knowledge allows considering it a composition of many different characteristics, all knowledge can be split into parts that are very different in their nature and characteristics. The allocation and portion of the single characteristics define different types of knowledge.

In order to assess these different types of knowledge and capture important qualitative differences in knowledge²⁵, research established three characteristics of knowledge: tacitness, complexity, and specificity.²⁶

²³ Knowledge does not have any ontological autonomy but is related to "objects" like e.g. technologies, organizational routines, or abilities. When talking about knowledge in this thesis, it is important to keep in mind that these objects are only means to better capture the construct of knowledge characterized above.

²⁴ Translated from Al-Laham (2003), p. 43, cf. also Mellewigt/Decker (2009), p. 614.

²⁵ Cf. Turner, Makhija (2006), p. 198.

2. Deriving the governance challenge to transfer knowledge

All three characteristics are independent dichotomies that define two different types of knowledge at a time:

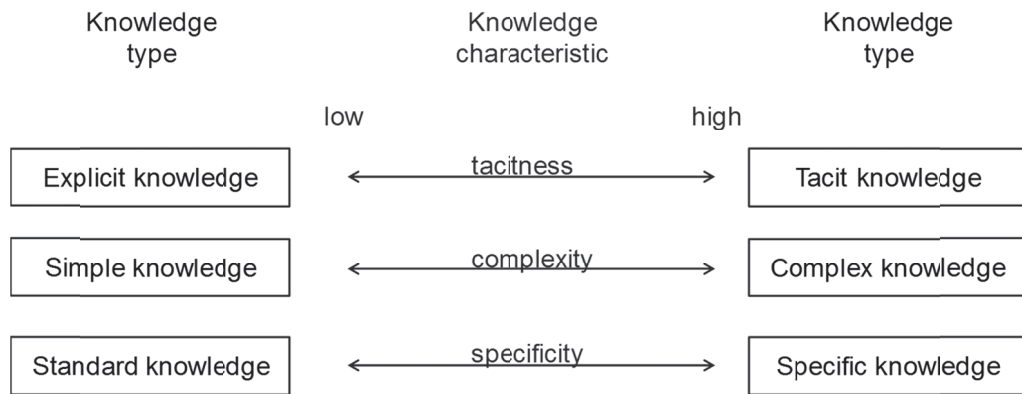


Figure 1: Different types of knowledge

The characteristic of tacitness was first introduced by POLANYI in 1966. His definition still holds today and is used as a dichotomy every knowledge source can be positioned in.²⁷ The dichotomy refers to the codifiability²⁸, teachability²⁹, and predictability of the effects of single components of knowledge³⁰.

Tacit knowledge as one pole of the dichotomy is a part of our subsidiary or preconscious awareness, constituting something that the individual is vaguely aware of but cannot specify, e.g. intuition and personal experiences.³¹

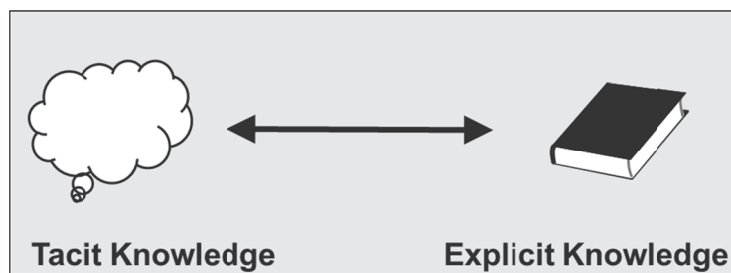


Figure 2: Tacit versus explicit knowledge

²⁶ Cf. e.g. Reed, Defilippi (1990); Zander, Kogut (1995); Simonin (1999); MCEvily, Chakravarthy (2002).

²⁷ Cf. Nonaka& Takeuchi (1995).

²⁸ Cf. Zander, Kogut (1995); Simonin (1999).

²⁹ Cf. Zander, Kogut (1995).

³⁰ Cf. McEvily, Chakravarthy (2002).

³¹ Cf. Polanyi (1966) p. 4.

2. Deriving the governance challenge to transfer knowledge

As represented by Figure 2, the more tacit the knowledge is, the harder it can be formalized explicitly. On the contrary, explicitness forms the opposite pole and refers to the abstract, scientific, and rational elements of knowledge consisting of articulated facts and rules, which are readily transferable or achievable.³²

The following table characterizes organizational knowledge in terms of process and outcome knowledge in the light of tacitness.

	Process Knowledge (I know how to do it!)	Outcome Knowledge (I know what to achieve!)
Tacit No ability to specify it No formalization	<p>“(…) subtle nuances associated with the process are what make it effective.”³³</p> <ul style="list-style-type: none"> You have to engage in the process “in order to understand the true nature of the knowledge.”³⁴ <i>E.g. leading a team</i> 	<p>“Imprecise and unspecific targets and objectives based on subjective assumptions.”³⁵</p> <ul style="list-style-type: none"> You have to “extrapolate from past experience, observations of success and failure of others, and perspectives of appropriate standards.”³⁶ <i>E.g. improved leadership skills</i>
Explicit Articulability Teachability	<p>“(…) It is possible to reduce the process into a set of specific and identifiable rules and courses of action.</p> <ul style="list-style-type: none"> The employee can be given clear and unambiguous direction as to the exact procedures in which to engage.”³⁷ <i>E.g. assessment of ISO processes</i> 	<p>“(…) organizationally desired end results can be specified clearly and precisely.”³⁸</p> <ul style="list-style-type: none"> “The individual has exact and indisputable standards to which it should adhere.”³⁹ <i>E.g. ISO certification</i>

Table 1: Differentiation of tacit and explicit knowledge

The second characteristic is complexity. Complexity is defined by the number of knowledge elements and the degree of their interaction.⁴⁰ It is described by interdependent techniques, routines, individuals, and resources bound to the knowledge.⁴¹

³² Cf. Schreyögg Geiger (2003), p. 14; Probst/Büchel (1998), p.27.

³³ Turner, Makhija (2006), p. 198.

³⁴ Turner, Makhija (2006), p. 199.

³⁵ Turner, Makhija (2006), p. 199.

³⁶ Turner, Makhija (2006), p. 199.

³⁷ Turner, Makhija (2006), p. 198; Cf. Grant (1996a); Kogut, Zander (1992).

³⁸ Turner, Makhija (2006), p. 199.

³⁹ Turner, Makhija (2006), p. 199.

⁴⁰ Cf. Zander, Kogut (1995); Simonin (1999a,b).

⁴¹ Cf. Simonin (1999b).

2. Deriving the governance challenge to transfer knowledge

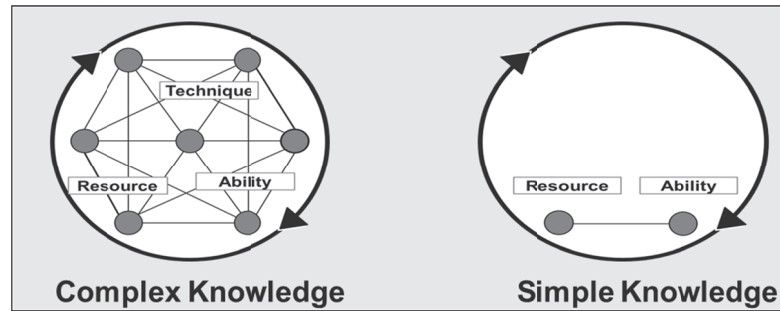


Figure 3: Complex versus simple knowledge

As shown in Figure 3, complex knowledge has “numerous as well as varied parameters [...]” that may be gained “from distinct and multiple functional areas or disciplines.”⁴² Simple knowledge on the other hand has only few inner interdependences and few resources or skills that have to be combined.

The following table characterizes organizational knowledge in terms of process and outcome knowledge in the light of complexity.

	Process Knowledge (I know how to do it!)	Outcome Knowledge (I know what to achieve!)
Simple Task certainty Few number of parameters Little variance of knowledge	Few techniques and routines have to be applied to achieve the goal. ⁴³ <ul style="list-style-type: none"> You have to manage few assets. <i>E.g. exchange a wheel</i> 	The puzzle has few pieces. Targets and objectives are measurable in few KPIs. <ul style="list-style-type: none"> You have one-dimensional targets. <i>E.g. car with new wheels</i>
Complex Task uncertainty High number of parameters Variance of knowledge	Multiple sources, techniques and skills have to be put together the correct way like puzzle pieces to achieve the goal. <ul style="list-style-type: none"> You have to manage more competencies and a broader base of knowledge.⁴⁴ <i>E.g. optimization of a car plant</i> 	The final picture has multiple pieces. Targets and objectives of the goal are multifaceted and have to be measured differently. <ul style="list-style-type: none"> You have to consider different complex issues simultaneously.⁴⁵ <i>E.g. reduced cost of production</i>

Table 2: Differentiation of complex and simple knowledge

The third characteristic of specificity originates from transaction cost economics (TCE), mainly defined by WILLIAMSON in 1985. Specificity refers to the dependence of the knowledge to a specific context and the interdependence with it, respectively.

⁴² Turner, Makhija (2006), p. 200.

⁴³ Cf. Turner, Makhija (2006), p. 200.

⁴⁴ Cf. Turner, Makhija (2006), p. 200.

⁴⁵ Cf. Turner, Makhija (2006), p. 201.

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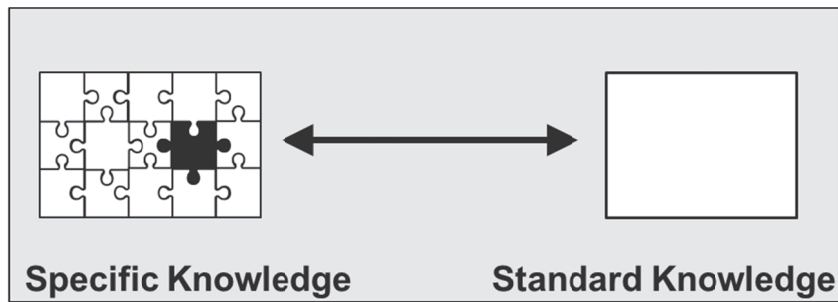


Figure 4: Specific versus standard knowledge

Specific knowledge is not standardized, neither universally usable⁴⁶ nor by itself, and it is not discrete. As shown in Figure 4, it can be perceived as a piece of a puzzle that fits perfectly just in this one position. Specificity results from system dependence⁴⁷ and is indicated by significant investments in specialized equipment, facilities, and skilled human resources to overcome this dependency.⁴⁸ In other words, specific knowledge “is accumulated and developed according to specific requirements [...]. It is designed for and organized around the set of rules and the myriad of relationships”⁴⁹ which enable the entire system to function in a coordinated way. In contrast, standardized knowledge can be applied to many different contexts, different industries, tasks, or countries without adapting it. “It is also context free in the sense that it can be used in different situations and purports to apply to a wide array of phenomena.”⁵⁰ To complement the image for specific knowledge as shown in figure 3, standard knowledge functions as a framework, not as a specific solution.

The following table characterizes organizational knowledge in terms of process and outcome knowledge in the light of specificity.

⁴⁶ Cf. McEvily, Chakravarthy (2002).

⁴⁷ Cf. Zander, Kogut (1995).

⁴⁸ Cf. Simonin (1999); Williamson (1985), pp. 55, 95 f.

⁴⁹ Lam (1997), p. 977.

⁵⁰ Lam (1997), p. 977.

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	Process Knowledge (I know how to do it!)	Outcome Knowledge (I know what to achieve!)
Standard Self-contained Universally applicable	Few investments have to be done to achieve the goal. <ul style="list-style-type: none"> You can apply the knowledge to many contexts. <i>E.g. project-management know how</i> 	Targets and objectives are measurable in standardized KPIs. <ul style="list-style-type: none"> You have few specific targets. <i>E.g. PMI certification</i>
Specific Context/System-dependency Significant investments	Multiple context factors have to be considered, and knowledge has to be "customized" to achieve the goal. <ul style="list-style-type: none"> "The knowledge is highly specialized for a given task or set of tasks."⁵¹⁵² <i>E.g. design a marketing campaign</i> 	Targets and objectives of the goal are based on individual assessment criteria. <ul style="list-style-type: none"> You have one time targets. <i>E.g. market know how of xy</i>

Table 3: Differentiation of specific and standard knowledge

The definitions of the six types of organizational knowledge as presented above finalize the definition of knowledge for the purpose of this thesis' interest. In the following, the subject of knowledge transfer (KNT) is introduced.

2.2 Knowledge transfer

2.2.1 The process of knowledge transfer

Knowledge transfer (KNT) in this thesis is the transfer of organizational knowledge from one organization to another. More specifically, it is the transfer of knowledge from a "knowledge supplier" to a "knowledge buyer".

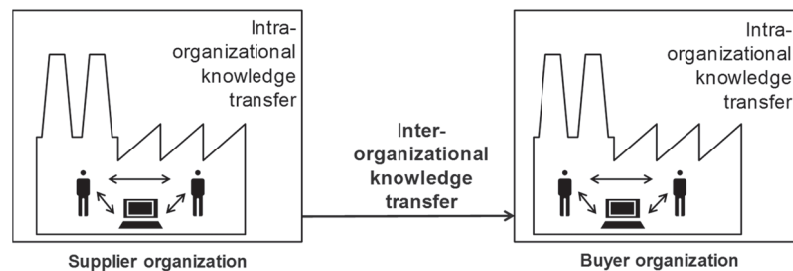


Figure 5: Knowledge transfer focus of this thesis

⁵¹ Cf. Turner, Makhija (2006), p. 200.

⁵² Turner, Makhija (2006) developed their distinction between process and outcome knowledge based exclusively on the knowledge characteristics of tacitness and complexity. The additional consideration of specificity in this paper required a further distinction of their description of process and outcome complexity since they mixed assumptions of specificity (in terms of context-dependency) with complexity (inner interdependence of assets).

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This definition focuses the thesis on a special type of knowledge transfer in organizational research: the inter-organizational transfer of knowledge. As presented in Figure 5, inter-organizational transfer refers to transfers between different firms or organizations i.e. beyond the boundaries of a firm.⁵³ Some researchers also distinguish between dyadic inter-organizational transfer and systemic inter-organizational transfer; i.e. the transfer within inter-organizational networks.⁵⁴ Therefore it shall be noted that dyadic inter-organizational knowledge transfer is the focus of this thesis. Intra-organizational transfer refers to transfers that take place within the boundaries of a firm. This type of transfer is not part of the research subject.

Research differentiates inter-organizational transfer and intra-organizational transfer of knowledge⁵⁵, because the former is more complicated than the latter transfer.⁵⁶

Finding a suitable definition for inter-organizational knowledge transfer in research is difficult, as shown by merely considering the alternative labels for knowledge transfer: e.g. knowledge flow⁵⁷, knowledge sharing⁵⁸, learning, or knowledge acquisition⁵⁹. Additionally, current research developed different definitions for transferring knowledge between organizations as well as for the results of the transfer. VAN WIJK ET AL. (2008) for example label knowledge transfer as a “process” whereas EASTERBY-SMITH ET AL. (2008) call it an “event”. The result of the process perspective is the knowledge exchange with, reception by, and influence on organizational actors (teams, units, or organizations).⁶⁰ The event of knowledge transfer results in an organization “learning.”⁶¹

⁵³ Van Wijk et al. (2008); Easterby-Smith et al. (2008).

⁵⁴ Cf. Squire et al (2009); Gupta/Govindarajan (2000).

⁵⁵ Van Wijk et al. (2008); Holmqvist (2003); Easterby-Smith et al. (2008), p.687; Argote et al. (2003); Inkpen (2002); Simonin (1999b); Szulanski (1996).

⁵⁶ Cf. Inkpen, Tsang (2005); Van Wijk et al. (2008); Squire et al. (2009).

⁵⁷ Cf. Gupta, Govindarajan (2000), Schulz (2001).

⁵⁸ Cf. Hansen (1999), Tsai (2002), Foss et al. (2007, 2010).

⁵⁹ Cf. Darr et al. (1995), Lyles, Salk (1996).

⁶⁰ Van Wijk et al. (2008).

⁶¹ Easterby-Smith et al. (2008), p.677.

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There is a huge discussion in research whether the labels “organizational learning” and “knowledge transfer” are synonyms or distinct concepts. This thesis does not want to participate in this debate but draw from it to develop a suitable definition within its own context. With regard to the explicit supplier-buyer context, this thesis discusses an intended knowledge transfer within the relationship. An intended transfer implies an active and intentional facet and excludes any kind of unspecific process or spill-over⁶² of knowledge which would be characterized by the concept of dissemination⁶³.

The buyer-supplier transfer is based on contracts, because one company sells a good (knowledge) to another. This transfer represents a structured process of passing knowledge.⁶⁴ It is bound to several and diverse interactions of individuals and technology. The knowledge is not exchanged in one event (this might only be correct for data and information).

The result of this process is a change in the customer’s knowledge base.⁶⁵ The customer receives knowledge from the supplier. In order to do so, he definitely needs to learn, because his conscious decision to behavioral and cognitive evolution is necessary.⁶⁶ Thus, the concept of learning⁶⁷, defined as understanding knowledge and becoming able to do something⁶⁸, is a necessary determinant of a successful knowledge transfer in buyer-supplier (B-S) relationships.

With regard to differentiated goals of a buyer-supplier relationship, the consequences of the knowledge transfer and learning might be multifaceted. Consequences of knowledge transfer, i.e. the goals of the relationship, could be for example changes in financial performance, innovativeness, process performance, organization, strategy, or every

⁶² Cf. Epple et al. (1996), Winter, Szulanski (2001). Argote(2003).

⁶³ Cf. Szulanski (1996) p. 28.

⁶⁴ "Transfer"; Merriam-Webster Online Dictionary 2008, Date of access: 24 June 2008, <http://www.merriam-webster.com/dictionary/transfer>.

⁶⁵ Argote et al. (2000).

⁶⁶ Mody (1989).

⁶⁷ 'Learning' is viewed as a conscious decision and not a mere by-product of production in this thesis.

⁶⁸ "Learn"; Merriam-Webster Online Dictionary 2008, Date of access: 24 June 2008, <http://www.merriam-webster.com/dictionary/learn>.

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other dimension of organizational success and survival.⁶⁹ To achieve those goals, the buyer has to gain benefits from the knowledge acquired from the supplier.⁷⁰ This might mean learning routines, handling situations, or establishing procedures from the supplier.

To sum up these aspects, knowledge transfer in this thesis is defined as follows.

Definition:

Knowledge transfer is a structured process of diverse and intentional interaction and learning processes that results in changes of the knowledge base of the recipient organization or its actors.

In knowledge management literature, many approaches have been developed to describe the process of knowledge transfer. They agree on two points.

Firstly, they consider the knowledge transfer process in a sender-receiver framework containing an organizational and an individual level⁷¹: *„Knowledge is considered immobile in so far as it cannot be easily formalized or communicated and is understood to reside within individuals rather than at the level of the firm (Grant, 1996). Transfer is thus reliant on the sender being able to codify and disseminate his/her knowledge and the receiver being able to value, assimilate and utilize this new knowledge (Cohen and Levinthal, 1990).“*⁷²

Secondly, all developed processes hold for inter-organizational transfer as well as for intra-organizational.⁷³

⁶⁹ Cf. Simonin (1999); Argote, Ingram (2000); Jensen, Szulanski (2007); Inkpen (2008).

⁷⁰ Cf. Epple et al. (1996), Winter, Szulanski (2001); Argote(2003).

⁷¹ Cf. Lin et al. (2005); Prange et al. (1996); Squire et al. (2009).

⁷² Squire et al. (2009), p. 464.

⁷³ Cf. von Krogh/Köhne (1998), p. 235 ff.

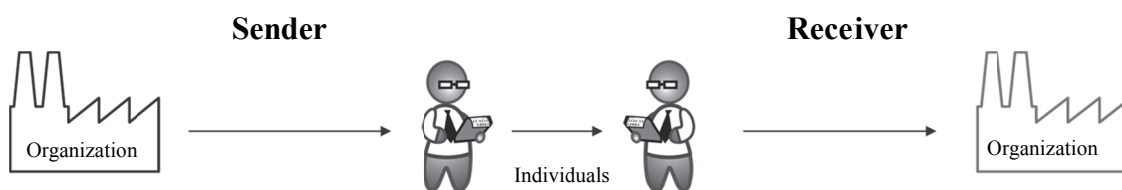


Figure 6: The sender-receiver model of knowledge transfer on the individual and organizational level

These basic agreements by researchers result in very similar tasks and steps that have to be undertaken in order to transfer knowledge. However, the phases of the process that bundle different steps differ in their number and names. This thesis uses a 4-staged process based on SZULANSKI (1996), enriched by descriptions by KROGH/KÖHNE (1998).⁷⁴ Szulanski's process model is used as a basis because it is probably the most detailed model that has been empirically verified.⁷⁵ Figure 7 presents an overview of this process by structuring the main activities and defining the results of each stage.

The first stage, the initiation stage, comprises all activities “that lead to the decision to transfer”⁷⁶ and all activities that are needed to define the setting for the transfer.

The second stage is called the “implementation stage.” In this stage, the knowledge is actually flowing from the sender to the receiver individual resulting in the receiver having the knowledge.

In the third stage, the “ramp-up stage,” the individual integration of the knowledge takes place. It is completed when the receiver has used and understood the received knowledge to the extent that he gains sufficient results with it.

The last stage is the “integration stage.” It describes the organizational integration of the knowledge by establishing routines, roles, and responsibilities for the new knowledge to institutionalize it. This final stage results in the actual change of the knowledge base of the receiver. At that stage, the knowledge transfer is completed successfully.

⁷⁴ Von Krogh/Köhne (1998) described the process in three stages. Their last stage, “integration,” is a consolidation of Szulanski's (1996) third and fourth stage. Thus von Krogh/Köhne's descriptions of “individual integration” are sorted into the third stage whereas their “organizational integration” describes the fourth stage.

⁷⁵ Cf. Tsang (2008).

⁷⁶ Szulanski (1996), p.28.

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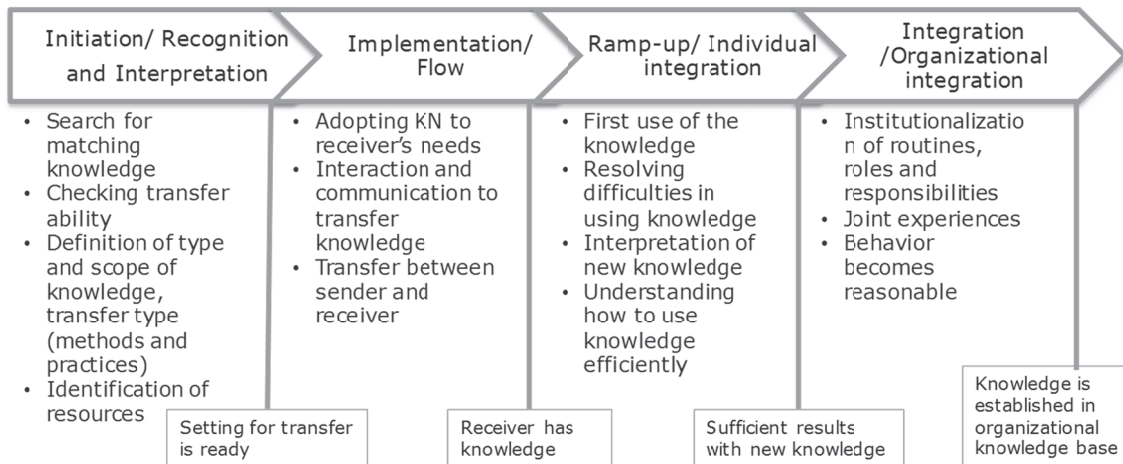


Figure 7: The knowledge transfer process⁷⁷

2.2.2 Successful knowledge transfer

Since successful knowledge transfer is defined by the change in the knowledge base of the receiver resulting from the efficient use of the transferred knowledge⁷⁸, the question arises what the concrete outcome of a knowledge transfer process is. How can one say and measure successful knowledge transfer? In order to do so, researchers developed three different concepts: the process-oriented view, the knowledge base view, and the performance view:⁷⁹

The performance view considers the effects of a knowledge transfer on the organization. It measures a knowledge transfer's outcome by the change in the organization's performance, i.e. a successful knowledge transfer is one that results in higher organizational performance. The performance outcomes of the transfer process that have been central to academic analyses are financial performance, new products introduced, and innovativeness.⁸⁰ Scholars agree and proved empirically that the performance measurement is just a means to estimate the success of a knowledge

⁷⁷ Adopted from Szulanski (1996) and von Krogh/Köhne (1998).

⁷⁸ Cf. Szulanski (2000), p.13.

⁷⁹ Cf. Szulanski (2000), p.13.

⁸⁰ Cf. Katila, Ahuja (2002); Van Wijk et al. (2008); Lane et al. (2001).

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transfer. For example VAN WIJK ET AL. (2008) found positive mean correlations for performance and innovativeness with knowledge transfer.

The most popular method to measure the performance empirically has been primary questionnaires.⁸¹ Additionally, learning curve effects⁸², decreases of costs per unit⁸³, and special technological assets in product development⁸⁴ have been applied to measure the performance-oriented outcome of a knowledge transfer.

However, the performance-oriented view and this measurement of knowledge transfer do not investigate all connections between knowledge transfer and the performance, i.e. performance results might not only be explained by the knowledge transfer but by many other factors that have not been considered.

The knowledge base view considers the stock of knowledge in an organization. It measures the outcome of a knowledge transfer by the change in an organization's knowledge inventory. A successful knowledge transfer is a knowledge transfer that results in a higher amount of knowledge in an organization. Empirical studies use different approaches to measure the change of the knowledge base, e.g. the number of new patents after a knowledge transfer⁸⁵, cross-citation rates of patents⁸⁶, or imitation of innovation by competitors⁸⁷. The most frequently used approach is a primary questionnaire measuring the amount of knowledge by the perception and assessment of managers.⁸⁸

The process-oriented view considers the stage the knowledge has reached within the process. With reference to the previously introduced process of knowledge transfer, this aims at enabling the receiver to use the knowledge efficiently and measures the outcome by the degree of integration in the receiver's organization. Approaches to operationalize the process-oriented outcome of knowledge transfers are the intensity of participation in

⁸¹ Cf. Levin/Cross (2004); Lane/Lubatkin (1998).

⁸² Cf. Darr et al. (1995); Darr/Kurtzberg (2000).

⁸³ Cf. Darr et al. (1995); Darr/Kurtzberg (2000).

⁸⁴ Cf. Yli-Renko et al. (2000).

⁸⁵ Cf. Bresman et al. (1999); Almeida et al. (2002).

⁸⁶ Cf. Mowery et al. (1996).

⁸⁷ Cf. Zander/Kogut (1995).

⁸⁸ Cf. Dhanaraj et al. (2004); Lyles/Salk (1996); Simonin (1999); Tsang (2002).

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knowledge transfer⁸⁹, the stickiness within the four phases⁹⁰, and the frequency of activities in single stages of the process.

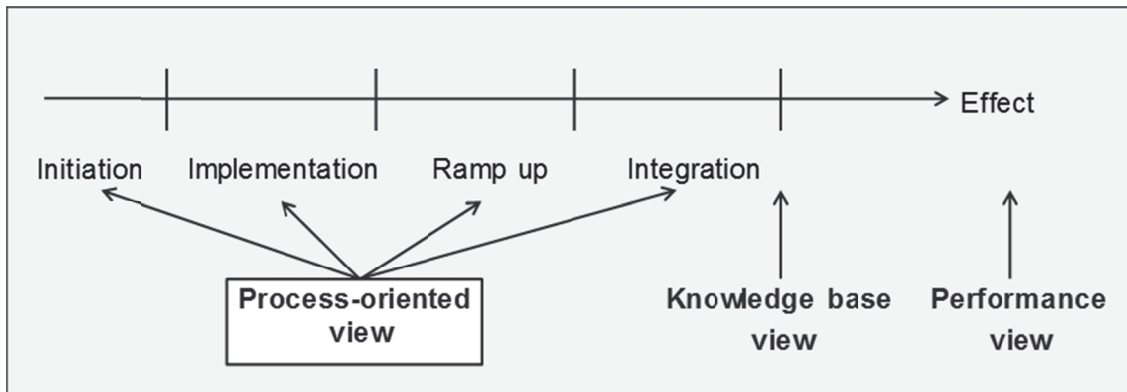


Figure 8: Concepts of measuring knowledge transfer success

This thesis follows the process-oriented view of knowledge transfer success (cf. Figure 8). Thus, success of knowledge transfer is achieved when knowledge has completed the fourth phase, i.e. knowledge from the sender is integrated into the knowledge base of the receiver. However, this implies that the prior phases have also been accomplished. The success of knowledge transfer therefore depends (aside from other context factors) on “how easily the underlying knowledge sources can be communicated, interpreted, and absorbed.”⁹¹ This ease of transfer differs between the different types of knowledge because they provide different challenges to the transfer process.

2.2.3 Challenges when transferring different types of knowledge

The main theoretical argument why knowledge challenges the transfer process is grounded in the resource-based theory of the firm (RBV).⁹² The RBV sees firms as

⁸⁹ Cf. Guapta/Govindarajan (2000).

⁹⁰ Cf. Szulanski (1996).

⁹¹ Van Wijk et al. (2008), p. 844, cf. also Kogut and Zander (1992).

⁹² RBV is built on several assumptions: 1) Firms are conceptualized as profit-maximizing entities, 2) firms are risk-neutral price takers, making choices according to the expected value of resources (Lippman and Rumelt, 1982), 3) managers are presumed to be rationally bounded, 4) the presence of imperfections in the market for strategic factors, resulting in heterogeneous resource endowments between competing firms (Barney, 1986).

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bundles of valuable resources.⁹³ These resources are defined as “all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness.”⁹⁴

RBV explains the competitive advantage of firms by the imitability of these resources. “Firms that are able to accumulate resources and capabilities that are rare, valuable, nonsubstitutable, and difficult to imitate will achieve a competitive advantage over competing firms (Barney, 1991; Dierickx & Cool, 1989; Rumelt, 1984).”⁹⁵ Thus it suggests that “complex, specific, and tacit knowledge generates more durable advantages because it is difficult to imitate”^{96, 97}.

From a knowledge management perspective, which sees knowledge transfer as creating business in the first place, this advantage becomes a disadvantage because “knowledge transfer depends on how easily that knowledge can be transported, interpreted, and absorbed (Hamel et al. 1989).”⁹⁸ As identified by SIMONIN (1999), the reason why the characteristics of knowledge limit the ease of the transfer is because they cause ambiguity.⁹⁹

Ambiguity is defined as the “inherent and irreducible uncertainty as to precisely [define] what [...] knowledge components and sources are and how they interact.”¹⁰⁰ It can be considered the lack of understanding the logical linkages between actions and outcomes, inputs and outputs, and causes and effects that characterize a competency and its transferability.¹⁰¹ This results in the knowledge’s “resistance to clear communication, its embeddedness in context, and its idiosyncrasy”¹⁰², i.e. it creates barriers to imitation and

⁹³ Cf. Penrose (1959).

⁹⁴ Barney (1991), p. 101.

⁹⁵ Dyer, Singh (1998) p. 660.

⁹⁶ McEvil/Chakravarthy (2002), p. 285.

⁹⁷ Cf. Winter (1987); Reed/DeFilippi (1990); Simonin (1999b).

⁹⁸ Simonin (1999b) p. 597.

⁹⁹ Cf. Birkinshaw et al. (2002), Van Wjik et al. (2008); Simonin (1999b, 2004); Coff et al. (2006).

¹⁰⁰ Van Wjik et al. (2008), p. 833.

¹⁰¹ Cf. Simonin (1999).

¹⁰² Simonin (1999) p. 367.

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learning.¹⁰³ The higher these barriers, the more time is needed to explain and learn the specifics of the knowledge source. Thus ambiguity constrains the ultimate success of the knowledge transfer.¹⁰⁴

All characteristics of knowledge create ambiguity and barriers to imitation and to learning and therefore hinder the success of knowledge transfer:

“Tacit knowledge involves intangible factors embedded in personal beliefs, experiences, and values.”¹⁰⁵ It cannot be “codified or articulated in manuals, computer programs, training tools, and so on.”¹⁰⁶ Consequently, in the case of tacitness, the receiver did not even know what the components of the knowledge are, how they interact and where they come from – i.e. the receiver does not know what he has to learn and to integrate.

“Tacit knowledge is by nature intuitive—it cannot be articulated or verbalized, and often is unconscious— and, compared to explicit knowledge, it is much more difficult to transfer (Kale et al. 2000; Martin and Salomon 2003; Polanyi 1962).”¹⁰⁷

According to KOGUT (1988), tacitness creates “the necessity to replicate experiential knowledge that is difficult to grasp.”¹⁰⁸ Furthermore it is considered a source of destabilization or conflict and causes frustration in learning.¹⁰⁹ Therefore, close cooperation may be the only way to learn tacit knowledge.¹¹⁰ In addition, SCHÖN (1983) argues that the learning process occurs through a series of stages. Thus this close cooperation must not be occasional.

Grasping the actual knowledge components is per definition not a problem for specific or complex knowledge. Since the components of complex and specific knowledge can be documented, the receiver knows them and their sources. However, specific

¹⁰³ Cf. Simonin (1999).

¹⁰⁴ Cf. Van Wjik et al. (2008).

¹⁰⁵ Inkpen, Pien (2006) p. 781.

¹⁰⁶ Inkpen, Pien (2006), p. 781.

¹⁰⁷ Janowicz-Panjaitan, Noorderhaven (2009) p. 1028.

¹⁰⁸ Simonin (1999), p.599.

¹⁰⁹ Cf. Simonin (1999), p.599.

¹¹⁰ Cf. Pisano (1989); Simonin (1999).

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knowledge, which per definition depends on the context, creates uncertainty of how these components interact with the specific context of the receiver.

“Unlike specific knowledge which cannot be easily severed from its prevailing context, this type of knowledge [standardized] is more discrete and thus characterized by its relative ease of transfer.”¹¹¹

In other words, “the knowledge needs to be embedded in specific organizational routines and operating procedures understood and shared by client members with common experience and values.”¹¹² For the sender, it is difficult to catch all relevant knowledge components right away. “He might have to step into new content and context every day to fulfill the whole adaption of the knowledge to the client’s needs – i.e. the fulfillment of the transfer has to cover all sorts of rules of the client, which not always appears to the sender immediately and completely”¹¹³ Confronted with job (task) boundaries that tend to be broad and ambiguous¹¹⁴, the transfer of specific knowledge requires a high engagement of the sender and patience of the receiver.

Finally, complex knowledge, which is per definition the source of multiple resources and interaction, can be documented and does not create uncertainty due to context-interaction. But the receiver has the challenge to capture all knowledge components and their interactions. “As the numbers of parts and multistage processes increase, the quantity and diversity of the information involved increase with it, making the integration of the various production tasks more cognitively difficult and costly to synchronize.”¹¹⁵

“Complexity is expected to affect the comprehension of the totality of an asset and to impair its transferability”¹¹⁶

Since the information about the knowledge components and their interaction lies with the sender, complexity creates uncertainty about the completeness of the knowledge for the receiver. According to TEECE (2000, p. 36), “such knowledge cannot be moved into an organization without the transfer of clusters of individuals with established

¹¹¹ Lam (1997) p. 977.

¹¹² Lam (1997), p. 977.

¹¹³ Lam (1997), p. 977.

¹¹⁴ Lam (1997), p. 977.

¹¹⁵ Mesquita, Brush (2008), p. 788.

¹¹⁶ Simonin (1999), p. 600.

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patterns of working together.”¹¹⁷ Thus with increasing complexity, parties need to become involved in a greater number of forecasting and planning sections as they complete each step.¹¹⁸

The definitions above show that although all characteristics of knowledge hinder the transfer by creating ambiguity, they do so in different ways, i.e. ambiguity occurs due to different reasons. Consequently, the knowledge characteristics influence how knowledge is transferred, taught, and learned¹¹⁹, i.e. they create different knowledge transfer processes and challenges.

Reflecting the ambiguity challenge from a strategic management perspective, the three knowledge characteristics provide obstacles to knowledge transfer between organizations but they also contribute to protecting knowledge from being imitated by rivals.¹²⁰ Consequently, in the knowledge economy, the management of knowledge transfer has to solve the “knowledge leveraging paradox because of its simultaneous difficulty to be interpreted, assimilated, and applied to commercial ends.”¹²¹

2.3 Governance - Means to coordinate and control transactions

The previous chapter identified knowledge transfer as a process in an inter-organizational relationship that results in changes of the knowledge base of the recipient organization or its actors. In addition, it was outlined that different types of knowledge place different challenges on the transfer process. This chapter introduces the means of the strategic management of a buyer-supplier relationship to secure a successful knowledge transfer – governance.

¹¹⁷ Cummings, Teng (2003), p.44.

¹¹⁸ Mesquita, Brush (2008), p. 788.

¹¹⁹ Lubatkin et al. (2001) p. 1356.

¹²⁰ Cf. Coff et al. (2006); Van Wijk et al. (2008).

¹²¹ Van Wijk et al. (2008) p. 844, cf. also Coff et al. (2006).

2.3.1 The governance concept

Taking the perspective of the new institutional economics¹²² (NIE), all inter-organizational relationships are characterized by asymmetric information and bounded rationality and opportunism.¹²³ This means on the one hand that the sender of the knowledge (the supplier) has more information about the knowledge, the results of the transfer, and the consequences. On the other hand, receiver and sender alike try to maximize their profits in the relationship.

Assuming risk neutrality¹²⁴ of the parties, the transfer is endangered by moral hazard¹²⁵ and adverse selection¹²⁶. Moral hazard is a situation in which one party decides on how much risk to take, while the other party bears (parts of) the negative consequences of risky choices.¹²⁷ In the knowledge transfer context, the receiver knows less about the knowledge components he obtained than the sender. Therefore, he cannot estimate the necessary means to transfer this knowledge efficiently. The buyer has to pay for the means and time that are used to transfer the knowledge. Consequently, the sender can use transfer mechanisms that are not necessary at all but that increase his income.

Adverse selection is a situation in which the party with less information (the receiver) pays a price for a good that is calculated based on the average quality of the good or the sender although the actual good is below the average quality level (failure of market mechanism¹²⁸).¹²⁹ Adverse selection is a problem that occurs in the pre-transaction

¹²² NIE has its roots in two articles by Ronald Coase, "The Nature of the Firm" (1937) and "The Problem of Social Cost" (1960) whereas the actual name NIE was developed by O.E. Williamson in (1975). The NIE considers institutions as a system of formal and informal norms and rules. These norms and rules use incentive and punishment instruments to direct the behavior of individuals. The purpose of an institution is to reach a certain goal like e.g. profit maximization. It is predominantly based on transaction cost economics (TCE) (O.E. Williamson) but also includes principal agent theory and explains why different organizational structures are developed and how they affect organizational efficiencies.

¹²³ Cf. central assumptions of TCE in Williamson (1975).

¹²⁴ Central assumption of the TCE.

¹²⁵ Cf. Richter/Furubotn (2003), p.588.

¹²⁶ Cf. Mishra et al. (1998).

¹²⁷ Cf. Richter/Furubotn (2003), p.588.

¹²⁸ The receiver of knowledge calculates the price for the knowledge he buys based on the average price of the market for this type of knowledge and the results he wants to achieve with it. The sender who

2. Deriving the governance challenge to transfer knowledge

phase (before the contract is closed), whereas moral hazard is mainly a problem of the transaction phase. Still, both problems increase the transaction costs¹³⁰ and limit the transaction value. Moral hazard and adverse selection increase the cost of knowledge transfer, and they limit the change of the receiver's knowledge base. To cope with these inefficiencies and ensure a successful knowledge transfer, the parties need to establish sufficient governance to coordinate and control the relationship.¹³¹

The term governance was traditionally defined very broadly as “a mode of organizing transactions.”¹³² This mode refers to “a system to regulate or promote inter-partner exchange to minimize transaction cost and/or maximize transaction value.”¹³³

A governance system includes the structure and mechanisms that are used to manage the transaction, i.e. coordinating and controlling costs and value.¹³⁴ Both governance structure and mechanisms have the goal to minimize transaction costs and/or maximize transaction value by regulating moral hazard and adverse selection.

The governance structure (often also called governance form) is the structural form that arises from the contractual organization of the transaction.¹³⁵ They are applied to coordinating and controlling the organizational resources and the relationship on the firm level. The decision for a specific structure (contract) is made in the formation phase of the transaction¹³⁶, e.g. the buyer-supplier negotiations or alliance formation phase.

might know that the knowledge is not sufficient to achieve this target can nonetheless accept this price.

¹²⁹ Cf. Weigelt/Camerer (1988), p.451.

¹³⁰ Cf. Hoetker/Mellewigt (2009).

¹³¹ According to the TCE perspective, the main problem of organizing is a problem of contracting (Williamson, 1985). The basic unit of analysis is the transaction, a transfer of a good or a service, for which the most efficient form of governance, or contractual law, respectively, should be applied.

¹³² Li et al. (2010), p.272.

¹³³ Li et al. (2010), p.272. and cf. Adler (2001); Bradach and Eccles (1989); McEvily et al. (2003); Liu et al. (2009).

¹³⁴ Cf. Hoetker/Mellewigt (2009), p.1027.

¹³⁵ Cf. Oxley (1997). For alliances, they range from unilateral contract agreements to equity-based contracts.

¹³⁶ Cf. Meier (2010), p. 13.

Accordingly, “the decision for a certain governance form is a fundamental and hardly reversible choice.”¹³⁷

Governance mechanisms “are concrete management and control activities, which describe in detail how the required behavior of the partner will become motivated, influenced, and established.”¹³⁸ They “capture organizational routines, control and coordination mechanisms, and systems”¹³⁹ that are used to manage the particular transaction process in order to gain the desired outcome, i.e. they allow managers to solve problems of control, coordination, and cooperation.¹⁴⁰

Definition:

Governance mechanisms are “organizational routines, control and coordination mechanisms, and systems” that are used to manage the particular transaction process in order to gain the desired outcome.

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This thesis focuses on buyer-supplier transactions between knowledge senders and receivers. These transactions are governed either by contracts for work or contracts for services. Equity arrangements such as for example in contracts for strategic alliances are not common in buyer-supplier relationships. The discussion of governance structure thus implies the limited analysis of these different types of contracts and their ability to manage the transfer of different knowledge types. In contrast, the number and type of governance mechanisms in a buyer-supplier relationship are not limited to special cases. Thus the discussion of governance mechanisms implies the analysis of all types of management and control activities and their ability to manage the transfer of different knowledge types, i.e. it is multifaceted.

Although the discussion of contractual effects is not considered to be less important, this thesis focuses on the effects of governance mechanisms.

¹³⁷ Meier (2010), p. 15.

¹³⁸ Hoetker/Mellewigt (2009), p.1027.

¹³⁹ Meier (2010), p. 15 with reference to Gray (2001).

¹⁴⁰ Cf. Hoetker/Mellewigt (2009), p.1027; Meier (2010), p. 13.

¹⁴¹ Meier (2010), p. 15 with reference to Gray (2001).

2.3.2 Types of governance mechanisms

In the knowledge transfer context, governance mechanisms are also called “knowledge management practices.”¹⁴² Their number is nearly endless. Examples for such mechanisms are joint decision making, face-to-face meetings, goal alignment, or the exchange of personal, standardized project management processes, experience-based staffing, and training of personnel, detailed defined authority structures, knowledge sharing procedures, and informal socialization.¹⁴³

To sort all these mechanisms, research distinguishes between different types of governance mechanisms. The most common distinction, which also shall be used in this work, is formal versus relational governance mechanisms.¹⁴⁴¹⁴⁵

There is discussion in research on whether the types of mechanisms are substitutes or complements. This thesis does not want to participate in this debate. Instead it draws from the current state of the discussion. That is, formal and relational mechanisms are not exclusive but “may occur to varying degrees” in the same transaction.¹⁴⁶

The established differentiation of formal versus relational mechanisms separates them by their function to specify their outcome in advance and their dependence on specific people and their relationship respectively.¹⁴⁷

*“Formal safeguards¹⁴⁸ refer to organizational devices aiming at controlling conditions and outcomes of collaboration [...]”.*¹⁴⁹

*“Informal or social control¹⁵⁰ mechanisms are based largely on trust [...]”.*¹⁵¹

¹⁴² Cf. Meier (2010); Gray (2001).

¹⁴³ Cf. Meier (2010); Van Wjik et al. (2008); Foss et al. (2010).

¹⁴⁴ Cf. Hoetker/Mellewigt (2009); Dekker (2004); Martinez/Jarillo (1989); Li et al. (2010), p.272.

¹⁴⁵ The effect of relational governance is theorized based on relational theory not on TCE.

¹⁴⁶ Cf. Macneil (2000); Mellewigt, Madhok, and Weibel (2007).

¹⁴⁷ Cf. Hoetker/Mellewigt (2009), p. 1027.

¹⁴⁸ Safeguard is a different word for governance mechanism.

¹⁴⁹ Sawers et al. (2008), p. 176.

¹⁵⁰ Control is a different word for governance mechanism

¹⁵¹ Sawers et al. (2008), p. 176.

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Formal mechanisms specify the conditions of the collaboration and the outcomes to be accomplished in the relationship and by its partners.¹⁵² They monitor the realization of the outcome targets.¹⁵³ Thus formal mechanisms try to limit the consequences of moral hazard and adverse selection by monitoring the expected result and the behavior of the people involved.¹⁵⁴

“When using formal mechanisms, parties specify several verifiable contingencies, such as inputs and outputs, the level and timing of actions, task and review processes, performance benchmarks, procedures for dispute resolution, and even penalties for noncompliance (Poppo & Zenger, 2002: 709; Ryall & Sampson, 2007:12). The more explicit and detailed such specifications are, the more a contract is said to be complete, and therefore, the more it helps protect exchanges. This protection is possible because, given the possibility of legal recourse, parties refrain from opportunism (Mayer & Nickerson, 2005).”¹⁵⁵

Relational mechanisms rely on trust. Trust is a “positive expectation about another’s motives with respect to oneself in situations entailing risk”¹⁵⁶ and “trust mitigates the extent of the uncertainty that exists between organizations which cannot control one another’s actions it discourages opportunistic behavior [...]”¹⁵⁷. Trust enhances the “opportunity for greater information sharing over time.”¹⁵⁸ Consequently, relational mechanisms try to limit the actual need for and danger of moral hazard and adverse selection by increasing information sharing.¹⁵⁹

Relational mechanisms also serve as safeguards; parties refrain from opportunistic actions to preserve their reputations and avoid the termination of valuable long-term relationships (Axelrod, 1984: 124; Heide & Miner, 1992:

¹⁵² Cf. Sawers et al. (2008), p. 176.

¹⁵³ Cf. Sawers et al. (2008), p. 176.

¹⁵⁴ Sawers et al. (2008), p. 176.

¹⁵⁵ Mesquita, Brush (2008), p. 786.

¹⁵⁶ Boon and Holmes (1991), p. 194.

¹⁵⁷ Hart and Saunders (1997), p. 30.

¹⁵⁸ Hart and Saunders (1997), p. 30.

¹⁵⁹ Sawers et al. (2008), p. 177.

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267; Klein & Leffler, 1981), to balance their resource interdependency (Pfeffer & Salancik, 1978), or even to rationally maintain the trust developed over time from repeated close ties, so as to enable other profitable cooperative gains in the future (Deutsch, 1973).¹⁶⁰

In summary, to prevent inefficiencies in a transaction arising from moral hazard or adverse selection, formal mechanisms specify roles, performance expectations, and establish resolution mechanisms¹⁶¹, whereas informal mechanisms create inter-firm communication and coordination routines¹⁶². Formal mechanisms rely on financial parameters, the drafting and implementation of formal contracts¹⁶³, enforceable rules or standard procedures, whereas the relational mechanisms rely on trust and cooperation¹⁶⁴. In conclusion, formal mechanisms prevent the failing to perform as agreed¹⁶⁵ by enhancing the predictability of each party's actions and structuring communication flows.¹⁶⁶ Relational mechanisms prevent the failing of the transaction by limiting the need for opportunistic actions by establishing trust between the parties. Their effect is based on relational theory.¹⁶⁷

To put in a nutshell, formal mechanisms coordinate the efforts of partners¹⁶⁸, whereas informal mechanisms coordinate the actual partner (i.e. people).

Table 4 summarizes the arguments of the different approaches and differentiates the central characteristics from the coordination approach and the underlying attributes.

¹⁶⁰ Mesquita, Brush (2008), p. 787.

¹⁶¹ Cf. Poppo and Zenger (2002).

¹⁶² Cf. Dyer/Singh (1998), Eisenhardt (1985), Hoetker/Mellewigt (2009).

¹⁶³ Cf. Ferguson, Paulin, and Bergeron (2005), p.217.

¹⁶⁴ Cf. Eisenhardt (1985), Hoetker/Mellewigt (2009).

¹⁶⁵ Cf. Williamson (1985).

¹⁶⁶ Cf. Galbraith (1977), Gulati and Sych (2005).

¹⁶⁷ Cf. Gulati (1998), Uzzi (1997).

¹⁶⁸ Cf. Gulati (1995), Ryall/Sampson (2006); Sobrero/Schrader (1998).

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Governance approach	Formal	Relational
Central characteristics ¹⁶⁹	Specifies and stipulates the outcome or a behavior in advance	Outcome cannot be pre-specified: it depends on interaction of individuals ¹⁷⁰
	Independent of specific people involved ¹⁷¹ , “separated from the specific people and their relationships”	It matters who is involved
Coordination approach	Coordinates by structuring information flows and parties’ actions ¹⁷² (specifying roles, performance expectations, resolution mechanisms ¹⁷³)	Coordinates by creating inter-firm communication and coordination routines ¹⁷⁴
Reliance on:	Operates based on financial parameters and the drafting and implementation of formal contracts ¹⁷⁵ , enforceable rules or standard procedures.	Operates based on trust, dependence, and cooperation ¹⁷⁶

Table 4: Characteristics of formal and relational governance mechanisms

2.3.3 The governance question for the transfer of knowledge

Knowing that the characteristics of knowledge influence how knowledge is transferred, taught, and learned, the questions arises how firms govern these different knowledge exchanges properly.¹⁷⁷ Governance is a means to coordinating and controlling the transfer. The transfer provides different challenges due to the characteristics of knowledge. Thus, the governance composition needs to address these difficulties effectively in order to achieve sufficient results:

Governance for tacit knowledge transfer has to address the “the necessity to replicate experiential knowledge that is difficult to grasp.”¹⁷⁸ Thus it has to deal with the special need for close cooperation.

¹⁶⁹ Developed by Hoetker/Mellewigt (2009).

¹⁷⁰ Cf. Das and Teng (1998), Makhija and Ganesh(1997), Williamson (1979), Sobrero/Schrader (1998).

¹⁷¹ Cf. Telser and Higinbotham (1977); Williamson (1979).

¹⁷² Cf. Galbraith (1977); Gulati and Sytch (2005).

¹⁷³ Cf. Poppo and Zenger (2002).

¹⁷⁴ Cf. Dyer/Singh (1998), Eisenhardt (1985), Hoetker/Mellewigt (2009).

¹⁷⁵ Cf. Ferguson, Paulin, and Bergeron (2005), p.217.

¹⁷⁶ Cf. Eisenhardt (1985), Hoetker/Mellewigt (2009).

¹⁷⁷ Lubatkin et al. (2001), p. 1356.

¹⁷⁸ Simonin (1999), p.599.

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Governance for complex knowledge transfer has to address the uncertainty about the context interaction and about the completeness of the knowledge for the receiver. Thus it has to consider the special need for greater number of forecasting and planning.

Governance for specific knowledge transfer has to address the uncertainty of how these components interact with and include the specific context of the receiver. Thus, the special need for high engagement of the sender and patience of the receiver needs to be taken into consideration here.

For the strategic management of buyer-supplier knowledge transfer, the primary question is: Which type of governance mechanism is effective in managing the success of the knowledge transfer? The second question is: How much of this mechanism is needed to achieve a successful transfer efficiently? More specifically, the following may be considered:

- Can the difficulties of a certain knowledge type be resolved by applying either relational or formal governance mechanism to the knowledge transfer?
- Is one type of the governance mechanisms useful for covering all the difficulties of different knowledge characteristics, or is it necessary to adopt a combination dependent on the knowledge type?
- Is a single application of one or the other group effective and efficient, or is a combination of relational and formal mechanisms needed?

Neither the TCE nor the relational theory provide an answer to these questions, because they do not take the subject of the transfer (the knowledge type) but rather the transfer context into account. Accordingly, this thesis deals with the resolution of these questions. It summarizes the initial research questions and positions in inter-organizational relationship (IOR) research as follows:

The subject of analysis in this thesis is buyer-supplier relationships. This type of IOR is clearly differentiated from other IORs in the dichotomy of market and hierarchy (cf. Figure 9).¹⁷⁹ Therefore, the research and findings of this thesis have to be distinguished from knowledge transfer research in other IORs.

¹⁷⁹ Cf. Williamson (1991).

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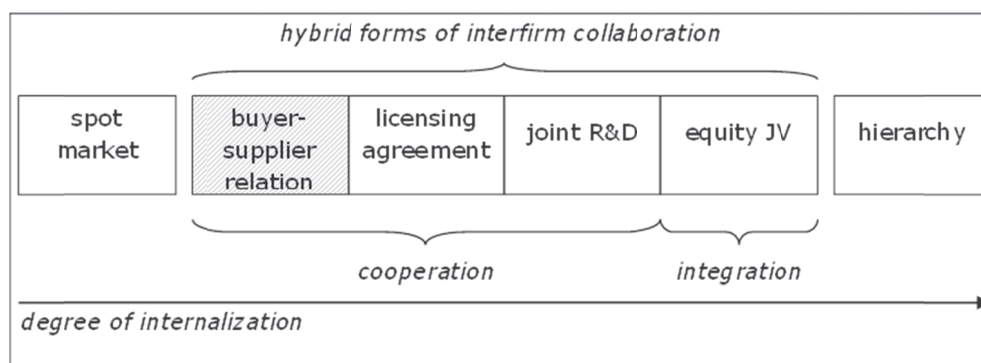


Figure 9: Collaboration context of knowledge transfer

Analyzing buyer-supplier relationships for knowledge implies that the transferred good is limited to a pure knowledge good. This means that the knowledge in question is not connected to any physical goods, e.g. the supply of a production machine and the knowledge to run it. This thesis excludes any type of buyer-supplier relationship aiming for technology transfer. *“Knowledge transfer and technology transfer are often used interchangeably and while both knowledge transfer and technology transfer are highly interactive activities, they serve different purposes. Knowledge transfer implies a broader, more inclusive construct that is directed more toward understanding the “whys” for change. In contrast, technology transfer is a narrower and more targeted construct that usually embodies certain tools for changing the environment.”*¹⁸⁰

The concentration on pure knowledge goods is necessary to resolve the specific research area of this thesis: governance of different knowledge types. Therefore, the focus of this work is completely different from that of research analyzing the effect of knowledge-intensive goods in contrast to less knowledge-intensive or physical goods.¹⁸¹

Usually, buyer-supplier relationships are thought of as vertical cooperation, yet in analyzing the relationships of knowledge suppliers and their “buyers”, the cooperation type must not be limited to vertical ones. Many consultant services, especially strategy consultancy, are not pre-products but a service or an accompaniment on the same level, i.e. they represent more or less cross-industry cooperation. Thus the transaction type to be analyzed in this thesis can be characterized as hybrid cross-industry buyer-supplier relationships.

¹⁸⁰ Gopalakrishnan, Santoro (2004), p. 57.

¹⁸¹ Cf. for example Hoetker/Mellewig (2009).

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Since these relationships are positioned close to the spot market, buyer-supplier relationships are usually managed by contracts that specify deliverables in detail instead of hierarchical mechanisms which integrate the supplier (cf. Figure 9).

In summary, if the subject of buyer-supplier relationships is knowledge transfer, these kinds of relationships can be characterized by intended knowledge-sharing based on contractual agreements, detailed definition of knowledge deliverables, goals, and the results of the relationship.

Knowledge transfer was defined as an inter-organizational relationship consisting of a four-staged structured process of diverse and intentional interaction and learning processes between individuals and organizations resulting in changes of the knowledge base of the recipient organization or its actors. Accordingly, this thesis considers learning as a necessary attribute of successful knowledge transfer. This work follows the process-based view of knowledge transfer success. Therefore, the success of knowledge transfer is defined by the degree to which the knowledge has been integrated into the customer organization.

The transfer good “knowledge” is defined as a company-specific resource containing all the information and abilities each member uses consciously or intuitively to solve tasks and problems. The supply of pure knowledge goods demands an understanding of the differences in these goods rather than considering a knowledge-intensive good in contrast to a less knowledge-intensive good. To differentiate types of knowledge, this thesis follows the established characteristics of tacitness, complexity, and specificity. In practice, knowledge can never be characterized by just one of these characteristics. They nonetheless provide categories, in which knowledge goods can be sorted based on their dominant characteristic.

All three characteristics are considered to cause ambiguity, which explains the difficulty inherent in knowledge transfer. However, the reasons why the characteristics cause ambiguity are diverse, and as a result, the way knowledge is transferred, taught, and learned differs for different types of knowledge.

Governance has the task to coordinate and control any type of knowledge transfer. Governance aims to maximize the value of the transaction and to reduce the costs. Therefore, the question arises which type of governance is best suited to coordinating

and controlling the different types of knowledge transfer difficulties caused by the characteristics of knowledge.

The governance question in this thesis exclusively focuses on governance mechanisms. Governance structure (contractual designs of buyer-supplier relationships), although generally not considered less important, is outside the scope of this work. In order to differentiate different types of governance mechanisms, this thesis follows the most established differentiation of formal versus relational mechanisms.

In order to shed some light on the understanding of how firms might govern their different knowledge exchanges, this paper is going to analyze the joint effect of the two types of governance mechanisms and the three different knowledge characteristics in a knowledge transfer.¹⁸² As visualized by the following figure, the question is how the three types of knowledge (tacitness, complexity, specificity) have to be matched to the two types of governance mechanisms (formal/relational) to secure a successful knowledge transfer.

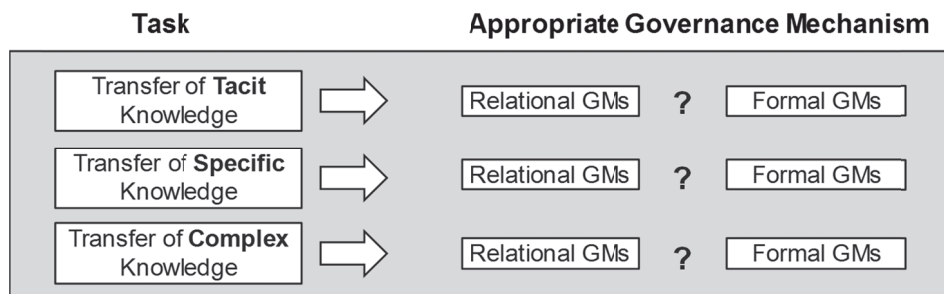


Figure 10: Visualization of the detailed research questions

Consequently the main research question can be distinguished into three more specific ones:

- 1) Which type of governance mechanism (formal/relational) can coordinate **tacit knowledge** transfer effectively and efficiently?
- 2) Which type of governance mechanism (formal/relational) can coordinate **complex knowledge** transfer effectively and efficiently?
- 3) Which type of governance mechanism (formal/relational) can coordinate **specific knowledge** transfer effectively and efficiently?

¹⁸² Lubatkin et al. (2001), p. 1356.

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3 STATE OF THE ART

3.1 Search strategy

A significant number of articles have been published on inter-organizational knowledge transfer¹⁸³, on governance mechanisms, and on buyer-supplier relationships. The research question of this thesis touches on all of these research areas. Subsequently, the literature has to be reviewed and structured with regard to the special focus of this work, i.e. (1) knowledge transfer literature including governance issues, (2) knowledge transfer literature focusing on buyer-supplier relationships, (3) buyer-supplier literature about governance issues, and (4) governance literature focusing on knowledge transfer in buyer-supplier relationships.

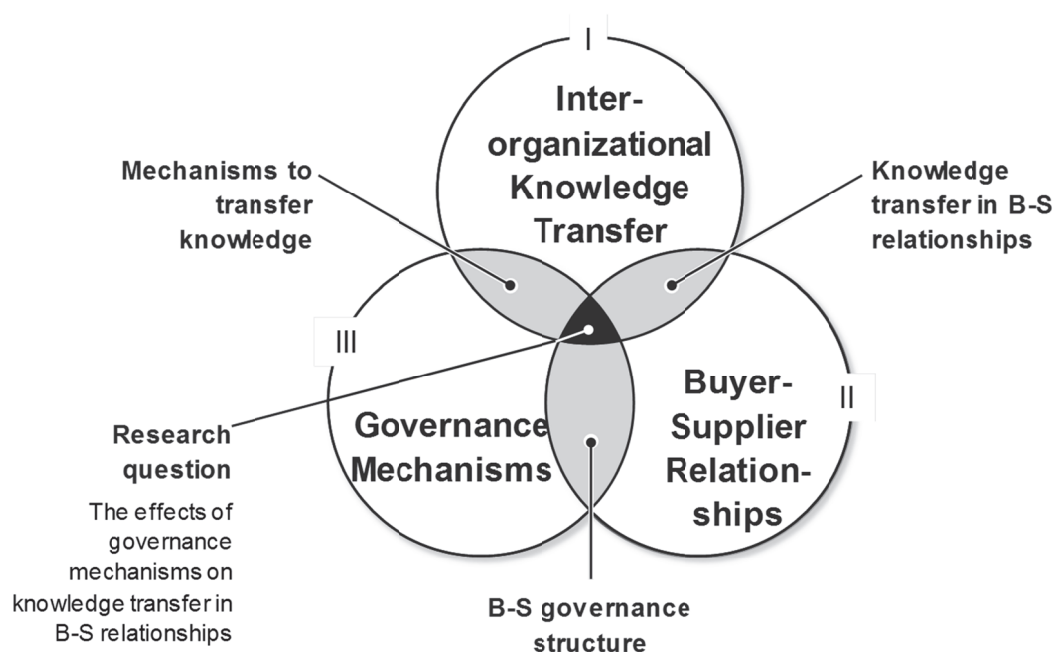


Figure 11: Overview of relevant research fields

Basically, this thesis follows the principles for systematic review suggested by TRANFIELD ET AL. (2003). In order to provide a systematic, transparent and replicable methodology, the review follows seven steps:

¹⁸³ Cf. Meier (2010)

Step 1: First, currently published literature reviews were identified. They serve as fixed points for the basic understanding of the research areas and represent the basic literature stock.

For research on inter-organizational knowledge transfer (I), this thesis builds on the review of MEIER (2010) who investigated knowledge management in strategic alliances and developed an integrative framework to structure the determinants of knowledge management outcomes. His review listed 81 relevant articles on knowledge management. In addition, the references of EASTERBY-SMITH, LYLES AND TSANG` s (2008) special issue on knowledge transfer complete the understanding of the current status of inter-organizational knowledge transfer (I). These articles and frameworks build the basis for the understanding of knowledge transfer in this thesis.¹⁸⁴ FOSS (2010) reviewed 13 top journals on the topic of knowledge sharing with the focus on mechanisms to manage the transfer. He listed 100 relevant articles, which serve as a reference point to the basic understanding of governance of knowledge transfer (1).

Step 2: The literature stock generated in step 1 was analyzed in order to identify relevant keywords for each research area. An initial list of keywords was derived and supplemented through discussions with experienced academics in the field of knowledge management and organizational governance research. This discussion yielded a total of 22 keywords.¹⁸⁵

Step 3: The key words are used to construct search strings that cover the relevant research areas of this thesis (cf. Figure 11). This procedure resulted in a total of 13 search strings as presented by Figure 12.

¹⁸⁴ Meier (2010) focuses on strategic alliances, thus his references do not contain buyer-supplier literature. Interestingly, the literature on interfaces between knowledge and governance is limited to one paper.

¹⁸⁵ Keywords identified are:

knowledge transfer, knowledge sharing, knowledge flow, knowledge acquisition, knowledge, practice, adoption, transfer, transfer process, transfer method, learning, cooperation, inter-organizational, buyer-supplier, consultant, client, inter firm, governance, management practice, mechanism, organizational controls

Searching for special knowledge transfer governance mechanisms and processes (1):

AB (("knowledge*" OR "practice*") and AB (("transfer process*" OR "transfer method")),
 AB (("knowledge transfer*" OR "knowledge sharing*") and AB "management practice*",
 AB (("knowledge transfer*" OR "knowledge sharing*" OR "knowledge flow*") and AB mechanism*.
 AB govern* and AB knowledge and AB ((transfer OR adoption)),
 AB (("knowledge transfer*" OR "knowledge sharing*" OR "knowledge flow*") and AB govern*,

Searching for knowledge transfer within buyer-supplier relationships (2):

AB (("knowledge transfer*" OR "knowledge sharing*") and AB "buyer-supplier*",
 AB (("knowledge transfer*" OR "knowledge sharing*") and AB ((interorgani*ational OR "inter*
 firm*")),
 AB consultant and AB client and AB knowledge

Searching for governance issues with focus on consultant involvement (3)

AB consultant and AB client and AB govern*
 AB consultan* and AB project and AB govern*

Searching for governance issues within the buyer-supplier knowledge transfer literature

AB govern* and AB "buyer-supplier*" and AB ("knowledge*" OR "practice*"),
 AB govern* and AB "buyer-supplier*" and AB learning,
 AB govern* and AB learning and AB ((co-operation OR interorgani*ational)),

Figure 12: Search strings

Step 4: The search area was limited to peer-reviewed journal articles, i.e. leaving out books, book chapters, and conference proceedings. As this thesis aims to contribute to authoritative research in the field of business and management, the review confined its search to high quality journals in the domain of business and management. Following ARMSTRONG AND WILKINSON (2007), the Social Science Citation Index (SSCI, 2009) was used to identify journals for inclusion. Journals listed in the subject categories business and management of the ISIWeb of Knowledge with a 5-year-impact factor above 1.5 were included (for journals established later than 2003, a cut-off value of 1 for the current impact factor was chosen). This selection yielded a list of 100 journals.

With regard to the closeness and frequent confusion of knowledge transfer and learning, the 10 most important journals (based on the 5-year-impact factor) in applied

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psychology, social psychology, and sociology were added as well. After clearing the doubles, the final search area contained 107 journals.

Step 5: The search strings developed in step 3 were used to search for relevant papers in the 107 journals. For this search, EBSCO host “Business Source Premier” and “Psychology and Behavioural Sciences Collection” were the main databases used.¹⁸⁶ Journals not available in these databases¹⁸⁷ were either searched manually or via ScienceDirect. The search was limited to the abstracts of the papers. It retrieved a total of 765 articles. After limiting the articles to the 107 SSCI top journals (cf. step 4), 221 articles remained.

Step 6: The titles and abstracts¹⁸⁸ of the 221 articles were reviewed against exclusion and inclusion criteria (cf. tables below). Due to the exclusion inclusion criteria, 104 and 53 articles respectively were excluded, leaving a total of 64 relevant articles.¹⁸⁹

No.	Criteria	Reason for Exclusion
1	Publication type	Excluding books, book chapters, conference proceedings, dissertation abstracts, editorials, and working papers
2	Organizational form of transfer	Excluding articles with an intra-organizational focus ¹⁹⁰ (e.g. MNC and Joint Venture literature) and a focus on networks
3	Non-commercial knowledge transfers	Excluding articles on cooperation of governmental organizations, of NGOs, or with the participation of universities
4	Transfer asset: Knowledge	Excluding articles on the transfer of assets other than knowledge, i.e. with a focus on technology transfers or logistics. Articles on different assets will be included where interrelations to subsequent knowledge transfer processes are investigated
5	Perspective	Excluding articles with single product or tool analysis or comparison

Table 5: Exclusion criteria

¹⁸⁶ The latest search results included are from July 26th 2014.

¹⁸⁷ Not available on EBSCO were: Technol Forecast Soc, Tourism Manage.

¹⁸⁸ In cases where the title and abstract were not informative enough to include or exclude the article straightaway, articles were downloaded and assessed in detail.

¹⁸⁹ Cf. Pittaway et al. (2004).

¹⁹⁰ According to Easterby-Smith et al. (2008), the process of intra-organizational KNT involves different kinds of boundaries with distinct problems. Thus it should be put together with inter-organizational phenomena.

No.	Criteria	Reason for Inclusion
1	Theoretical papers	These articles provide the basis for summarizing and integrating empirical evidence.
2	Quantitative and qualitative empirical studies	Extant empirical evidence represents the particular interest of this work.
3	Governance structure or mechanisms	Examining how knowledge transfer processes are managed in buyer-supplier relationships
4	Knowledge transfer outcomes	Examining what influences knowledge transfer outcomes in buyer-supplier relationships

Table 6: Inclusion criteria

Step 7: These 64 articles have been analyzed in detail. 18 articles had a special focus on buyer-supplier-specific transfer of knowledge and its governance, thus contributing to the research question of this thesis. 12 of them are quantitative empirical studies, two are exploratory field studies, and four are conceptual papers.

Table 7 summarizes the entire search strategy.

Search strategy actions	No of articles
Application of 17 key words/13 search strings to the EBSCO Business Source Premier and Psychology and Behavioural Sciences Collection database	765
Selecting only articles published in one of the 107 top journals	221
Application of exclusion criteria	117
Application of inclusion criteria	64
Total number of articles with a focus on governance and knowledge transfer in buyer-supplier relationships	18

Table 7: Overview: search strategy results

3.2 Foundations for explaining knowledge transfer

The following chapters derive insights on the governance of different types of knowledge transfer based on the roles of governance and knowledge in the knowledge transfer. The analysis of these roles is consciously based on all 64 papers that discuss governance and knowledge transfer - without any focus on buyer-supplier relationships -, in order not to neglect any potential reasoning to solve the research question.

As introduced in Chapter One, the theoretical argument for the positive role of governance in knowledge transfer is based on TCE¹⁹¹, whereas the argument for the negative role of knowledge types is based on the RBV¹⁹². According to ARGOTE ET AL. (2003) and REAGANS (2003), this multi-theoretical explanation is characteristic for the theoretical research on knowledge transfer. Both summarized that coordinating the transfer of knowledge from the sender to the receiver can be managed through a variety of mechanisms, and that there are a number of explanations for how that transfers occurs. They found that theoretical research draws from different established theories to explain why transfer success differs and why different elements affect the success.¹⁹³ Consequently, there is not yet any consistent theory that explains knowledge transfer which could describe the joint effect of governance and knowledge types.

In order to identify theoretical explanations for how governance should be composed to manage the transfer of different types of knowledge, this chapter analyzes the role of knowledge and governance as defined by the “knowledge transfer framework” (Chapter 3.2.1) and introduces the current theoretical discussion about micro-foundations in knowledge transfer (Chapter 3.2.2). Chapter 3.2.3 assesses the theoretical explanations provided so far.

¹⁹¹ TCE is considered an established theory in organizational research. The important aspects to explain the role of governance based on TCE were already introduced in Chapter two. Therefore, this thesis does not introduce this theory in further detail. The interested reader is recommended to investigate Oliver Williamson’s work on this subject (1975, 1985).

¹⁹² The relevant aspects of the RBV to explain the role of knowledge in KNT were already outlined in Chapter two. Since the RBV is an established organizational theory, this work does not introduce this theory in further detail but recommends Barney (1986) to the interested reader.

¹⁹³ Cf. Argote et al. (2000), Reagans, McEvily (2003).

3.2.1 The knowledge transfer framework for explaining knowledge transfer success

In order to summarize the multiple perspectives and mechanisms in knowledge transfer research, the Journal of Management Studies 2008 published a special issue on inter-organizational knowledge transfer. EASTERBY-SMITH, LYLES AND TSANG (2008) reviewed the papers of this special issue and provided a framework to organize the literature and indicated the most important factors that “explain” the success of knowledge transfer.¹⁹⁴ This framework will be referred to as the “KNT framework” in the following.

The KNT framework defines the central elements and factors that explain inter-organizational knowledge transfer success. It defines the state of the art knowledge for explaining inter-organizational knowledge transfer success used here as a reference point to identify explanations for the interaction of governance and different knowledge types.

The “KNT framework”¹⁹⁵ comprises four elements (Figure 13)

- 1) the resources and capabilities of the donor firm**
- 2) the resources and capabilities of the recipient firm**
- 3) inter-organizational dynamics**
- 4) the nature of knowledge.**¹⁹⁶

The elements “resources and capabilities of the donor firm” and “resources and capabilities of the recipient firms” both refer to organizational characteristics and will thus be discussed together.

¹⁹⁴ Easterby-Smith, Lyles, Tsang (2008).

¹⁹⁵ It mainly builds on Grant (1996) and Argote (2003).

¹⁹⁶ Cf. Easterby-Smith et al. (2008).

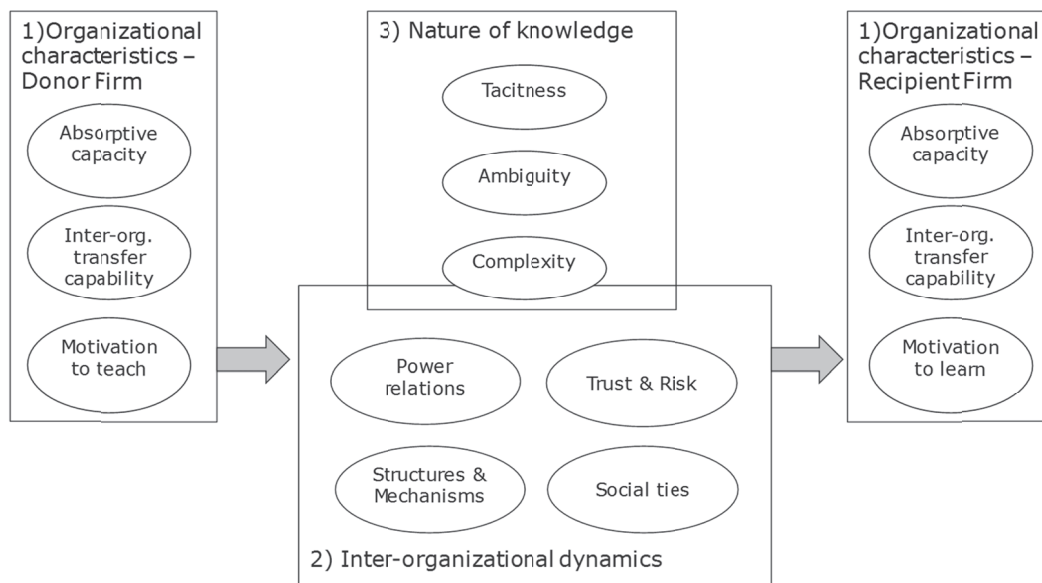


Figure 13: Elements of inter-organizational knowledge transfer and their most relevant factors¹⁹⁷

Within the single sub-chapters, each factor will be introduced and aligned to the concepts and findings of MEIER (2010)¹⁹⁸ and VAN WIJK ET AL. (2008)¹⁹⁹. They analyzed and summarized the empirical effects of single factors within the “KNT framework.” Thus their papers are central to understanding the empirical findings in general knowledge transfer research.

3.2.1.1. Organizational characteristics

The resources and capabilities of the donor firm and recipient firms are the organizational characteristics that set up the framework for the transfer. They are considered to be key drivers of effective knowledge transfer.²⁰⁰

Many organizational characteristics (e.g. age and size of the firm) have been empirically tested on their effect on knowledge transfer success. The tests provided mixed or no stable results.²⁰¹ Consequently, EASTERBY-SMITH ET AL. (2008) did not use those characteristics in their “KNT framework.” They identified three central characteristics

¹⁹⁷ Easterby-Smith et al. (2008), p.679.

¹⁹⁸ Meier (2010) summarized the empirical findings of research on all knowledge transfer elements in the context of strategic alliances.

¹⁹⁹ Van Wijk et al. analyzed via meta-analysis how the factors are differentially related to knowledge transfer between and within organizations.

²⁰⁰ Cf. Argote et al. (2003), p. 573.

²⁰¹ Cf. Easterby-Smith et al. (2008), p.678.

influencing the knowledge transfer in literature: “Absorptive Capacity,” “Intra-organizational transfer capability,” and “Motivation to teach and to learn”.²⁰²

Absorptive capacity²⁰³ is “the ability to recognize the value of new knowledge and to assimilate and use that knowledge.”²⁰⁴ Whenever the organization is faced with new knowledge, this ability will decide on the effectiveness and efficiency of the knowledge transfer.²⁰⁵ Absorptive capacity forms the interface to the intra-organizational perspective on knowledge transfer: Assimilating the new knowledge is the last step in an inter-organizational transfer and the initial step to make use of new knowledge within the organization. Thus absorptive capacity highly affects the extent of the learned knowledge.²⁰⁶

EASTERBY-SMITH ET AL. (2008) looked at knowledge transfer under the condition that it takes place in both directions between donor and recipient firm. Therefore the factor “absorptive capacity” is part of the factor sets of both the recipient as well as the donor firm.

Intra-organizational transfer capability is the ability to diffuse the absorbed knowledge within the organization. This means, an organization that receives new knowledge has to allocate the right knowledge to the right persons within its boundaries.²⁰⁷ This intra-organizational transfer manifests the knowledge in the organization and thus is a driver for the success of knowledge transfer.²⁰⁸

Since VAN WIJK ET AL. (2008) focus on inter-organizational transfer, this factor does not appear in the meta-analysis. It is not empirically proven.

²⁰² Cf. Argote et al. (2003), p. 573.

²⁰³ The construct was originally introduced by Cohen Levinthal (1990). Since then, its crucial role has been documented extensively, e.g. by Lane et al.(2006), Zahara and George (2002), Lane et al (2001), Mowery et al. (1996), Gupta and Govindarajan (2000), and also by the meta-analysis of Van Wijk et al. (2008).

²⁰⁴ Easterby-Smith et al. (2008), p.678.

²⁰⁵ Cf. Van Wijk et al. (2008), p.834.

²⁰⁶ Cf. Gupta and Govindarajan (2000), Szulanski (1996).

²⁰⁷ Cf. Easterby-Smith et al. (2008), p.679.

²⁰⁸ Cf. Easterby-Smith et al. (2008), p.679.

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Motivation to teach represents the active interest of the donor firm to transfer the knowledge. It is a key factor for a knowledge transfer, because it is important for “engaging in the effort and time required to transfer knowledge.”²⁰⁹ On the recipient side, the engagement of the donor firm influences the “extent to which recipients seek out, accept, and utilize external knowledge.”²¹⁰ This is the motivation to learn.

Similar to the motivation to teach, the intent to learn refers to the engagement in the transfer. The enthusiasm for learning determines the extent to which knowledge is transferred.²¹¹

From an empirical perspective, only the relevance of absorptive capacity and motivation to learn prevails. MEIER (2010) confirmed the positive effect of learning intent and absorptive capacity. VAN WIJK ET AL. (2008) proved the effect of absorptive capacity of the receiver empirically as represented by Figure 14.

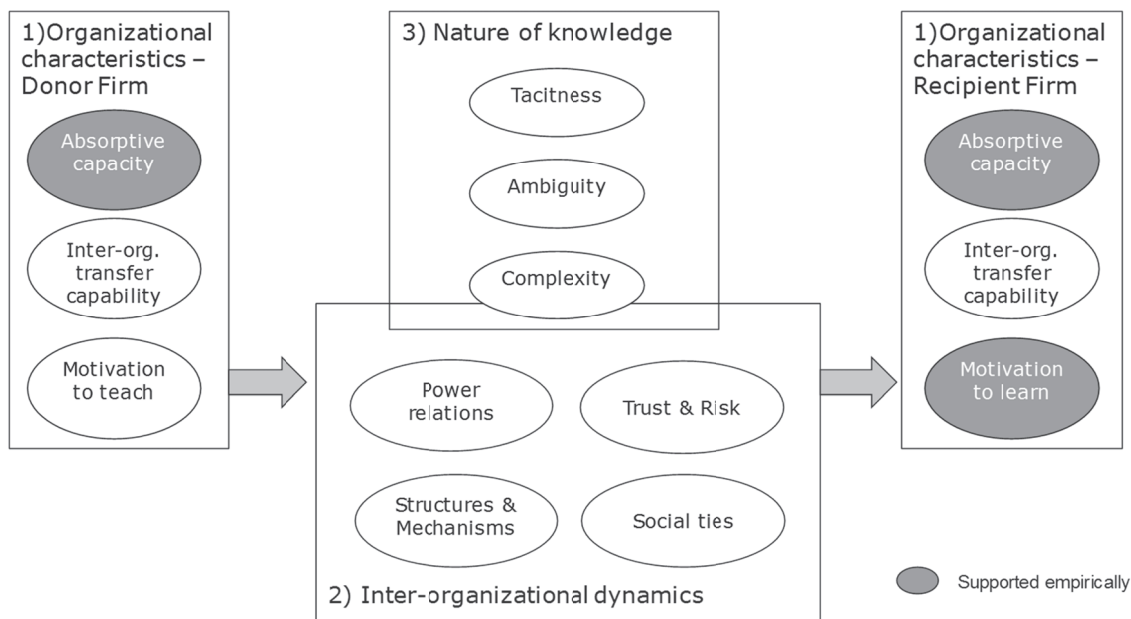


Figure 14: Empirical support for effects of organizational factors²¹²

²⁰⁹ Quigley et al. (2007), p.71.

²¹⁰ Quigley et al. (2007), p.71.

²¹¹ Cf. Hamel (1991).

²¹² Factors marked in green indicate empirical proof of the effect on KNT success for this factor.

In summary, absorptive capacity and motivation to learn explain why knowledge transfer is successful. However, the interaction of these organizational characteristics with governance or knowledge types has not yet become a part of the research discussion. Thus insights for the research question of this thesis cannot be derived from the analysis of this first element of the KNT framework.

3.2.1.2. Nature of knowledge

The element “nature of knowledge” refers to the type of knowledge as described in Chapter 2.1. The type of knowledge is defined by the three characteristics tacitness, complexity, and specificity.²¹³ In contrast to this, the KNT framework uses the three factors tacitness, ambiguity, and complexity.

Tacitness and complexity have already been discussed in Chapter 2.1. Their negative effects on knowledge transfer have been proven empirically.²¹⁴

Ambiguity is defined as the “inherent and irreducible uncertainty as to precisely [define] what knowledge components and sources are and how they interact.”²¹⁵ Ambiguity is the reason why tacitness, complexity, and specificity inhibit knowledge transfer.²¹⁶

It might replace specificity in the framework because the effects of ambiguity have been proven consistently²¹⁷ whereas the effects of specificity are not stable.²¹⁸ For example, SIMONIN (1999a) found that specificity has no significant effect on the success of knowledge transfer at all.

Ambiguity is not only a mediator for the effects of knowledge characteristics but also for the effects of prior experience, cultural distance, and organizational distance.²¹⁹ Therefore it is a major explanation mechanism for several factors of the KNT framework.

²¹³ Cf. e.g. Reed, Defilippi (1990); Zander, Kogut (1995); Simonin (1999); MCEvily, Chakravarthy (2002).

²¹⁴ Tacitness: Probst et al. (1998), Esterby-Smith et al. (2008), Simonin (1999a), and Zander/Kogut (1995), complexity: Simonin (1999a,b).

²¹⁵ Van Wijk et al. (2008), p. 833.

²¹⁶ Cf. Simonin (1999b).

²¹⁷ Cf. Simonin (1999a,b), Meier (2010).

²¹⁸ Cf. Meier (2010), p.7.

²¹⁹ Cf. Simonin (1999b).

MEIER (2010) assessed the research on the effects of knowledge characteristics to be “preoccupied with tacitness”²²⁰ and “the way in which the complexity and specificity of knowledge directly affects knowledge management processes has remained relatively unclear.”²²¹ He reasoned the focus on tacitness by the “difficulty in constructing appropriate instruments of measurement for knowledge characteristics”²²² and asks for “a more precise survey of single knowledge assets as confined entities of knowledge”²²³ in future research.

No matter if ambiguity or single characteristics of knowledge are discussed, the authors contributing to the KNT framework do not theorize that the nature of knowledge interacts with the organizational characteristics or the inter-organizational dynamics. Instead they limit the general ability to transfer the knowledge, i.e. they describe and define the individual difficulties and challenges of a transfer based on the non-imitability arguments of RBV and KBV as already explained in Chapter 2.

In summary, the KNT framework defines a direct effect of the factors involved in the nature of knowledge on knowledge transfer success, an effect which is reasoned by ambiguity and thus grounded in the RBV and KBV. Since ambiguity also explains the effects of some organizational characteristics, it defines a joint level of explanations with nature of knowledge. Thus the first insight is that ambiguity serves as a multiple theoretical explanandum in knowledge transfer.

3.2.1.3. Inter-organizational dynamics

Inter-organizational dynamics contain factors that describe connections and relationships between the donor and the recipient firm.²²⁴ Factors are e.g. power relationships or social ties.

VAN WIJK ET AL. (2008) defined three separate dimensions within the inter-organizational dynamics: the **structural dimension**, the **relational dimension**, and the

²²⁰ Meier (2010), p.7 with reference to Dyer and Nobeoka 2000; Grant 1996a,b; Thuc Anh *et al.*2006.

²²¹ Meier (2010), p.7.

²²² Meier (2010), p.7.

²²³ Meier (2010), p.7.

²²⁴ Cf. Argote et al. (2003), p. 573.

cognitive dimension of the social context. On the other hand EASTERBY-SMITH ET AL. (2008) defined four central factors within the inter-organizational dynamics: power relations, trust and risk, structures and mechanisms, and social ties. Comparing the dimensions of VAN WIJK ET AL (2008) to the factors of EASTERBY-SMITH ET AL. (2008), they can be matched as presented by Figure 15:

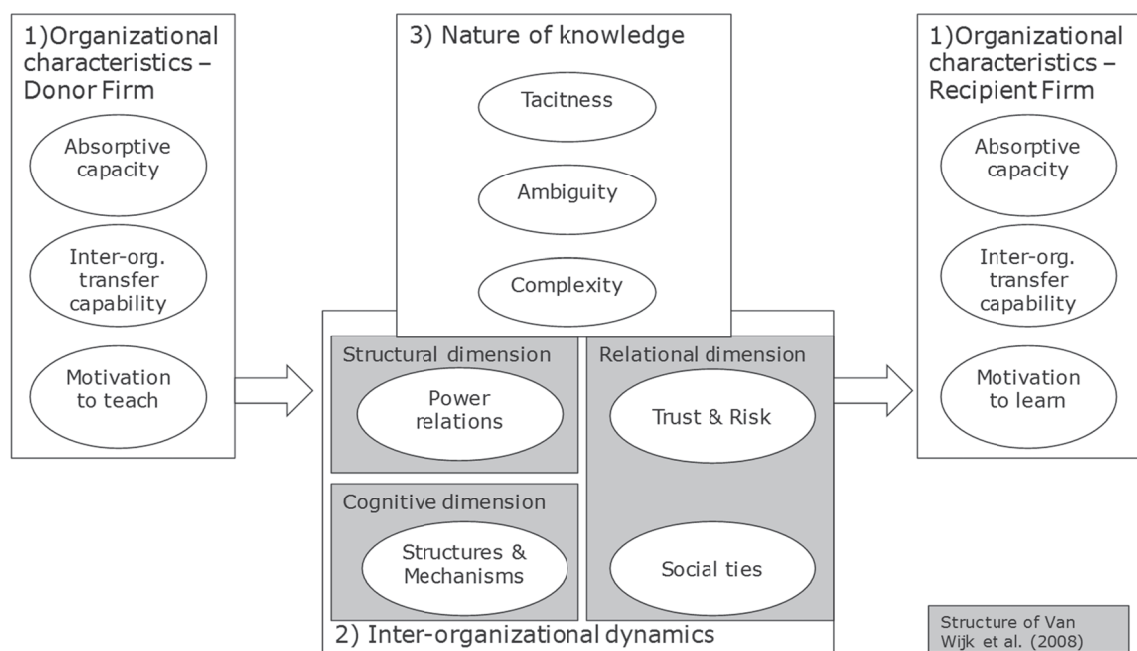


Figure 15: Matching the perspectives on inter-organizational dynamics of KNT framework and Van Wijk et al (2008).

VAN WIJK ET AL.'s (2008) **structural dimension** summarizes factors describing the “pattern and configuration of relationships and linkages among firms”²²⁵. They proved that the factors “number of relations” and “centralized position within the overall pattern of relationships”²²⁶ have positive effects on knowledge transfer. “While the number of relations increases access to external knowledge, a centralized position within an overall pattern of relationships determines whether such knowledge can be used beneficially.”^{227, 228}

²²⁵ Van Wijk et al. (2008), p. 834.

²²⁶ The overall pattern of relationships refers to a network of organizations.

²²⁷ Van Wijk et al. (2008), p. 834.

²²⁸ “An actor that occupies a central position creates a brokerage position, enabling it to locate relevant information or knowledge and exchange it within the social network (Burt, 1992). Therefore, centrally

EASTERY-SMITH ET AL. (2008) argued that in a dyadic transfer, “the donor and the recipient are often in a situation of power asymmetry, with the former being in a more superior position. The pace of knowledge acquisition by the recipient is a key factor affecting its bargaining power relative to the donor, as learning shifts the dependency relation.” With this shift the basis for cooperation and thus for any type of transfer may deteriorate.

Whereas EASTERBY-SMITH ET AL. (2008) focus on the properties of a single relationship between two organizations²²⁹, VAN WIJK ET AL. (2008) concentrate on the properties of a set of relationships in a network of organizations. Still, both describe properties of an organization’s relationship and position to other firms that affect learning and knowledge transfer.

In summary, arguing via RBV or organizational learning theory, structural factors of the relationship are not discussed in dependence on other elements of the KNT framework but to affect the success of knowledge transfer directly. There cannot be identified theoretical explanations that would help to reason within the research question.

“The **relational dimension** refers to the nature of the relationship themselves and the assets that are rooted in them.”²³⁰ VAN WIJK ET AL. (2008) analyzed two factors within their description of the relational dimension: “Trust & Risk” and “Social Ties.” EASTERBY-SMITH ET AL. (2008) used exactly the same factors in the KNT framework. Thus the relation dimension is covered completely by the KNT framework’s element of inter-organization dynamics.

The first factor contains two interconnected factors: risk and trust.

The potential “erosion of competitive advantage” through *unintended knowledge transfer and the loss of valuable knowledge* during the transfer is perceived as a risk by

located units or firms may access other actors easily, as well as acquire or share more diverse knowledge (e.g. Tsai, 2001).” (Van Wijk et al. (2008), p. 834)

²²⁹ Dyadic research on knowledge management

²³⁰ Van Wijk et al. (2008), p. 834; Cf. Tsai; Goshal (1998).

the donor.²³¹ On the contrary, the recipient perceives the risk of acquiring *inadequate knowledge* that is “not useful or not of high quality.”²³²

Consequently the value and the usefulness of knowledge are addressed in these descriptions. This defines the argument why risk is important to explain the success of knowledge transfer as RBV-based.

Unintended knowledge transfer or inadequate knowledge is very difficult to control or to manage. This lack of manageability reflects the important role trust plays within the inter-organizational dynamics in knowledge transfer.²³³

In knowledge transfer, trust is defined as the perceived “credibility of the sources”²³⁴, i.e. donor firm and recipient firm. Trust in the credibility of the knowledge source “creates a sense of security.”²³⁵ This sense of security facilitates knowledge transfer by countering the risks of gaining inadequate knowledge or losing a competitive advantage.²³⁶ A credible source would neither use unintentionally transferred knowledge to damage the competitive position of the partner nor would a credible source transfer inadequate knowledge intentionally. LI AND LI (2005) confirmed that the effect of trust on knowledge transfer is more prominent in inter-organizational relationships than in intra-organizational relationships. In other words, the factors risk and trust are theorized to interact in such a way that trust limits the risk of transferring non-valuable knowledge.

Social ties are personal relationships between the two organizations or single members of the organizations.²³⁷ This factor is a major “conduit for knowledge flow.”²³⁸ People can assess the credibility of one another more easily if they have personal ties to each other.²³⁹ Thus social ties are directly related to the factor trust. They can help to

²³¹ Norman (2002).

²³² Easterby-Smith et al. (2008), p.680.

²³³ Cf. Easterby-Smith et al. (2008), p.680; Van Wijk et al. (2008), p. 845.

²³⁴ Ko et al (2005), Easterby-Smith et al. (2008).

²³⁵ Cf. Easterby-Smith et al. (2008), p.680.

²³⁶ Cf. Inkpen, Pien (2006), p. 783.

²³⁷ Cf. Reagans, McEvily (2003); Easterby-Smith et al. (2008).

²³⁸ Easterby-Smith et al. (2008), p.680.

²³⁹ Easterby-Smith et al. (2008), p.680.

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overcome any kind of differences, e.g. cultural, geographical, national, corporate, that may exist between the two knowledge-sharing organizations.²⁴⁰

Therefore, social ties strengthen trust, limiting the risk of transferring non-valuable knowledge.

In summary, the analysis of the relational dimension provides an insight into the reasoning for using relational governance mechanisms in the knowledge transfer:

Trust is a factor that is cross-linked strongly with the factors social ties and risks of the knowledge transfer. Since relational governance mechanisms are based on trust, the power of trust to counter the risks of gaining inadequate knowledge or losing a competitive advantage can be a potential explanation for the suitability of relational mechanisms in the further discussion of this thesis.

The **cognitive dimension** of VAN WIJK ET AL. (2008) “refers to the resources within the relationships that provide shared representations, interpretations, and systems of meaning and is embodied in attributes like shared vision, collective goals, and proper way of acting in social systems.”²⁴¹ In EASTERBY-SMITH ET AL. (2008), no matching examples to these attributes can be found. However, within their factor “**Structure & Mechanisms**”, they summarize factors established within the context in which the knowledge transfer takes place.²⁴² The structure of the inter-organizational relationship refers to the organizational form surrounding the knowledge transfer.²⁴³ The mechanisms are the transfer mechanisms established within that organizational form, such as contracts, rules of operating, or equity agreements.²⁴⁴ These mechanisms “affect how organizations interact.”²⁴⁵ Thus they affect the aforementioned attributes “proper way of acting” or “shared vision” by VAN WIJK ET AL. (2008).

The two papers defined their factors on different levels of the cognitive dimension: EASTERBY-SMITH ET AL. (2008) on the underlying and influencing structure level

²⁴⁰ Cf. Easterby-Smith et al. (2008); Hansen, Lovas (2004); Bell, Zaheer (2007).

²⁴¹ Van Wijk et al. (2008), p. 835; Cf. Nahapiet, Ghoshal (1998).

²⁴² Easterby-Smith et al. (2008), p. 680.

²⁴³ Cf. Easterby-Smith et al. (2008), p. 680.

²⁴⁴ Cf. Easterby-Smith et al. (2008), p. 680.

²⁴⁵ Easterby-Smith et al. (2008), p. 680.

and VAN WIJK ET AL. (2008) on the level of the resulting effects and consequences. Still they agree upon the importance of this dimension for the success of knowledge transfer.

Structures & mechanisms interact with the other determinants of the KNT framework.²⁴⁶ This interaction is especially stressed for the nature of knowledge. The graphical design of the framework even shows an interface of the two elements. However, how the effects of structures & mechanisms unfold within the framework or may interact with the nature of knowledge is not explained.

The empirical support of all factors that are part of the element inter-organizational dynamics is presented in Figure 16.

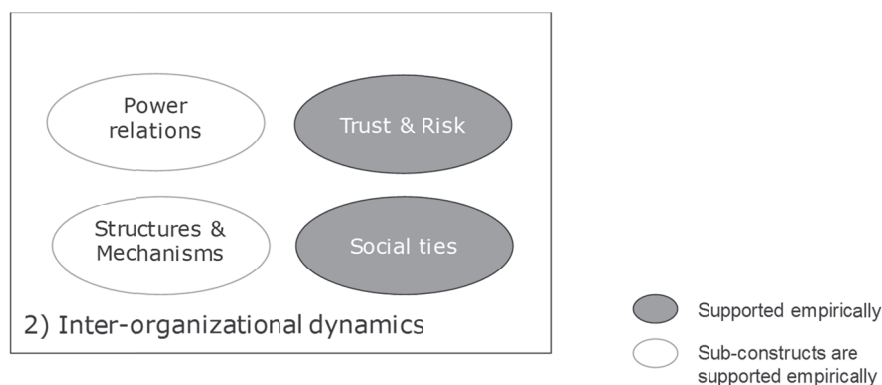


Figure 16: Empirical support for effects of inter-organizational dynamic factor²⁴⁷

In summary, MEIER (2010) and VAN WIJK ET AL. (2008) only proved the effects of social ties and trust empirically. The factors “Structures & Mechanisms” and “Power Relations” are factor sets and contain several sub-factors.²⁴⁸ Therefore the factors could not be empirically proved directly. Only the sub-constructs were tested. For example, VAN WIJK ET AL. (2008) found meta-analytic evidence for positive effects on knowledge transfer of “similar visions and systems,” which can be considered a sub-factor of “structures & mechanisms.”

²⁴⁶ Easterby-Smith et al. (2008), Van Wijk et al. (2008).

²⁴⁷ Factors marked in green indicate empirical proof of the effect on KNT success for this factor.

²⁴⁸ Easterby-Smith et al. (2008) give examples for “Structures & Mechanisms” sub-factors but do not place any in the framework.

MEIER (2010) provided examples of concrete mechanisms²⁴⁹ to facilitate knowledge transfer and their empirically analyzed effects, but found no meta-analytic evidence for any of them.

In conclusion, the description of structures & mechanisms by EASTERBY-SMITH ET AL. (2008) matches the definition of governance of transactions that is the coordination and control of a transaction as described in Chapter 1. Therefore the reasoning presented above is also true for governance: The effect of governance and the interaction with the nature of knowledge is not explained within the KNT framework. A single governance type or mechanism is not part of the KNT framework.

3.2.1.4. Theoretical insights from the KNT framework to explain the governance of knowledge transfer

The reference point literature agrees that every knowledge transfer involves a similar, general set of transfer elements, defined by organizational characteristics, inter-organizational dynamics, and knowledge characteristics. Those characteristics affect the unfolding of a transfer²⁵⁰. Dominant theories to explain the single effects of these characteristics have been RBV (KBV), TCE, organizational learning theory, and the relational view.

The analysis of the theoretical and empirical effects of the factors in the KNT framework revealed the following insights in light of the research question:

- None of the factors of organizational characteristics interacts with governance or knowledge types. Thus theoretical explanations for the research question of this thesis cannot be derived from the analysis of this first element of the KNT framework.
- The knowledge characteristics in the focus of this thesis are summarized by the element “nature of knowledge.” They are theorized to limit the success of knowledge transfer because of ambiguity or behavioral uncertainty as explained

²⁴⁹ He named his set of factors that reflect structure and mechanisms “active knowledge management.”

²⁵⁰ Cf. Szulanski (1996), pp. 30–32; Szulanski (2003), pp. 25–31.

in Chapter 2. Thus no new insights for the interaction of knowledge and governance could be identified in the discussion of this element.

- The structural dimension of the inter-organizational dynamics element is not discussed dependent on other elements of the KNT framework but insofar as it directly and positively affects the success of knowledge transfer. Thus theoretical explanations for the research question of this thesis cannot be derived from the analysis of this dimension of the KNT framework.
- The analysis of the relational dimension provides an insight into the potential reasoning for using relational governance mechanisms in the knowledge transfer: Social ties, trust, and risk are interconnected factors of the framework. Since relational governance mechanisms are based on trust, they are connected to this chain. Thus the power of trust to counter the risks of gaining inadequate knowledge or losing a competitive advantage can be a potential explanation for the suitability of relational mechanisms in the further discussion of this thesis.
- The analysis of the cognitive dimension revealed that EASTERBY-SMITH ET AL. (2008) defined governance as an element of the knowledge transfer framework within the element of inter-organizational dynamics. Governance is included in the factor “Structures & Mechanisms” of the inter-organizational dynamics and is theorized to interact with the element of nature of knowledge.
- Single governance mechanisms are not explained by the framework.
- A general theoretical explanation why and how governance interacts with the element or single factors of nature of knowledge is not noted by the KNT framework. In fact, a research gap was identified for the integrative role of governance in the KNT framework.²⁵¹

²⁵¹ Cf. Foss et al. (2009, 2010), Meier (2010).

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There are some authors who address the interaction of governance and knowledge but the insights might have been too rare to be displayed in the KNT framework or to achieve meta-analytic evidence for the effects. Since these authors worked on a major part of the research question, their findings are outlined in the following.

STOCK & TATIKONDA (2000) argue based on information processing theory. Technology uncertainty caused by different characteristics of knowledge and organizational interaction are key factors which influence transfer effectiveness. When the characteristics of knowledge²⁵² cause higher uncertainty, the project organization needs higher levels of cooperation, communication, and coordination²⁵³ to manage the project efficiently^{254, 255}. Cooperation and communication are relational governance mechanisms whereas coordination can address relational or formal governance. In conclusion, STOCK & TATIKONDA (2000) recognize the interaction of the nature of knowledge and governance types.

TURNER AND MAKHIJA (2006) argue from the knowledge-based view that governance creates different transfer processes and that these processes more or less fit different types of knowledge. They theorize that relational mechanisms²⁵⁶ are more important to govern process knowledge whereas formal governance²⁵⁷ is more important to govern outcome knowledge.

HOETKER AND MELLEWIGT (2009) theorize based on TCE that formal governance cannot manage knowledge-intensive goods. They argue that knowledge is always tacit and for that reason cannot be specified in advance. Consequently, formal mechanisms cannot specify what to monitor. Relational mechanisms in contrast do not need the

²⁵² They discuss the novelty, complexity, or tacitness of technology.

²⁵³ Communication includes the methods of communication, magnitude and frequency of communication, and nature of information exchanged. Coordination refers to the nature of the planned structure and process of interactions and decision-making between source and recipient (Parkhe, 1991). Cooperation is the willingness of a partner to pursue mutually compatible interests rather than to act opportunistically (Das and Teng, 1998, p. 492).

²⁵⁴ Efficiency in this paper means in time, budget and quality.

²⁵⁵ Stock & Tatikonda (2000).

²⁵⁶ They called this “process controls.”

²⁵⁷ They called this “outcome control.”

specification ability and therefore still unfold their power to manage knowledge-intensive goods.²⁵⁸

The three papers explain the interaction of governance and knowledge very differently since they use explanations based on information processing theory, TCE as well as KBV. Still, the chronological reflection shows where this stream of research is heading: The earliest paper recognizes the interaction of the nature of knowledge and the governance dimension but did not untangle the fit between the different types of knowledge and governance types²⁵⁹ This was started by the second paper by differentiating governance for different types of organizational knowledge, yet all characteristics of knowledge were confused with each other in the description of process versus outcome knowledge. The latest paper addressed this limitation and focused on one characteristic and the fit of governance.

In conclusion, research heads for a more detailed understanding of the governance knowledge fit, but it has not reached the discussion of different types of knowledge yet.

In Figure 17, all empirical effects of the factors within the framework introduced by Easterby-Smith et al. (2008) are summed up. Empirically proven effects are indicated by the spaces filled.

The investigation of the empirically proven relationships between factors of knowledge transfer and different performance or outcome factors of knowledge transfer have been performed by MEIER (2010) and VAN WIJK ET AL. (2008).

MEIER (2010) found empirical evidence for the effects of tacitness, learning intent, absorptive capacity, and trust. VAN WIJK ET AL. (2008) found meta-analytic evidence for the effects of ambiguity, absorptive capacity, centralized network position and number of relations (power relation), tie strength (social ties), trust, similar visions and systems (structures & mechanisms). The theorized positive effect of decentralization (motivation to teach) turned out to be negative for inter-organizational transfer.

²⁵⁸ Cf. Hoetker /Mellewigt (2009).

²⁵⁹ E.g. does uncertainty caused by complexity need higher cooperation, communication, or coordination, or is each type equally important?

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The meta-analyses support the theoretical finding that the factor set of structures & mechanisms is not yet well explored in knowledge transfer research.²⁶⁰

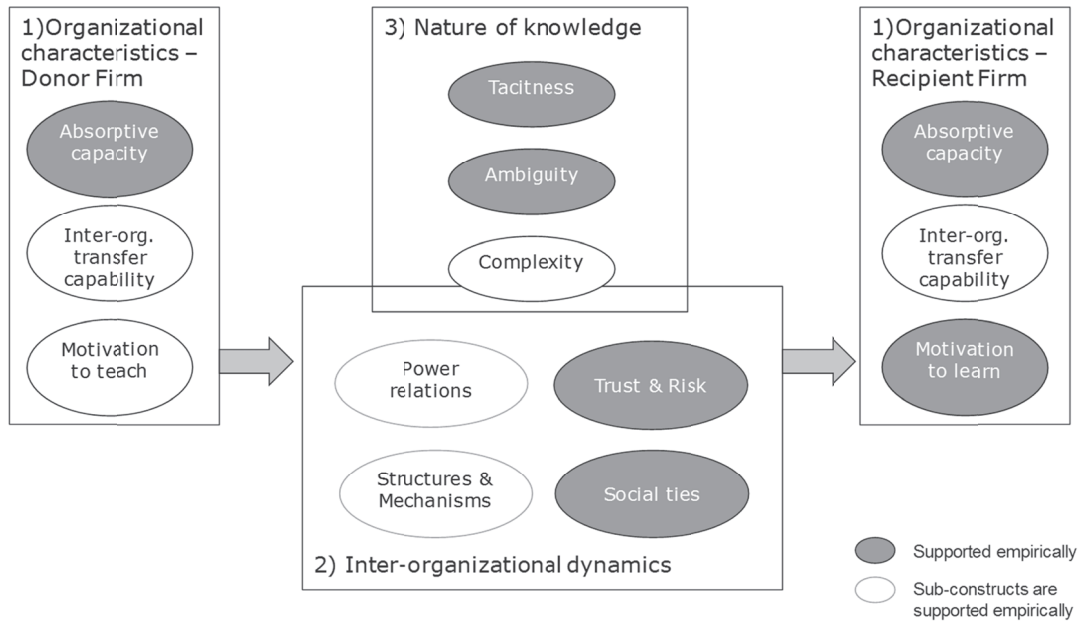


Figure 17: Empirical effects of the factors influencing knowledge transfer²⁶¹

In summary, the established research on knowledge transfer²⁶² does not provide any concrete advice for the appropriate governance of the different characteristics of knowledge. Quite the contrary, this is considered a research gap.²⁶³

²⁶⁰ Cf. Foss et al. (2009, 2010); Meier (2010).

²⁶¹ The figure must not be understood as an incorporated model that has been investigated in its whole, but as a collection of single effects that have been proved within different models of knowledge transfer.

²⁶² As summarized by Easterby-Smith et al. (2008), Van Wijk et al. (2008) and Meier (2010).

²⁶³ Cf. Meier (2010).

3.2.2 The theoretical mechanisms of knowledge transfer success – causal effects

The central factors of the KNT framework explain the success of knowledge transfer on a macro level. Macro level means an organization-based explanation of the success of knowledge transfer in contrast to one based on individuals: The factors of the KNT framework “relate to the way theory conceives the firm as an organization rather than being viewed as a vehicle for processing information (i.e. the standard neoclassical view of the firm as an agent that simply reacts to information signals that it receives from the outside).”²⁶⁴ In other words, all the factors are characteristics on the firm level.

In line with the finding of a rather limited contribution of the KNT framework to the question of governance of knowledge, there is a growing research stream asking whether knowledge transfer can be explained on such a “macro level” in the first place. This stream calls for micro level factors to explain the success of knowledge transfer.²⁶⁵ The micro level factors are located on the individual level²⁶⁶ of people instead of firms.²⁶⁷ Micro level factors are mechanisms that affect the individuals in the transfer rather than the organizational context.

The micro level research²⁶⁸ argues that “firms must be conceived as a collection of resources and capabilities and considered as organizations that can learn, share, diffuse, and create knowledge through interaction”²⁶⁹ to explain the success of knowledge transfer.

Advocates of the micro level perspective are social science-oriented researchers such as for example Grant (1996), Osterloh & Frey (2000), Felin & Foss (2005), Felin & Hesterly (2007), Felin et al. (2009), and Argote et al. (2003). They argue for micro level

²⁶⁴ Caloghirou et al. (2004), p. 30.

²⁶⁵ Cf. Foss et al. (2009, 2010).

²⁶⁶ In contrast to the corporate level, which reflect the macro level.

²⁶⁷ Janowicz-Panjaitan, Noorderhaven (2009), p. 1030.

²⁶⁸ E.g. Foss et al. (2009, 2010), Felin & Foss (2005), Felin & Hesterly (2007), Felin et al. (2009), and Argote et al. (2003).

²⁶⁹ Caloghirou et al. (2004), p. 30.

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factors based on the COLEMAN model of social science explanation as presented in Figure 18.²⁷⁰

According to this model, the relationship between *social facts* and *social outcomes* cannot be explained exclusively on a macro level (arrow 4) but needs to be connected to *conditions* and *actions of individuals* (arrows 1, 2, 3).²⁷¹

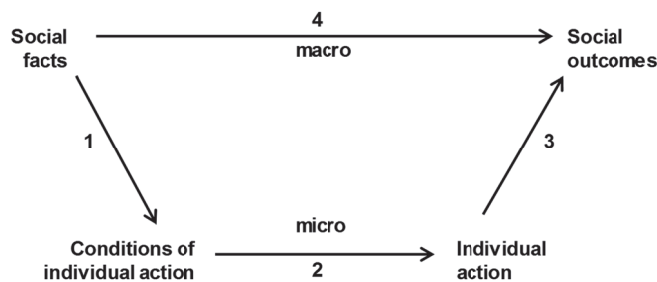


Figure 18: General model of social science explanation²⁷²

In other words, organizations are not able to act but their individual representatives are.²⁷³ Thus *social outcomes* like a change in the knowledge base of an organization cannot be explained directly by social facts such as e.g. the choice of governance or the knowledge type that is in place (arrow 4). Moreover, one has to explain the effect of social facts on the conditions of actions of individuals (arrow 1) and their resulting individual action, respectively (arrow 2).

In summary, individual level factors need to be understood and specified in order to explain any collective phenomenon²⁷⁴, because individuals carry out the tasks of the collaboration.²⁷⁵

The COLEMAN model defines that “macro links are always mediated by micro links and macro explanation is therefore inherently shorthand for a more complicated, multi level explanation.”²⁷⁶ Thus for understanding knowledge transfer as a whole it is crucial

²⁷⁰ For the general model of social science cf. Coleman (1990) and for the application to the knowledge management context cf. Foss (2007), p.35.

²⁷¹ Cf. Coleman (1990), p.13 ff.

²⁷² Coleman (1990).

²⁷³ Cf. Foss et al. (2010), Coleman (1990).

²⁷⁴ Cf. Felin & Hesterly (2007); Felin et al. 2009, Minbeva et al. (2012).

²⁷⁵ Cf. Hamel (1991); Janowicz-Panjaitan, Noorderhaven (2009).

²⁷⁶ Foss et al. (2010), p. 459.

to understand the micro factors of knowledge transfer, e.g. individual attitudes, intentions, and goals.²⁷⁷

This means for example “if HRM activities have an impact on organizational level outcomes, they will only do so provided that employee perceptions and behavior are affected.”²⁷⁸

The central factors of the KNT framework can only predict the performance of knowledge transfer but do not explain where this performance comes from.²⁷⁹ This is explained by the causal mechanisms on the micro level. Accordingly, they are crucial to understanding how knowledge transfer is influenced.²⁸⁰ Causal mechanisms provide a joint explanation for the effects of factors on the macro level of knowledge transfer. This joint explanation is very valuable here, because it is needed to explain the interaction of governance and knowledge.

In research, a number of causal mechanisms which potentially explain knowledge transfer are discussed.²⁸¹

According to ARGOTE ET AL. (2003), an individual’s motivation, ability, and opportunity are such causal mechanisms to explain the transfer of knowledge.²⁸² They are the reason for a specific outcome of the knowledge transfer whereas all characteristics of the KNT framework are variables explaining what affects the outcome.²⁸³ ARGOTE ET AL. (2003) argue that “just as successful individual performance depends on an individual’s ability, motivation, and opportunities to perform successful knowledge management also depends on ability, motivation, and opportunity.”²⁸⁴ Reflecting the elements of the KNT framework, they theorize that all

²⁷⁷ Cf. Foss et al. (2010), p. 459; Minbeva et al (2012), p. 388.

²⁷⁸ Minbeva et al. (2012), p. 389.

²⁷⁹ Cf. Foss (2007, 2010).

²⁸⁰ Cf. Minbeva et al (2009, 2012).

²⁸¹ Cf. Felin & Foss (2005), Felin & Hesterly (2007), Felin et al. (2009), and Argote et al (2003)

²⁸² Cf. Argote et al. (2003) ; Chang et al (2012), Gruen et al (2007), Minbaeva et al (2012).

²⁸³ Cf. Argote et al. (2003), p. 575; Meier (2010), p.3.

²⁸⁴ Argote et al. (2003), p.575.

elements “could operate through more than one causal mechanism.”²⁸⁵ “For example, social relationships provide individuals with the opportunity to create, retain, and transfer knowledge. Social relationships also provide individuals with the incentives to participate in the process.”²⁸⁶

A different suggestion for causal mechanisms on the micro level is provided by FOSS ET AL. (2007, 2009, 2010). Based on an extensive literature review, they provide many examples of causal mechanisms like e.g. individual attitudes, intentions, goals, motivations, and behaviors.²⁸⁷ Finally, they developed two main causal mechanisms: individual motivation and cognition.²⁸⁸ Whereas motivation can be aligned to the mechanism also defined by ARGOTE ET AL. (2003), cognition refers to the individual perception of organizational factors. Thus FOSS ET AL. (2010) also take into account the heterogeneity of the people themselves.

FOSS developed the so-called “KGA” (knowledge governance approach)²⁸⁹ as a response to the “methodological collectivism” that dominates knowledge-based research. This way, he adapted the social science model to the knowledge context²⁹⁰. The KGA defines the “conditions of knowledge sharing behavior” as causal for the success of knowledge transfer. Accordingly, governance mechanisms have rather an indirect than a direct impact on knowledge transfer.²⁹¹

ARGOTE ET AL (2003) and FOSS (2007, 2010) developed causal mechanisms that are applicable to the explanation of all elements of the knowledge transfer. NONAKA (1994) defined mechanisms for the transfer of tacit knowledge exclusively: To manage tacit knowledge, NONAKA (1994) developed the “theory of knowledge creation.” This

²⁸⁵ Argote et al. (2003), p.575.

²⁸⁶ Argote et al. (2003), p.575.

²⁸⁷ Cf. Foss et al. (2010), p. 459.

²⁸⁸ Cf. Foss et al. (2010), p. 459.

²⁸⁹ Participating researchers have also been Grandori (2001) and Peltokorpi & Tsuyuki (2006).

²⁹⁰ Cf. Foss (2007); Gooderham et al. (2011), Minbeva et al. (2012).

²⁹¹ Cf. Foss (2007), p. 29 ff.; Foss et al. (2009), p. 455 ff.

theory describes the creation of new organizational knowledge based on the ongoing transformation of knowledge from an explicit to implicit status.²⁹²

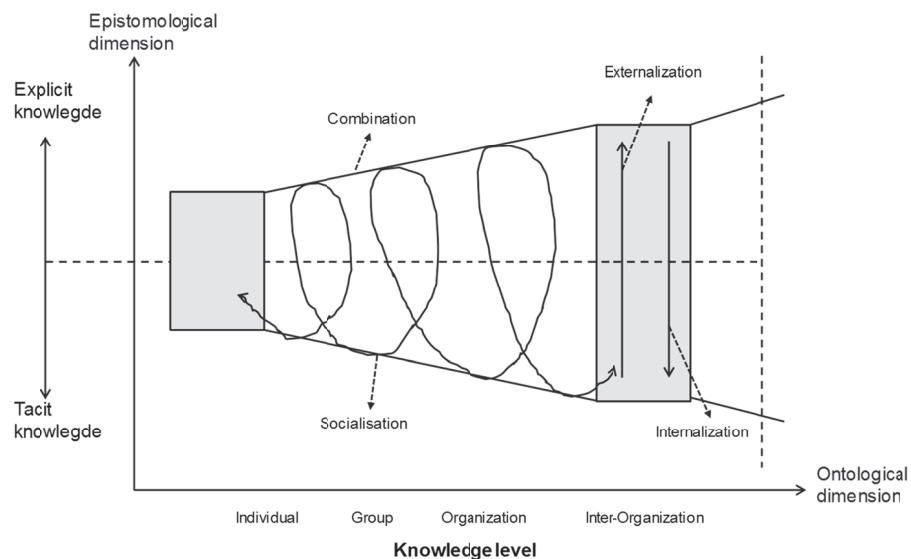


Figure 19: Knowledge creation spiral²⁹³

Within the transformation process, knowledge changes its epistemological and ontological²⁹⁴ status: It is either tacit or explicit (cf. y-axis of Figure 19) and resides either on the individual level or on the organizational (cf. x-axis of Figure 19).²⁹⁵ Explicit knowledge is transferred because people combine it with their own knowledge. Tacit knowledge can only be transferred within groups by socializing with people. Afterwards it needs to be externalized into an explicit form to be finally internalized from other organizations. Thus the causal mechanisms in this theory are: socialization, combination, internalization, and externalization (cf. Figure 19).

When comparing the theoretical work of ARGOTE ET AL. (2003), FOSS (2007, 2010), and the KNT framework of EASTERBY-SMITH ET AL. (2008), motivation can be identified as the mechanism that appears in all theoretical considerations. Even in the KNT framework, motivation has a prominent place in the element of “organizational characteristics.” ARGOTE ET AL (2003) and FOSS (2007, 2010) developed causal

²⁹² Cf. Nonaka (1994), p. 20.

²⁹³ Nonaka (1994), p. 20.

²⁹⁴ Ontological means the existence of the knowledge.

²⁹⁵ Cf. Nonaka (1994); Nonaka/von Krogh (2009).

mechanisms that are applicable to the explanation of all elements of the knowledge transfer. For the governance of knowledge, this implies that the individual mechanisms and especially motivation shall also explain how governance and knowledge types separately and simultaneously affect the success of knowledge transfer.

The mechanisms defined by NONAKA make this theory valuable for the description of the transfer of tacit knowledge although it describes the creation of knowledge rather than the transfer. The theory gives advice on how tacit knowledge needs to be handled. Additionally, it describes knowledge transfer on the individual and organizational level, thus adding the individual level perspective to the process of knowledge transfer. For the governance of tacit knowledge, this implies that it is only effective if it coordinates and controls the socialization and combination of the individual level as well as the internalization and externalization on the organizational level.

3.2.3 Assessment of the theory on knowledge transfer

This thesis aims to provide managerial advice on how to govern a knowledge transfer process for different types of knowledge. This chapter discussed the current research into the role of governance and knowledge in knowledge transfer and the theoretical arguments that are used to explain their effects.

Combining the understanding of the classical role of governance with the challenges of the multi-dimensional process of knowledge transfer and the inter-dependent context of governance as defined by the general framework of knowledge transfer, we can summarize as follows:

Governance mechanisms that are applied to knowledge transfer cannot be considered to result in direct performance outcomes of knowledge transfer solely, because they are part of an inter-dependent framework of other factors of the knowledge transfer. One major factor is the nature of knowledge. Thus to coordinate and control the success of knowledge transfer, a major task of governance is managing the effects of knowledge types on knowledge transfer.

Research for the governance of tacitness recommends using relational governance to govern this knowledge characteristic.²⁹⁶ The appropriate governance mechanisms for complexity and specificity have not yet been discussed. Thus, the interaction of different governance types and all three knowledge types has not been theorized in detail. In addition, while the role of the single elements of the KNT framework is explained by multiple established theories, there is no consistent theory to explain the success of knowledge transfer.

Since the process of knowledge transfer is based on individual actions, individuals cause the performance outcomes of the knowledge transfer. Thus governance and knowledge effects can be explained by the conditions they create for individuals to perform in the knowledge transfer. As identified by ARGOTE ET AL. (2003), FOSS (2010), and EASTERBY-SMITH ET AL. (2003), the individual conditions that are important for explaining the success of knowledge transfer are the cognition, motivation, ability, and opportunity of the people involved. However, the mechanism “motivation” appears predominantly in the explanation of the success of knowledge transfer.²⁹⁷

Concerning tacit knowledge, NONAKA (1994) provides further and different advice. He defined the mechanisms of socialization, combination, internalization, and externalization to be causal to creating tacit knowledge on the firm level of the receiver. Only governance that addresses these mechanisms can be assumed to be effective in supporting the transfer of tacit knowledge.

In summary, governing knowledge transfer means compensating for the negative effects of knowledge types on the transfer and enabling people to enact the process of knowledge transfer.

Regarding tacit knowledge transfer, the governance task concerns coordination and control of socialization, combination, internalization, and externalization. For complexity and specificity, no specific governed task has yet been theorized.

²⁹⁶ Cf. Hoetker/Mellewigt (2009).

²⁹⁷ Cf. Foss et al. (2010); Minbeva et al (2012); Easterby-Smith et al. (2008).

Consequently, recent research on knowledge transfer does not provide much advice how to govern the transfer of different types of knowledge but in fact states frequently that matching different governance mechanisms to different types of knowledge is a promising research arena.²⁹⁸

3.3 Empirical evidence for the effects of governance on knowledge transfer success in buyer-supplier relationships

This section provides an overview of effective governance for knowledge transfer in buyer-supplier relationships that are proven empirically. The analysis of this empirical state of the art is strictly focused on buyer-supplier-specific knowledge transfer as identified in step (7) of the search, because the context of a transfer is crucial^{299, 300}.

The insights of this analysis are sorted into the following categories: 1) the effects of the governance form, 2) the effects of governance types (formal & relational), 3) the effects of single governance mechanisms, 4) governance mechanisms that interact with special knowledge characteristics.

3.3.1 The effect of the organizational governance form “buyer-supplier relationship” on knowledge transfer success

Buyer-supplier relationships are an organizational governance form for knowledge transfer that differs from those of strategic alliances, joint ventures, or inter-organizational networks.³⁰¹ The governance form of a buyer-supplier relationship is the relationship of two independent firms governed by a contract in the free market.³⁰²

²⁹⁸ Cf. Meier (2010), Inkpen/Dinur (1998).

²⁹⁹ Cf. Inkpen, Tsang (2005); Li/Li (2005), Van Wijk et al. (2008)

³⁰⁰ For example Li/Li (2005) found that “the effect of trust and shared vision may be contingent upon different contexts. It appears to be that in managing knowledge transfer, trust is a more influential factor in inter-organizational relationships, while shared vision, in contrast, is more influential in intra-organizational relationships.” (Li/Li (2005), p.93).

³⁰¹ Cf. Williamson (1991).

³⁰² Cf. Williamson (1991).

Market contracts are limited in transferring knowledge³⁰³ because they only facilitate targeted knowledge transfer, permitting the movement of codified rather than tacit, experience-based knowledge, and have only few knowledge mechanisms available, making them inflexible in governance.³⁰⁴

In other words, the governance form of buyer-supplier relationships limits the process of inter-firm knowledge transfer and its effectiveness.

In contrast, “[...] parties that transfer knowledge from related parties, such as in franchises (Darr et al. 1995), chains (Baum and Ingram (1998), federations (Ingram and Simons (1997), strategic alliances (Powell et al. (1996), and networks (Uzzi (1996), are able to transfer knowledge more effectively than from outsiders.”³⁰⁵ This is especially relevant for tacit knowledge, which flows more easily across firms within a network than across independent firms.³⁰⁶

In conclusion, the governance form of a buyer-supplier relationship is not at all a favorable organizational design for knowledge transfer.

The reasons for the superiority of the other organizational designs are diverse:

ALMEIDA ET AL. (2002) found that the knowledge managing advantages of multinational companies (MNCs) compared to markets lie in their “ability to standardize procedures and formats, to administer coordination between national units, develop interpersonal relationships between employees, and create a common culture to facilitate communication and cooperation.”³⁰⁷

This argument is in line with the finding that equity relationships are superior to non-equity relationships when transferring knowledge.³⁰⁸ Equity arrangements are particularly effective at aligning partner incentives and therefore promote greater inter-firm knowledge transfers than contractual arrangements.³⁰⁹

³⁰³ All statements have to be considered in contrast to MNCs or alliances, respectively.

³⁰⁴ Cf. Almeida et al. (2002).

³⁰⁵ Cummings, Teng (2003), p. 45.

³⁰⁶ Cf. Uzzi (1996).

³⁰⁷ Almeida et al. (2002), p. 157.

³⁰⁸ Cf. Kogut (1988); Mowery et al. (1996); Dyer, Singh (1998); Oxley, Wada (2009).

³⁰⁹ Cf. Kogut (1988); Mowery et al. (1996).

From a theoretical perspective, the reasons and mechanisms why the equity structure might facilitate greater knowledge transfer differ. TCE focuses on the incentive alignment associated with shared equity³¹⁰; instead from a knowledge-based perspective, equity creates organizationally embedded communities that facilitate tacit knowledge transfer³¹¹. International business research as a third perspective points to the enhanced control over technology and strategy that comes with equity ownership.³¹²

The less favorable organizational form of buyer-supplier relationships might be a reason for previous empirical research on governance forms and their role in inter-firm knowledge transfer concentrating on alliances, joint ventures and MNCs.³¹³

In fact, no study discussing the role of different types of buyer-supplier contracts in the context of knowledge transfer was found during the research for relevant papers for this work. As a result, the first empirical insight for the governance of knowledge transfer in buyer-supplier is as follows:

Insight 1:

The effect of a buyer-supplier-contract type on the success of knowledge transfer is a major research gap.

However, one can take the theorized functions and mechanisms of equity arrangements – the alignment of incentives, organizationally embedded communities, and enhanced control over technology and strategy – as an indication of the effective design of contracts in buyer-supplier relationships.

This portability thought is drawn from Cummings and Teng (2003) who conclude that “the separation of research on knowledge transfer by governance mode may have less importance in reality than in convention or in research ease, as organizational distance was not found to be statistically significant.”³¹⁴

³¹⁰ E.g., Pisano (1989); Oxley (1997).

³¹¹ E.g. Kogut (1988), Kogut and Zander (1992).

³¹² E.g. Geringer/Hebert (1989).

³¹³ Cf. e.g. Chen (2004); Mowery et al. (1996); Muthusamy and White (2005)

³¹⁴ Cummings, Teng (2003); p59.

3.3.2 The effects of formal versus relational governance mechanisms on the success of buyer-supplier knowledge transfer

Knowledge management research separates several groups of governance mechanisms, such as “knowledge connectors”³¹⁵ and “practices”³¹⁶ or “knowledge articulation mechanisms”³¹⁷ and “knowledge codification mechanisms”³¹⁸. They are grouped by their function in a particular context, such as information processing or behavior adoption.³¹⁹ Still, all can be classified into formal or relational governance mechanisms (Chapter 2).

Table 8 structures the governance groups used in the analyzed papers according to their formal or relational nature, as defined in Chapter Two.³²⁰ In addition, the table provides information about the respective dependent variable used in the paper and the type of knowledge that was transferred.

³¹⁵ Meier (2010) argues that Inkpen’s (1996, 2000) mechanisms are to be considered as knowledge connectors, while he differentiates the mechanisms of Berdrow, Lane (2003), Collins, Hitt (2006), Inkpen (2005), and Inkpen, Pien (2006) by calling them “practices”.

³¹⁶ Meier (2010).

³¹⁷ Mason/Leek (2008).

³¹⁸ According to Mason/Leek (2008), knowledge articulation includes such things as conferences or inter-firm reviews, while knowledge codification includes contracts, documents, review procedures, or decision support systems.

³¹⁹ Cf. Turner/Makhija (2006).

³²⁰ Table 8 contains only the papers that used governance groups. The remaining papers of the search will be presented according to their respective contributions within the following chapters.

3. State of the art

Relational governance mechanisms	Formal governance mechanisms	Dependent variable	Type of knowledge that was transferred	Author
<u>Trust*</u> (positive moderator)	<u>Contract</u> (positive moderator)	Extend of capabilities of supplier, overall innovativeness	Not defined	Li et al. (2010)
<u>ambidextrous management*</u>	<u>ontological commitment</u>	Exploitative and explorative knowledge sharing	Not defined	Im, Rai (2008)
<u>Informal control*</u> (moderator)	<u>Formal control</u> (moderator)	Unintended knowledge flow	Tacitness of dynamic capabilities	Sawers et al. (2008)
<u>Trust*</u>	<u>Contract</u>	learning orientation	Diverse	Wang et al. (2008)
<u>Trust</u>	<u>Contract*</u>	knowledge sharing routines	Diverse	Wang et al. (2008)
<u>Informal knowledge governance</u>	<u>Formal knowledge governance</u>	Knowledge sharing behavior	Not defined	Cao, Xiang (2012)
<u>Relationship characteristics</u>	<u>Contractual characteristics</u>	Exploratory knowledge sharing	Knowledge that lead to a new generation of services	De Vries et al. (2014)

Table 8: Dimensions of governance mechanisms in knowledge transfer between buyer and supplier

In addition to the structuring intention, the table above indicates which of the governance clusters have an empirical effect on knowledge transfer success by underlining each respective instance. In case that multiple clusters have significant effects, the asterisk identifies the mechanism with the higher impact.

A comparison of the findings in the papers revealed that in all cases, both categories of governance mechanisms are significant (both types of clusters are always underlined).

SAWERS ET AL. (2008) considered knowledge transfer from a protection perspective. They proved that unintentional knowledge flow from a SME to a larger partner in the South African technology industry can be prevented by putting in place more formal and informal protection mechanisms. Formal protection mechanisms “refer to organizational devices aiming at controlling conditions and outcomes of collaboration, that is, mechanisms that specify conditions of the collaboration and the outcomes to be accomplished in the relationship, and by its partners and monitor the realization of these outcome targets.”³²¹

³²¹ Sawers et al. (2008), p. 181.

Informal mechanisms are social control mechanisms defined as being based largely on trust.³²² Thus their definition fits perfectly the one used here.

Their findings revealed that both types of mechanisms serve as a moderator of the relationship between different dynamic capabilities and unintended knowledge flow.

In general, the more formal and informal mechanisms are in place, the less negative is the relationship between the number of internal capabilities and unintended knowledge flow. “This means that SMEs can better protect their tangible technology base and intangible resources, thus their internal capabilities, if more formal and informal safeguards are used.”³²³

IM, RAI (2008) found that learning³²⁴ in long term buyer-supplier relationships in the American logistics industry is enabled by the ambidextrous management of the relationship, and it is facilitated by ontological commitment.

Contextual ambidexterity is defined “as the behavioral capacity of a long-term relationship.”³²⁵ It “is the nonsubstitutable combination (i.e. interaction) of alignment and adaptability of the management system that includes service level agreements, incentives, and planning and review meetings that govern a relationship”³²⁶ – i.e. the organizational design.

Ontological commitment is defined “as the reliance of partnering firms on digital boundary objects to span their knowledge boundaries.”³²⁷ Digital artifacts appear at different semiotic levels³²⁸ and were measured by the authors due to the reliance on these objects³²⁹ in the partnership – i.e. the IT design.

³²² Sawers et al. (2008), p. 181.

³²³ Sawers et al. (2008), p. 179.

³²⁴ They analyzed exploratory and exploitative knowledge sharing as learning dimensions.

³²⁵ Im/Rai (2008), p.1284.

³²⁶ Im/Rai (2008), p.1284.

³²⁷ Im/Rai (2008), p.1284.

³²⁸ They refer to syntactic, semantic, and pragmatic.

³²⁹ “Specifically, the digital artifacts include (1) databases and repositories, and standards for data representation at the syntactic level; (2) structured and semistructured documents (e.g., EDI and XML documents), and unstructured documents (e.g., PDF and multimedia documents) at the semantic level; and (3) process models, and business models (e.g., computational models for risk and return) at the pragmatic level.” (Im/Rai (2008), p. 1287).

Thus ontological commitment is a mechanism specifying the outcome in advance and is rather formal whereas contextual ambidexterity is more of a relational mechanism, addressing the people involved and their relationships.

WANG ET AL. (2008) investigated the role of governance in increasing the creativity in buyer-supplier relationships in the marketing industry. They found that trust as well as contract intensity³³⁰ has significant positive effects on knowledge-sharing routines and learning orientation.

LI ET AL. (2010) analyzed the learning trajectory in offshore OEM cooperation. They empirically confirm the links between learning intent, capability enhancement, governance mode, and overall innovativeness from the perspective of local suppliers. The proven effect for governance groups is summarized as follows: Trust and contact³³¹ are two distinctive governance modes that moderate the positive relationship between the learning intent and capability enhancement of local OEM suppliers.

CAO, XIANG (2012) interviewed 339 employees in 39 Chinese strategic emerging firms to what extent the share work experience and documents with collaborators to measure the intensity of knowledge sharing. By using structural equation models they showed that formal as well as informal knowledge governance³³² have a significant positive effect on knowledge sharing behavior.

DE VRIES ET AL. (2014) investigated knowledge sharing between manufacturers and their outsourced customer-facing service partners. They proved that the manufacturers gained more exploratory knowledge about new service ideas, entrances to new market, and technology fields if the relationship is characterized by high relationship quality and relationship manager experience. Besides these relational characteristics, the detailed

³³⁰ Contract was measured on a scale invented by Jap& Ganesan (2000) which asks for a) a definition in writing of what each party's obligations are in this relationship, b) the governance of the behaviors of both parties by written contract, c) the resolution of disagreements by referring back to the contract, and d) contracts that precisely state the activities to be performed by the parties.

³³¹ Governing by contract for them means that a detailed contract is regarded as the most critical to guarantee cooperation, that a strict enforcement of detailed contract is essential for controlling the behaviors of all parties, that all working rules specified in a detailed contract should be followed, and that all partners should respect all explicit procedures in a detailed contract.

³³² They used the governance scale of Lawson et al. (2009).

specification of the contract also increased the level of knowledge sharing. In contrast, contractual incentives decrease the level of knowledge sharing. In summary, these findings lead to a second empirical insight:

Insight 2:
Formal as well as relational mechanisms are needed to transfer knowledge successfully.³³³



Figure 20: Formal as well as relational governance mechanisms are needed to increase the success of knowledge transfer

However, the recipe for good governance in knowledge transfer is not as easy to recommend: The more formal and relational governance applied, the more successful is the knowledge transfer. Moreover, the role of the two governance groups differs, and their overall effect on the success of knowledge transfer cannot be considered equal or even comparable:

Chapter 2 defined that in order to complete the knowledge transfer, an intentional interaction and learning processes resulting in changes of the knowledge base of the recipient have to occur. The stages of the process describing knowledge transfer have also been introduced in detail by defining four milestones that have to be achieved to complete the process. Consequently, the success of knowledge transfer can be considered differently – i.e. success in knowledge transfer can be measured as reaching each stage in the knowledge transfer stage. In addition, performance improvements that are causal to the fulfillment of the knowledge transfer can also serve as a measure of success.

The literature analysis shows that this differentiated understanding of successful knowledge transfer is also reflected in the empirical research on knowledge transfer. As

³³³ This insight is supported also by Faems et al. (2007), Slaughter, Kirsch (2006), Galbraith (1990) Mason/Leek (2008), and Lee, Cavusgil (2006) who all analyzed IORs other than buyer-supplier relationships.

documented in the third column in Table 8, the papers have analyzed the effect of governance mechanisms on different types of success variables. Thus overall statements on the impact of governance mechanisms on knowledge transfer are difficult and need to be interpreted carefully by considering the very meaning of the “type of success” that was the subject of the respective study. As outlined below, this differentiated view reveals a third insight for the governance of knowledge transfer.

WANG ET AL. (2008) found that trust as well as contract intensity³³⁴ have significant positive effects on knowledge sharing routines ($\beta=0.15$, $pb0.05$ / $\beta=0.64$, $pb0.001$) and learning orientation ($\beta=0.53$, $pb0.001$ / $\beta=0.18$, $pb0.01$). When comparing the impact size of trust and contract, the results of Wang et al. (2008) indicate that trust is more important in increasing learning orientation, whereas contract is more important in increasing the establishment of knowledge sharing routines.

The establishment of knowledge sharing routines is measured³³⁵ based on the budgets for information sharing and setting up of rules. Therefore, this success dimension of knowledge transfer measures the accomplishment of the beginning of the process, i.e. reaching the milestone “the setting is ready for the transfer.” In contrast, learning is a success dimension that describes the accomplishment of phase three of the knowledge transfer process. Phase three results in the individual usage of the knowledge and sufficient results, with learning as a prerequisite.

Therefore, the results indicate that relational governance mechanisms have more power in governing the later phases of the knowledge transfer process whereas formal governance mechanisms are more important for governing the early phase of the set up. This thought is supported by the findings of **IM AND RAI (2008)**. Since they considered different types of learning as the dependent variable, their results can be interpreted to fall into the third phase of knowledge transfer. Comparing the impacts of their mechanisms, the impact of the relational mechanisms³³⁶ is stronger than that of their formal counterparts^{337 338}.

³³⁴ Contract was measured on a scale invented by Jap & Ganesan (2000) which asks for a) a definition in writing of what each party's obligations are in this relationship, b) the governance of the behaviors of both parties by written contract, c) the resolution of disagreements by referring back to the contract, and d) contracts that precisely state the activities to be performed by the parties.

³³⁵ Cf. Wang et al. (2008), p. 116.

³³⁶ Ambidextrous management.

The study of **CAO, XIANG (2012)** used knowledge sharing behavior as the dependent variable. This variable contains items that measure if people share documents and experience and review information. Thus it can be considered phase two of the knowledge transfer process, because the people already engage in the transfer process but ownership of knowledge or learning is not part of the scale. The impact size of informal governance is higher than the one of formal governance.

The study of **DEVRIES ET AL. (2014)** showed that formal mechanisms in terms of contractual incentives can even have negative effects on knowledge sharing. As their dependent variable, they analyzed exploitative and explorative knowledge sharing. These constructs measure to what extent knowledge about new market chances (exploratory) and improving approaches (exploitative) have been delivered to the manufacturer. As the manufacturer need to have understood these knowledge to assess it, the construct reflect a phase three knowledge transfer result. In other words, contractual incentives have a negative effect in the later phase of the knowledge transfer process. The informal mechanisms “relationship quality” and “relationship manager experience” have positive effects in this stage of knowledge transfer.

In summary, this more process related analysis of the papers lead to:

Insight 3:

The effect of governance mechanisms differs for the phases of knowledge transfer.

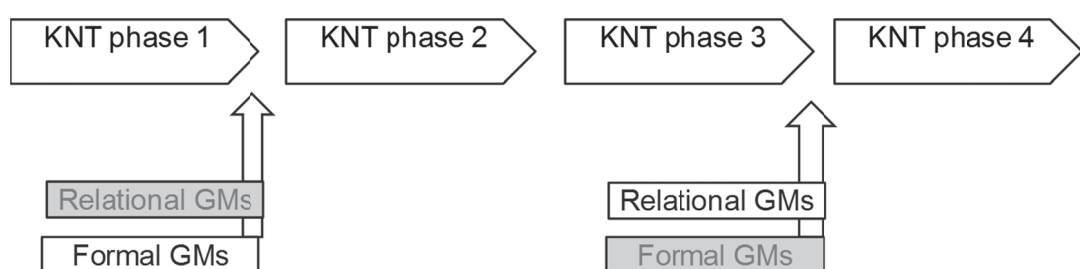


Figure 21: The effect of governance mechanisms differs for the phases of knowledge transfer

Besides the direct role of governance mechanisms, also a moderator role is found in empirical studies. In addition to the findings of **SAWERS ET AL. (2008)** (cf. insight 2) **LI ET AL. (2010)** proved the moderating effects of trust and contact as two distinctive

³³⁷ Ontological commitmen.

³³⁸ Cf. Results of PLS analysis of Im/Rai (2008), p. 1290.

governance modes. On the one hand they showed that the positive relationship between the learning intent and capability enhancement of local OEM suppliers will be positively moderated by the emphasis on trust as a governance mode for the actual management of offshore OEM. On the other hand the governance mode “contract” moderates the same relationship in an inverted U-shaped manner. These findings imply that the effect of the formal way of governance is constrained whereas the positive effect of trust is not.

Since the enhancement of capabilities is a result of the third phase in knowledge transfer their results support insight 3. In addition they extend the insight because they proved that in the later phases of knowledge transfer the use of formal mechanisms is not recommended without constraints. In other words, too much formal mechanisms can have a negative effect on the overall success of knowledge transfer.

Alliance research established that when it comes to the transfer of knowledge as opposed to physical goods, relational mechanisms are superior to formal mechanisms.³³⁹ Without any specification of the knowledge itself, it was empirically proved that in the case of a high “knowledge intensity” or high “causal ambiguity” of knowledge, governance has to contain “communication, social interactions, trial and error learning”³⁴⁰ as well as “articulation and codification”³⁴¹. HOETKER AND MELLEWIGT (2009) even proved that applying formal governance mechanisms has negative effects on the success of knowledge transfer in the alliance.

Summarizing the insights for the impact of governance groups on the transfer of knowledge in buyer-supplier relationships, this thesis supports the findings of the alliance research: All of the studies found both of the groups to impact knowledge transfer success. Thus formal as well as relational mechanisms are needed to transfer knowledge successfully. However, the impact has to be differentiated for different phases of the knowledge transfer process. Formal mechanisms have greater impact in the early phases whereas relational mechanisms are more powerful in the later phases.

³³⁹ Cf. Hoetker & Mellewigt (2009); Inkpen (2008); Enberg et al. (2006)

³⁴⁰ Inkpen (2008).

³⁴¹ Enberg et al. (2006).

In those stages, the insights suggest that too much formality may even impede the final success of the transfer.

In other words, in order to complete a knowledge transfer, relational mechanisms are superior to formal mechanisms in buyer-supplier knowledge transfer.

3.3.3 The effect of single governance mechanisms on the success of buyer-supplier knowledge transfer

Whether it is because of the dominant role of relational mechanisms in knowledge transfer or because of a specific research focus, many papers analyzed only the impact of relational mechanisms (cf. Table 9). They were analyzed to gain insights on the power of single governance mechanisms and to detail the insights for the group of relational mechanisms as developed above.

Relational GMs	Formal GMs	Dependent variable	Type of knowledge transferred	Author
<u>*Relational (being caring, feeling safe)/task-related factors (joint problem solving, management direction)</u>		Learning	Not defined	Bstieler, Hemmert (2010)
Relational (being caring, feeling safe)/ <u>*task-related factors (joint problem solving, management direction)</u>		Time efficiency of knowledge transfer	Not defined	Bstieler, Hemmert (2010)
<u>Communication/participation/shared values</u>		Extend of knowledge sharing	Not defined	Cheng et al (2008)
<u>Informal socialization mechanisms, formal socialization mechanisms</u>		Level of knowledge sharing	Not defined	Lawson et al. (2009)
<u>Ties</u>		Ease of knowledge transfer	Tacitness of technical expertise	Reagans, McEvily (2003)
<u>Cooperation</u>		Knowledge sharing routines	Not defined	Squire et al. (2009)
<u>Flexibility of governance</u>		Productivity of knowledge application	Not defined	Young et al (2003)

Table 9: Relational governance mechanisms analyzed in knowledge transfers in buyer-supplier relationships.³⁴²

All of the papers found an independent, positive impact of their respective relational mechanisms on the success of knowledge transfer. This is in line with the positive

³⁴² The table indicates which of the governance mechanisms were found to have an empirical effect on knowledge transfer success by underlining it. In the case that multiple mechanisms have significant effects, the asterisk identifies the mechanism with the higher impact.

impact on the success of knowledge transfer identified for relational governance mechanisms in general. However, the impacts of certain mechanisms are divergent:

BSTIELER, HEMMERT (2010) for example analyzed successful knowledge transfer from a time efficiency and learning perspective of inter-organizational (I-O) project teams in vertical product development partnerships. They differentiate two factors that foster an effective, engaging environment within which the teams can succeed: First, relational factors are represented by caring behavior and psychological safety. Second, task-related factors are represented by shared problem solving and management direction.

However, since none of the mechanisms define the output in advance, they are all considered to be relational according to the definition used in this thesis.

The study revealed that “the factors supporting time efficiency are slightly different from those that foster learning.”³⁴³ Shared problem solving was found to be the most important factor for both success variables. In contrast, management direction is only significant for time efficiency. Caring behavior and psychological safety have significant but lower effects on learning and time efficiency and are more important for learning than for time efficiency.³⁴⁴ In summary, relational mechanisms are more important for learning, whereas task-related mechanism have a greater impact on time efficiency.

This finding supports insight three, even for the impact of relational mechanisms only: The more the mechanisms are focused on persons (and less on the task), the higher is their positive impact on the later phases of the success of knowledge transfer.

Again, both groups of mechanisms “are necessary contributors for the performance of I-O project teams”³⁴⁵ – i.e. “neither relational (being caring, feeling safe) nor task-related conditions (joint problem solving, management direction) alone are sufficient for the final success of a collaborative project.”³⁴⁶

LAWSON ET AL. (2009) support and detail this conclusion. They analyzed the effect of formal and informal socialization mechanisms on knowledge sharing in inter-

³⁴³ Bstieler, Hemmert (2010), p.485.

³⁴⁴ Cf. Bstieler, Hemmert (2010), p.494.

³⁴⁵ Bstieler, Hemmert (2010), p.487.

³⁴⁶ Bstieler, Hemmert (2010), p.487.

organizational product development teams. Their findings provide evidence that formal socialization mechanisms (cross-functional teams, matrix reporting structures) only indirectly influence knowledge sharing through informal socialization (communication³⁴⁷ guidelines, social events).³⁴⁸ In contrast, informal socialization mechanisms increase inter-organizational knowledge sharing directly. They argue that “socialization tactics increase the level of trust between members of the team and give the partners’ greater time, opportunity, and motivation to strengthen and broaden their relationship.”³⁴⁹

SQUIRE ET AL. (2009) investigated cooperation and knowledge transfer within buyer-supplier relationships in UK manufacturing firms in eight industries. They used similar informal mechanisms as **LAWSON ET AL. (2009)** to define their cooperation construct. Cooperation in their study was measured by a scale invented by Carr and Pearson (1999). It contains the following items: (a) We are loyal to this supplier. (b) We have frequent face-to-face planning/communication with this supplier. (c) There is high level/corporate level communication on important issues with this supplier. (d) There are direct computer links to this supplier.

They proved that “cooperation” independently increases the knowledge transfer in terms of an increased sharing of manuals, learning, know-how, know-where, expertise, and experience.³⁵⁰

Structuring the findings of all three studies, Table 10 shows that even if all mechanisms are relational, those focusing on personal, social relationships are more important to increase the success of knowledge transfer.

³⁴⁷ Cf. also Ramasamy et al. (2006); Hurley and Hult (1998); Mohr and Spekman (1994); Morgan and Hunt (1994).

³⁴⁸ The dependent variable in this study is the behavior of KNT (frequent contact, informal discussion, communication of information) and not the extent or internalization of knowledge (effectiveness).

³⁴⁹ Lawson et al. (2009), p. 161.

³⁵⁰ The original scale they used was invented by Lee (2001).

3. State of the art

Effect on KNT success	Governance mechanisms with a dominant or positive impact on KNT	Governance mechanisms with no or minor impact on KNT
Items of the governance constructs	Relational: being caring³⁵¹: <ul style="list-style-type: none"> Communicating affection Appreciation Respect for other team members. 	Task-related: management direction³⁵²: Extent to which the direction for the work of the development team was <ul style="list-style-type: none"> clear, challenging, targeted, goal-oriented.
	Relational: feeling safe³⁵³: The team created an atmosphere in which members felt more or less safe in taking on the risks of self-expression and engagement.	Task-related: joint problem solving³⁵⁴ <ul style="list-style-type: none"> Joint planning and evaluation of the project and its progress Joint agreements on project adjustments Shared responsibility for the project
	Informal Socialization Mechanisms³⁵⁵ <ul style="list-style-type: none"> Communication guidelines Awareness of supplier issues Social events 	Formal Socialization Mechanisms³⁵⁶ <ul style="list-style-type: none"> Cross-functional teams Matrix-style reporting structure Formal project structure
	Cooperation³⁵⁷ <ul style="list-style-type: none"> We are loyal to this supplier We have frequent face-to-face planning/communication with this supplier There is high level corporate level communication on important issues with this supplier There are direct computer links to this supplier 	
Focus of mechanisms	→ Focused on social relationships/ties	→ Focused on tasks

Table 10: Relational mechanisms focusing on social relationships are more important

REAGANS AND MC EVILY (2003) are in line with this finding. They analyzed knowledge transfer within technical consulting in the area of materials science. Their findings proved that tie strength is positively associated with the ease of knowledge transfer. Ease of knowledge transfer in their study represents the ease of explaining a key idea, concept, or theory in a certain field of expertise to the receiver. Tie strength was measured by asking for the closeness between the persons and the frequency of communication between them. They conclude that it is easier to transfer all kinds of knowledge through a strong bond and more difficult through a weak tie.

³⁵¹ Cf. Bstieler, Hemmert (2010).

³⁵² Cf. Bstieler, Hemmert (2010).

³⁵³ Cf. Bstieler, Hemmert (2010).

³⁵⁴ Cf. Bstieler, Hemmert (2010).

³⁵⁵ Cf. Lawson et al. (2009).

³⁵⁶ Cf. Lawson et al. (2009).

³⁵⁷ Cf. Squire et al. (2009).

Establishing social ties is a very prominent governance mechanism in literature. Many authors³⁵⁸ provide evidence that “social ties allow for better opportunities to share knowledge and experiences, develop trust.”³⁵⁹ As a result, the concluding construct of trust is found to be highly important to increasing the success of knowledge transfer. Trust per se is not a governance mechanism³⁶⁰ but a factor of the inter-organizational characteristics in the KNT framework. Still, it is important to explain the impact of different governance mechanisms as proved by CHENG ET AL (2006).

CHENG ET AL. (2006) analyzed how trust interacts with factors affecting inter-organizational knowledge sharing in manufacturing firms in Taiwan. They showed that “trust is the pivot of the factors influencing inter-organizational knowledge sharing.”³⁶¹ The more a mechanism contributes to trust positively³⁶² or negatively³⁶³, the more the mechanism contributes to knowledge sharing correspondingly.³⁶⁴

Effect on KNT success	Governance mechanisms with a dominant or positive impact on KNT		Governance mechanisms with no or minor impact on KNT
Items of the governance constructs	Communication ³⁶⁵ : <ul style="list-style-type: none"> • You and your partner frequently exchange opinions • Your partner frequently keeps you informed about new developments • You and your partner frequently discuss each other's expectations³⁶⁶ 	Participation ³⁶⁶ <ul style="list-style-type: none"> • You are involved in the set up of the commercial goals with your partner • Your partner takes into account your suggestions • You perform an active role in the decision making 	Shared values ³⁶⁷ <ul style="list-style-type: none"> • You have compatible goals with your partner • You are enthusiastic about pursuing the collective missions with your partner • You and your partner support each other's goals
Focus of governance mechanisms	→ Contribute to trust		

Table 11: Relational mechanisms that contribute to trust are more important for the success of knowledge transfer.

³⁵⁸ Cf. e.g. Cummings, Teng (2003); Granovetter (1985).

³⁵⁹ Cummings, Teng (2003), p.45.; Granovetter (1985).

³⁶⁰ Cf. definition in Chapter 1.

³⁶¹ Cheng et al. (2006) p. 283.

³⁶² E.g. participation and communication.

³⁶³ E.g. opportunistic behavior.

³⁶⁴ Cf. Cheng et al. (2006) p. 283.

³⁶⁵ Cf. Cheng et al. (2006).

³⁶⁶ Cf. Cheng et al. (2006).

³⁶⁷ Cf. Cheng et al. (2006).

Consequently, the governance mechanisms with no significant influence on trust (such as shared values) have no or little influence on knowledge sharing.³⁶⁸

Insight 4:

Governance mechanisms that contribute to trust are most important for the success of knowledge transfer.

A different perspective on governance in knowledge transfer is provided by **YOUNG ET AL. (2003)**. They analyzed the influence of flexibility in buyer-supplier relationships on the productivity of knowledge in the software industry. Their findings proved that an increase of the flexibility with which a firm governs its relationships with trading partners will also increase the productivity of the firm's knowledge-based resources. In other words, the more flexible the mechanisms are, the more they impact the success of knowledge transfer positively. However, according to **DYER AND SINGH (1998)**, flexible inter-organizational relationships are governed by self-enforcing informal safeguards, such as trust. Again, trust prevails as the most important underlying mechanisms to explain why governance mechanisms like communication, participation, cooperation, shared problem solving, informal socialization mechanisms, being caring, and feeling safe are so important to increasing the success of knowledge transfer.

In summary, transferring knowledge from supplier to buyer “is not something that can be mandated by the organization through formal mechanisms [...]”³⁶⁹ Rather, knowledge transfer between buyer and supplier requires more subtle mechanisms that increase trust, such as informal socialization and cooperation³⁷⁰ tactics. In other words, “knowledge transfer is all about ties between people.”³⁷¹ Formal mechanisms may “provide the structure for social interactions.”³⁷² But they are not sufficient to result in

³⁶⁸ Cf. Cheng et al. (2006), p. 283.

³⁶⁹ Lawson et al. (2009), p. 166.

³⁷⁰ Cf. also the results of Inkpen (2000); Inkpen, Pien (2006).

³⁷¹ Inkpen (2005), p. 133.

³⁷² Lawson et al. (2009), p. 166.

an effective knowledge transfer and can even harm the completion of the knowledge transfer process.

3.3.4 Empirical evidence for the governance of different types of knowledge

The previous state of the art analysis of governance mechanisms and their effect on knowledge transfer revealed evidence that there are effective mechanisms for coordinating the knowledge transfer in buyer-supplier relationships. This section sharpens the perspective on these mechanisms by analyzing the recent literature on governance for buyer-supplier relationships with regard to associations between governance mechanisms and specific knowledge characteristics. As outlined in Chapter 2, tacitness, complexity, and specificity are the knowledge characteristics which define different challenges in the knowledge transfer. Now, consideration shifts to the knowledge gathered so far about governing these challenges?

20% of the papers presented in Table 8 and Table 9 did not characterize the type of knowledge that was the subject of the transfer (cf. column “*Type of knowledge that was transferred*”). In conclusion, the insights 2-6 are derived for no specific type of knowledge. In other words, the effectiveness and efficiency of relational and formal governance mechanisms was not differentiated for tacit, complex, or specific knowledge. Moreover, three studies conclude that the most efficient techniques of transferring specific types of knowledge still present a research gap.³⁷³

The literature review provided only two studies with empirical insights into the research focus of this thesis: REAGANS AND MC EVILY (2003) and SAWERS ET AL. (2008) investigated the interaction of tacitness and governance in buyer-supplier relationships.

REAGANS AND MC EVILY (2003) considered the tacitness of technical expertise. They proved that the positive association between tie strength and knowledge transfer increases with the tacitness (decreases with codifiability) of the knowledge being transferred. Given that strong ties require a greater investment of time, it is inefficient to

³⁷³ Cf. Sawers et al. (2008); Meier (2010); Foss et al. (2010).

use strong ties to transfer codified knowledge. Thus it is more efficient to use strong ties only to transfer tacit knowledge but weak ties to transfer codified knowledge.

SAWERS ET AL. (2008) considered the tacitness of dynamic capabilities. They differentiate the role of informal and formal governance mechanisms due to the type of dynamic capability that was transferred: “Strategic capabilities are the mechanisms which enable the organization to manage its capabilities and exploit them in the market.”³⁷⁴ They can be protected by formal mechanisms, “which encompass procedures, rules and regulations and intensive monitoring.”³⁷⁵ Thus formal mechanisms can limit the flow of strategic knowledge.³⁷⁶

External capabilities “encompass managing the relationship between the organization and the external resources which it needs.”³⁷⁷ The knowledge flow of these external capabilities is increased by informal mechanisms.

Interpreting the finding of SAWERS ET AL. (2009) in the light of this thesis, we gained empirical proof of formal governance mechanisms limiting the flow of knowledge whereas informal mechanisms increase it. Considering strategic capabilities as more tacit and external capabilities as more explicit, these results indicate that formal mechanisms actually harm the transfer of tacit knowledge.

The challenge in transferring of tacit knowledge as opposed to explicit knowledge is the codification of the knowledge elements. Tacit knowledge cannot be distributed in explicit forms.³⁷⁸ In theory, tacit knowledge can be transferred either through a combined process of externalization, diffusion, and internalization, or through the process of socialization.³⁷⁹ Since tacit knowledge cannot be codified, the only option for transferring tacit knowledge is socialization. “Socialization describes the process of communicating and enhancing tacit knowledge. A child learning to speak its first language by imitation and observation is an example of ‘one-to-one’ transfer of tacit knowledge. An individual assimilating an organization’s culture is an example of

³⁷⁴ Sawers et al. (2008), p. 175.

³⁷⁵ Sawers et al. (2008), p. 181.

³⁷⁶ Cf. Sawers et al. (2008), p. 180.

³⁷⁷ Sawers et al. (2008), p. 175.

³⁷⁸ Cf. Davenport and Prusak (1998).

³⁷⁹ Cf. Nonaka (1994).

‘many-to-one’ transfer of tacit knowledge. The transfer of tacit knowledge is usually a time-consuming process requiring frequent physical proximity and the development of trust.”³⁸⁰

Consequently, governance mechanisms relying on explicit descriptions of the knowledge are supposed to fail in coordinating the transfer of tacit knowledge. This major finding is theorized and empirically proved³⁸¹ in buyer-supplier empery by LAWSON ET AL. (2009). They failed to show significant influence of written communication or blueprints on the transfer of tacit knowledge.³⁸² In line with the codification argument presented above, they concluded that “any formal governance mechanism failed to enhance the transfer of tacit knowledge.”³⁸³

Consequently, the recommendation for governing tacit knowledge is to rather use relational mechanisms than formal, which represents insight 5.

Insight 5:

For the transfer of tacit knowledge, only relational governance mechanisms are effective.

For the governance of complex and specific knowledge, the research gap identified by prior research³⁸⁴ is underlined by the absence of findings in empirical buyer-supplier knowledge transfer. This defines insight 6.

Insight 6:

We have no evidence for the governance of complex or specific knowledge

Figure 22 summarizes all insights in light of the research question.

³⁸⁰ Hall, Andriani (2003), p. 147.

³⁸¹ Cf. Hoetker/Mellewigt (2009); Lawson et al. (2009).

³⁸² Lawson et al. (2009), p. 159.

³⁸³ Lawson et al. (2009), p. 159.

³⁸⁴ Cf. Sawers et al. (2008).; Meier (2010); Foss et al. (2010).

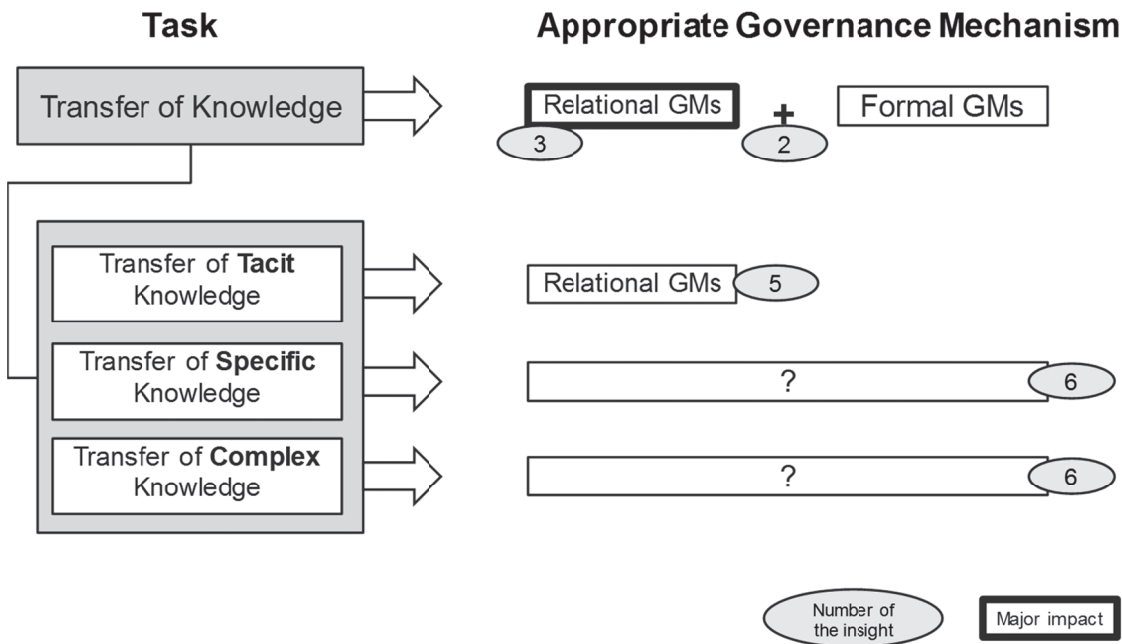


Figure 22: Summary of empirical insights³⁸⁵

However, during the literature search, one study was identified which focuses not on knowledge transfer but on the governance of buyer-supplier relationships in general and provides some clues for these missing interactions:

MESQUITA, BRUSH (2008) analyzed safeguard and production coordination effects in long-term buyer-supplier relationships. They showed that in the presence of high complexity, relational as well as contractual mechanisms enhance the production efficacy of a buyer-supplier relationship. Their results proved that the positive impact of the interaction between complexity and relational mechanisms is higher than that of complexity and contractual mechanisms.³⁸⁶ In line with this finding, “Hansen (1999) argued that strong ties promote the transfer of complex knowledge, while weak ties promote the transfer of simple knowledge. Specifically, a strong tie could ease the transfer of complex knowledge because it is more likely than a weak tie to be embedded in a dense web of third party relationships (Granovetter, 1973; Hansen, 1999).”³⁸⁷ In addition, Grant (1996) argued that although using a communication-intensive device for

³⁸⁵ The question marks identify the research gaps.

³⁸⁶ Cf. Mesquita, Brush (2008), p. 798.

³⁸⁷ Reagans, McEvily (2003), p.241.

the integration of knowledge is more expensive than relying on routines, it may be necessary when complexity increases.³⁸⁸

To clarify, MESQUITA, BRUSH (2008) showed that it interacts neither with relational nor contractual mechanisms when analyzing the efficiency of production. Specificity does interact with both mechanisms when analyzing the negotiation efficiency of a buyer-supplier relationship. This separated view on the efficiency of negotiation and production yields valuable insight into the relative importance of governance mechanisms as a contingency of transaction characteristics (complexity, specificity). Complexity is more important for the production function whereas specificity is more important for the negotiation function. Specificity is managed only by relational mechanisms whereas complexity can be managed by both formal and relational mechanisms. Thus the efficiency of governance is contingent on the transaction problem.

Since all the findings for complexity and specificity are revealed for a production case or non-buyer-supplier-relationships rather than for knowledge transfer in buyer-supplier, they cannot be considered as insights for the research question. Instead, they might serve as reference points for the findings of this thesis.

3.3.5 Assessment of empirical evidence

The analysis of the empirical evidence for the governance of different types of knowledge in buyer-supplier relationships revealed six major insights:

Insight 1:

Equity arrangements are particularly effective at aligning partner incentives and therefore promote better inter-firm knowledge transfers than contractual arrangements.³⁸⁹ Thus buyer-supplier relationships are a non-favored IOR type for transferring knowledge. The effect of different contract types on the success of knowledge transfer has not yet been analyzed and represents a major research gap.

Insight 2:

³⁸⁸ Cf. Enberg et al. (2006), p. 145.

³⁸⁹ Cf. Kogut (1988); Mowery et al. (1996).

For the transfer of knowledge that is not further specified, formal as well as relational governance mechanisms are needed.³⁹⁰

Insight 3:

Relational governance mechanisms have more power to govern the later phases of the knowledge transfer process whereas formal governance mechanisms are more important to govern the early phase of the set up. In fact, in the later phases of knowledge transfer, the use of formal mechanisms is not recommended without constraints. Mechanisms that are too formal can have a negative effect on the overall success of knowledge transfer. Thus, to complete the knowledge transfer, relational mechanisms are superior to formal mechanisms in buyer-supplier knowledge transfer.

Insight 4:

Even if all mechanisms are relational, those focusing on personal, social relationships are more important in increasing the success of knowledge transfer. Governance mechanisms contributing to trust are most important for the success of knowledge transfer. Successful examples are e.g. communication, participation, cooperation, shared problem solving, informal socialization mechanisms, being caring, and feeling safe.

Insight 5:

For the transfer of tacit knowledge, relational governance mechanisms are recommended. In fact, “any formal governance mechanism failed to enhance the transfer of tacit knowledge.”³⁹¹ Explicit knowledge, though, can be transferred with formal mechanisms. Thus for the transfer of explicit knowledge, the use of expensive relational mechanisms is not efficient.

Insight 6:

There is no evidence for the appropriate governance of complex or specific knowledge in buyer-supplier relationships.

³⁹⁰ This insight is supported also by Faems et al. (2007), Slaughter, Kirsch (2006), Galbraith (1990) Mason/Leek (2008), and Lee, Cavusgil (2006) who all analyzed IORs other than buyer-supplier relationships.

³⁹¹ Lawson et al. (2009), p. 159.

Table 12 summarizes all insights and identifies the empirical research gaps by placing question marks in the respective matrix fields. A “+” indicates a positive effect on the success of knowledge transfer when combining the knowledge type of a line with the governance type in the column. A “-” indicates a negative effect of this combination on the success of knowledge transfer.

Knowledge type	Role of buyer-supplier governance mode:	Effect of relational governance mechanisms	Effect of formal governance mechanisms
Knowledge (unspecified)	Less suited than MNC or alliances	+	+/- (if used too much)
Tacit knowledge	?	+	Not effective
Explicit knowledge		+ (but not efficient)	+
Complex knowledge			
Simple knowledge			
Specific knowledge			
Standard knowledge			

Table 12: Summary of empirical evidence for the governance of different knowledge types in buyer-supplier relationships

The matrix fields between tacitness, explicitness and governance mechanisms are not marked as research gaps. It should nonetheless be noted that the insights are based only on 12 papers and thus cannot yet be considered to be well established.

In summary, the state of the art analysis showed that the insights about how to solve the knowledge leveraging paradox for different types of knowledge are rare.

The most research was done for the characteristic of tacitness.³⁹² Findings for complexity and specificity are not only rare but are completely lacking for knowledge transfer in buyer-supplier relationships.

The lack of a more fine-grained differentiation between different knowledge challenges, when discussing proper governance, leaves us with limited advice for transferring highly complex or highly specific knowledge. Comparing governance and different IOR literature, it can best be assumed to be the same as for tacitness, because otherwise the implication would be that complexity and specificity do not create governance problems for buyer-supplier knowledge transfer at all.

³⁹² Cf. Simonin (1999), p. 598.

4 THEORETICAL MODEL FOR THE GOVERNANCE OF DIFFERENT TYPES OF KNOWLEDGE

This chapter provides the theoretical foundation for the analysis of how governance mechanisms and knowledge types jointly impact the success of knowledge transfer in buyer-supplier relationships.

4.1 *Theory selection*

In order to analyze how governance types and all three characteristics of knowledge jointly influence knowledge transfer (KNT), this thesis takes a knowledge management perspective with the goal of solving more than one research gap in existing literature.

Since knowledge transfer does not yet have any consistent theory³⁹³, this thesis engages in the discussion whether the micro level mechanisms of individuals help to explain the effects of multiple factors on the success of knowledge transfer. As prominent researchers of knowledge management, ARGOTE ET AL. (2003) have theorized that ability, motivation, and opportunity (AMO) are such micro level mechanisms. They are causal to explaining the transfer of knowledge.³⁹⁴ In other words, these three mechanisms are the theoretical reason why a specific knowledge transfer outcome occurs whereas all characteristics of the KNT framework introduced in Chapter 3 are variables that explain what affects the outcome.³⁹⁵

The three-part concept of motivation, ability, and opportunity used by ARGOTE ET AL. (2003) is an overall theoretical framework. It has been well established by different scholars in order to explain performance outcomes: In strategic human resource management research, this is known as the “theory of work performance” and is also called the “AMO model” or “people and performance model,” going back to BLUMBERG & PRINGLE (1982).³⁹⁶ In marketing research, it is established as the “MAO model of information processing,” based on ANDREWS (1988) with early

³⁹³ Cf. Chapter 2.

³⁹⁴ Cf. Argote et al. (2003); Chang et al. (2012), Gruen et al. (2007), Minbaeva et al. (2012).

³⁹⁵ Cf. Argote et al. (2003), p. 575; Meier (2010), p. 3.

³⁹⁶ Boxall/Purcell (2003), Campell et al. (1993), Raiden et al. (2006).

4. Theoretical model for the governance of different types of knowledge

foundations³⁹⁷ in the concepts of HEIDE (1958).³⁹⁸ The concepts and definitions of the three causal mechanisms of AMO (HR perspective abbreviation) and MAO (marketing perspective abbreviation) as well as their theoretical underpinnings are identical (cf. Chapter 3.2.1). However, there are different views on how to implement the AMO mechanisms as well as the performance dimension, which the model is applied to. For human resource theorists, AMO can be managed with HR practices. In contrast, for researchers in marketing, MAO is the framework in which to design advertising and communication. In line with their respective research interest, information processing is a marketing performance criterion while individual performance is a human resource management criterion of success.

Both perspectives, marketing and HR, have yet to be applied to the knowledge management context.³⁹⁹ This thesis bases its theoretical foundations predominantly on the strategic human resource management perspective (theory of work performance) for two reasons: First, because the subject of this thesis considers the transfer of knowledge, which is per definition more than information (cf. Chapter 2). Second, because the people and performance perspective has been connected directly to the theory of knowledge management by established journals and researchers of the strategic management community⁴⁰⁰, whereas MAO is applied to the knowledge context only by marketing journals.⁴⁰¹

Since the people and performance framework was developed by strategic human resource management, it unfolds its logic on the level of individuals. In the context of knowledge transfer, this is the ability, motivation, and opportunity of the participating individuals to transfer and receive the knowledge.⁴⁰² This definition represents a

³⁹⁷ For a complete discussion and schematic depiction of the foundations of the antecedent conditions of information processing and message elaboration cf. Petty/Cacioppo (1986); p. 218 ff. and Mitchell (1981), p25ff..

³⁹⁸ Batra/Ray (1986); Curry/Moutinho (1993); MacInnis/Jaworski (1989); MacInnis et al. (1991).

³⁹⁹ The marketing perspective was applied by Gruen et al. (2007) and the HR perspective by Argote et al. (2003) and Chang et al. (2012).

⁴⁰⁰ Cf. Argote et al. (2003) in *Mgmt. Science*; Chang et al (2012) in *Acad. of Mgmt. J.*

⁴⁰¹ Cf. Gruen et al. (2007) in *J. of the Acad. Mark. Sci.*

⁴⁰² Cf. Chang et al. (2012), p. 929; Argote et al (2003), p. 575.

4. Theoretical model for the governance of different types of knowledge

perspective, in which the effects of governance mechanisms as well as of knowledge types can be considered jointly, because they constitute the underlying explanatory level: the individual that has to enact the transfer process. The individual that has to transfer or receive knowledge is affected by all variables of the KNT framework. He is influenced by the governance mechanisms applied to the process, because he operates this process. NONAKA (1994) would probably go even further since he theorized that the transfer process occurs within the individual itself – the individual is the process.⁴⁰³ Each governance mechanism applied to the process is applied to the individual and consequently creates individual conditions of the transfer for him or her.

The knowledge to be transferred refers to the individual, because it describes the task he has to solve. Different characteristics of knowledge describe different tasks to transfer or receive knowledge for an individual and thus create different individual conditions. To sum up, by theorizing via the individual, this perspective provides the necessary ability of theorizing on the joint effects of governance and knowledge, the points of interests for this work.

An important additional advantage of this theoretical perspective lies in covering the research gap of missing micro foundations in the knowledge transfer that is addressed frequently.⁴⁰⁴ This call for micro foundations comes from social science research, arguing based on the general model of social science explanation.⁴⁰⁵ The model argues that the relationship between social facts and social outcomes (e.g. governance or knowledge and knowledge transfer success) cannot be explained on a macro level (institutional) but needs to be connected to conditions and actions of individuals.⁴⁰⁶ Organizations are not able to act but their individuals are.⁴⁰⁷ Thus social phenomena like a change in the knowledge base of an organization (indicator for successful knowledge transfer) are based on the actions of individuals in the organization.

Consistent with the knowledge management perspective of ARGOTE et al. (2003), social science theory states that the way characteristics of the knowledge transfer are

⁴⁰³ Cf. Nonaka's (1994) description of individual socialization and combination processes.

⁴⁰⁴ Cf. Foss (2007, 2010); Argote et al (2003); Meier (2010); Minbaeva et al. (2012).

⁴⁰⁵ For the general model of social science cf. COLEMAN (1990) and for the application to the knowledge management context cf. Foss (2007), p.35.

⁴⁰⁶ Cf. Coleman (1990), p.13 ff.

⁴⁰⁷ Cf. Foss et al. (2010), Coleman (1990).

theorized and analyzed provides insights into the predictors of performance of knowledge transfer but not the mechanisms.⁴⁰⁸ Therefore, this thesis explains the joint effects of the social facts of governance and knowledge on knowledge transfer not on the macro level but makes a first step towards filling in and testing the micro-foundations for the explanation of knowledge transfer success. Based on the theory of work performance, it considers ability, motivation, and opportunity as the conditions of an individual enacting the transfer process on the micro level of the general model of the social science explanation.

The following chapters introduce in a first section the theoretical argument of the theory of work performance (ToWP) as the basis its consistent argument and also serving as the theoretical underpinning of this thesis (Chapter 4.2). The next section links the framework of knowledge transfer, ToWP and the general model of social science explanation. Subsequently, Section 4.4 “theory application” defines the theoretical concepts of motivation, ability, opportunity, and performance in the context of knowledge transfer. Afterwards, governance mechanisms (Chapter 4.4.2) and knowledge types (Chapter 4.4.3) are discussed in the light of an individual’s AMO to transfer knowledge. This results in the development of theory-based propositions of their joint effects (Chapter 4.4.4). The final section (Chapter 4.4.5) summarizes the theoretical system of hypotheses.

4.2 Introduction to the theory of work performance

The theory of work performance (ToWP) was developed by BLUMBERG & PRINGLE (1982) and BOXALL & PURCELL (2003). Its intention was to sort the multifaceted antecedents of work performance, which had been a subject of academic research before but “failed to provide strong and consistent predictors.”⁴⁰⁹ The authors examined and organized what was known about performance and its antecedents, defining three basic

⁴⁰⁸ Cf. Foss (2007, 2010).

⁴⁰⁹ Blumberg & Pringle (1982), p. 560.

dimensions of performance: ability, motivation, and opportunity (AMO).⁴¹⁰ With these three dimensions, all antecedents of work performance can be clustered.⁴¹¹ In addition to the careful definition and separation of the three dimensions of work performance, the theory defines an interaction between the three dimensions and therewith explains differences in the work performance of people. The major assumption about people's behavior in the theory of work performance is expressed as a contingency of AMO. Before the ToWP was introduced, behavioral science theories related to job performance focused exclusively on motivation⁴¹² or ability and thus provided explanations only for parts of the social outcome.⁴¹³ The concept of opportunity was re-defined by BLUMBERG & PRINGLE (1983). Opportunity was detached from the concept of ability by separating personal (ability) from environmental (opportunity).⁴¹⁴ The conceptualization of opportunity and the definition of the interaction of all three dimensions is the part of the theory that results in its stability and value for explaining the effect of multifaceted influences on performance for the last 30 years.

4.2.1 Dimensions of work performance: The concepts of ability, motivation and opportunity

Work performance is influenced by an individual's ability, motivation, and opportunity⁴¹⁵:

“**Ability** refers to the personal capacity in terms of knowledge, skills, and experience to perform a task.”⁴¹⁶ People have the ability to perform when they “are able to do the job

⁴¹⁰ The original descriptors of the concept have been capacity, willingness, and opportunity. Over the last 30 years, the HR research community established ability instead of capacity and motivation instead of willingness.

⁴¹¹ Cf. Blumberg & Pringle (1982), p. 560.

⁴¹² Examples for such theories are: A. H. Maslow, "A Theory of Human Motivation," *Psychological Review* 50 (1943): 370-396; J. R. Hackman and G. R. Oldham, *Work Redesign* (Reading, Mass.: Addison-Wesley, 1980); V. H. Vroom, *Work and Motivation* (New York: John Wiley & Sons, 1964); and E. A. Locke, "Toward a Theory of Task Motivation and Incentives," *Organizational Behavior and Human Performance* 3 (1968): 157-189.

⁴¹³ Cf. Pringle & Blumberg (1986), p. 9.

⁴¹⁴ For the discussion of separating the concepts cf. Andrews (1988), Blumberg & Pringle (1982).

⁴¹⁵ Cf. Blumberg & Pringle (1982).

⁴¹⁶ Chang et al. (2012), p. 928.

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because they possess the necessary knowledge and skills.”⁴¹⁷ BLUMBERG & PRINGLE (1983) defined all “physiological and cognitive capabilities that enable an individual to perform a task effectively”⁴¹⁸ to create the ability of an individual. Cognitive capabilities in this context are the innate or trained mental capabilities of a person.⁴¹⁹ The concept of ability thus includes the individual's knowledge, skills, intelligence, age, state of health, level of education, endurance, stamina, energy level, motor skills, and similar variables.⁴²⁰

Motivation is the force that directs individuals towards goals.⁴²¹ People have the motivation to perform when they have the willingness to perform a task.⁴²² More generally spoken, the dimension of motivation is comprised by all “psychological and emotional characteristics that influence the degree to which an individual is inclined to perform a task.”⁴²³ With this definition, BLUMBERG & PRINGLE (1983) include the following in the concept of motivation: job satisfaction, personality, attitudes, norms, values, status, anxiety, task characteristics, job involvement, perceived role expectations, self-image, need states, and closely related concepts.⁴²⁴

Opportunity is “the extent to which a situation is conducive to achieve a desired outcome.”⁴²⁵ People have the opportunity to perform when they have the necessary resources, avenues for expression, and work environment to perform the task.⁴²⁶ BLUMBERG & PRINGLE (1983) state that all effects of the presence and arrangement of facts in the person’s objective environment define the concept of opportunity. Objective environment means that the environment is not in control of the individual

⁴¹⁷ Raiden et al. (2006), p. 884.

⁴¹⁸ Blumberg & Pringle (1982), p. 563.

⁴¹⁹ Cf. Pringle & Blumberg (1986), p. 10.

⁴²⁰ Cf. Blumberg & Pringle (1982), p. 563.

⁴²¹ Cf. Gruen et al. (2007), p. 539.

⁴²² Cf. Raiden et al. (2006), p. 884.

⁴²³ Blumberg & Pringle (1982), p. 563.

⁴²⁴ Cf. Blumberg & Pringle (1982), p. 563, Pringle & Blumberg (1986), p.10.

⁴²⁵ Gruen et al. (2007), p. 539.

⁴²⁶ Cf. Chang et al (2012), p. 928.

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and “beyond simply the individual’s immediate task environment.”⁴²⁷ They defined two dimensions of opportunity: natural conditions and acts of others. These dimensions reflect the effects of e.g. elements of the technical system, physical conditions, actions of co-workers, actions of supervisors, and organizational policies and procedures on performance.⁴²⁸ Table 13 summarizes the three AMO concepts.

Concept	Ability		Motivation		Opportunity	
Definition	Personal capacity to perform a task effectively		Psychological and emotional characteristics that directs individuals towards goals		Presence and arrangement of facts in the person’s objective environment	
Dimen- sions	Personal				Environmental	
	Physio- logical capabilities	Cognitive capabilities	Psycho- logical character- istics	Emotional character- istics	Natural conditions	Acts of others
Examples for ante- cedents	<ul style="list-style-type: none"> • age • state of health • endurance • stamina • energy level • motor skills 	<ul style="list-style-type: none"> • knowledge • skills • intelli- gence • level of education, 	<ul style="list-style-type: none"> • norms • status • task character- istics • job involve- ment • perceived role expecta- tions 	<ul style="list-style-type: none"> • self-image • need states • anxiety • personality • values • attitudes • job satisfac- tion 	<ul style="list-style-type: none"> • elements of the technical system • physical conditions 	<ul style="list-style-type: none"> • actions of co-workers • actions of supervisor • organi- zational policies and proce- dures

Table 13: Overview of the AMO concepts

However, “ability, motivation and opportunity are often specified in relation to a specific task.”⁴²⁹ Consequently, the three mechanisms will be defined to the exact focus of this thesis prior to developing hypotheses (cf. Chapter 4.4.1).

⁴²⁷ Blumberg & Pringle (1982), p. 565.

⁴²⁸ Blumberg & Pringle (1982), p. 563.

⁴²⁹ Chang et al (2012), p. 928.; cf. Gruen et al (2007), p.539.

4.2.2 The magic triangle: Interaction of dimensions of work performance

The central formula of the theory of work performance⁴³⁰ is: The degree to which individuals perform is a function of the three AMO mechanisms.⁴³¹

This formula contains several assumptions and principles, which the theory relies on and which therefore form the basis for any application of this model.

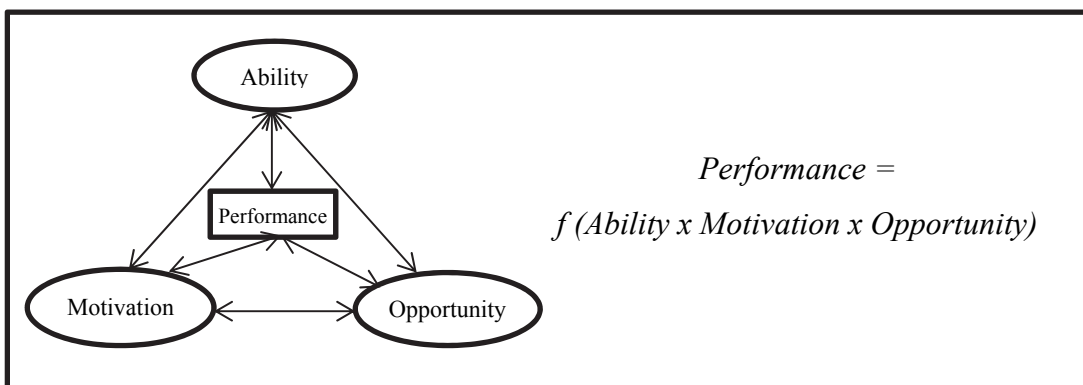


Figure 23: Dimensions of work performance⁴³²

The **first principle** is that each mechanism of AMO “serves only as necessary, but not sufficient condition”⁴³³ for performance. That is, all three AMO mechanisms have to be present to result in performance. Adopted alone, any of these mechanisms is unlikely to affect performance⁴³⁴:

“Even though an individual may be willing, and have the capacity to engage in a given behavioral act, whether or not this act can be consummated depends on the presence and arrangement of facts in the person's objective environment.”⁴³⁵

⁴³⁰ Blumberg & Pringle (1982), Boxall/Purcell (2003); MacInnis/Jaworski (1989); Andrews (1988); Petty/Cacioppo (1986); Chang et al (2012); Jiang et al (2012).

⁴³¹ The interactive relationship between ability and motivation was already adopted by Maier (1955) and Vroom (1964). Blumberg & Pringle (1983) added the dimension of opportunity to the interaction.

⁴³² Adapted from Blumberg & Pringle (1982), p. 565.

⁴³³ Andrews (1988), p. 220.

⁴³⁴ Raiden et al. (2006); Mac Duffie (1995), Ichniowski et al. (1996); Boxall/Purcell (2003); Liao (2005).

⁴³⁵ Blumberg & Pringle (1982), p. 563.

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Assuming each mechanism can vary between zero and some large (but bounded) number, then performance is zero if any of the values is zero.⁴³⁶ Consequently, lower levels of any of the three mechanisms ($\neq 0$) results in decreased levels of performance.

$$\text{Performance (O)} = f(\text{ability (a)} \times \text{motivation (O)} \times \text{Opportunity (o)})$$

Performance thus can take any value between zero and a value n that is bound to the value of the mechanisms. For example, a person with both a high motivation and a high ability would be predicted to choose to perform at a high level. “This action choice taken in conjunction with the opportunity that exists will determine the degree to which this level of performance is achieved.”⁴³⁷ Accordingly, the highest performance can be reached “by assigning the most capable and willing people to the more favorable environmental conditions.”⁴³⁸

BLUMBERG & PRINGLE (1983) theorize that the relative effects of the interdependent AMO mechanisms “probably vary from setting to setting.”⁴³⁹ “For example, opportunity appears to be a critical determinant of performance in coal mines, but it may have less impact in an insurance company.”⁴⁴⁰ Ability, motivation, and opportunity thus are not equally important in every situation, but can be weighted. Nevertheless, a strict interpretation of the model would imply that the effects of motivation, ability, and opportunity must be investigated in any thesis of work performance.⁴⁴¹

The **second principle** of the theory defines the achievement of the single AMO mechanisms themselves. For the effects creating ability, motivation, and opportunity, BLUMBERG & PRINGLE (1982) theorize a summative model:

“[] in a particular situation, capacity to perform might consist of a weighted algebraic sum of the effects of ability, age, and health. Even if one of the

⁴³⁶ Cf. Blumberg & Pringle (1982), p. 565.

⁴³⁷ Cf. Blumberg & Pringle (1982), p. 566.

⁴³⁸ Blumberg & Pringle (1982), p. 566.

⁴³⁹ Blumberg & Pringle (1982), p. 566.

⁴⁴⁰ Blumberg & Pringle (1982), p. 566.

⁴⁴¹ Blumberg & Pringle (1982), p. 566.

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*variables, such as age, were not favorably represented, there still would be some capacity remaining for performing because of favorable levels of ability and health.*⁴⁴²

This implies that even if the value of one antecedent of the mechanism is low or even zero there still would be a remaining portion of A/M/O to affect performance.

$$\text{ABILITY}(x) = v * \text{Ability antecedent 1 } (x) + w * \text{Ability antecedent 2 } (x) + \dots$$

$$\text{MOTIVATION}(x) = v * \text{Motivation antecedent 1 } (x) + w * \text{Motivation antecedent 2 } (x) + \dots$$

$$\text{OPPORTUNITY } (x) = v * \text{Opportunity antecedent 1 } (x) + w * \text{Opportunity antecedent 2 } (x) + \dots$$

The theory defines that an antecedent is not limited to affecting only one mechanism but probably two or all of them.⁴⁴³ For example, high job involvement can create motivation for an individual to perform a job and also provides him with some kind of ability to perform the job. However, the impact on motivation would be anticipated to be higher. Consequently, each antecedent can be theorized to have subsequent or negligible effects on one mechanism.

Neither the complete set of antecedents of each AMO mechanism nor the weights are part of the theoretical foundations. Nevertheless, 30 years of application provide a huge sorted list of antecedents⁴⁴⁴ guiding research but which leaves the freedom to theorize the importance of each antecedent in a certain context.

The **third principle** of the theory is the reverse influence of performance on each AMO mechanism. This means the three mechanisms increase performance and are increased by higher performance:

⁴⁴² Blumberg & Pringle (1982), p. 565.

⁴⁴³ Cf. Argote et al (2003), p. 575.

⁴⁴⁴ Cf. Table 13.

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“At the individual level, performance is determined by opportunity, willingness, and capacity and, in turn, is a partial determinant of each.”⁴⁴⁵

For example, performing in a certain task provides the individual with experience in that task. This experience is a determinant of ability, and thus performance improves the individual's ability.⁴⁴⁶ High performance increases one's job satisfaction wherefore it might reduce one's anxiety about performance, which is an element of motivation.⁴⁴⁷ Finally, an individual's performance “may inspire his or her co-workers to perform better, which in turn may impel the individual to even higher performance.”⁴⁴⁸ This reverse interaction of performance and opportunity can be seen for example at athletic events.

The implications of the three principles for the research question are summarized as follows: Principle 1 states the basic assumption of the framework: AMO are the components of high performance. People perform well when they have the AMO to perform. This principle implies that higher AMO results in a higher performance of an individual. Applied to a specific context, this means e.g. communication effectiveness (as a performance criterion) can be managed by enhancing an individual's level of AMO to communicate.⁴⁴⁹ The higher the AMO of an individual to communicate, the more effective is the communication. With this first principle, the framework offers a structure for identifying desirable components for a high performance organization.⁴⁵⁰ It provides the general structure by which performance can be managed.

Since the absence of any single mechanism removes an essential ingredient for performance⁴⁵¹, the strategic management of performance has to make sure all three AMO mechanisms are present. The second principle structures the connection between the three mechanisms and their antecedents. Thereby it provides the clusters to sort different management practices based on their effect on AMO.

⁴⁴⁵ Blumberg & Pringle (1982), p. 565.

⁴⁴⁶ Cf. Blumberg & Pringle (1982), p. 565.

⁴⁴⁷ Cf. Blumberg & Pringle (1982), p. 565.

⁴⁴⁸ Blumberg & Pringle (1982), p. 565.

⁴⁴⁹ Cf. MacInnis (1991).

⁴⁵⁰ Cf. Raiden et al. (2006), p. 884.

⁴⁵¹ Cf. Gruen et al. (2007), p. 539.

Since the joint effects of governance and knowledge types are in the focus of this thesis, the third principle does not play a central role in the further application of the theory to the knowledge management context. Considering the reactive influence of performance in addition to the complex interaction of knowledge and governance would exceed the scope of this work.

4.3 Theory Linkage: AMO and knowledge transfer in the general model of social science explanation

Representing the “theory” of knowledge management, ARGOTE ET AL. (2003) state: “[P]roperties of the knowledge management context could impact an individual’s ability to create, retain, or transfer knowledge,” [...] “provide people with the motives and incentives to participate in the knowledge management process,” and [...] “provide an individual with the opportunity to create, retain, or transfer knowledge.”⁴⁵² This means, the properties of the knowledge management context (cf. Chapter 3) have effects on an individual’s AMO in addition to the direct effects the KNT framework displays.

ToWP theorizes that AMO impact the peoples’ performance because each different configuration of AMO “can be interpreted as constituting a course of action a person may choose to follow.”⁴⁵³ Combining the two perspectives, this thesis theorizes that the properties of the knowledge management context affect AMO and knowledge transfer success. AMO on its part affects individual behavior resulting in more or less performance in terms of knowledge transfer success.

This combination of theoretical reasoning reflects the general model of social science explanation (cf. Figure 24). Considering the AMO of an individual as the “conditions of individual action” links the general social science model to the view of knowledge management and work performance theory respectively.

⁴⁵² Argote et al. (2003), p. 575.

⁴⁵³ Blumberg & Pringle (1982), p. 566.

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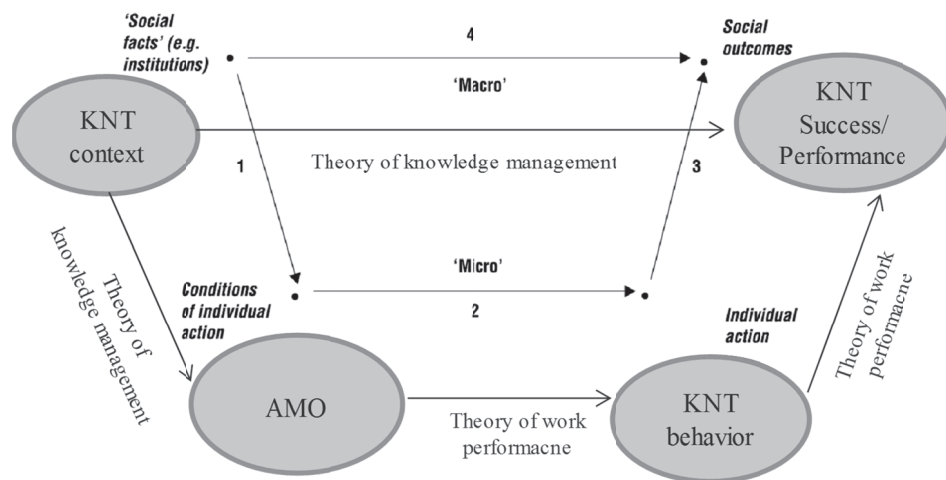


Figure 24: Combining the theory of work performance and knowledge management in the perspective of the general social science model⁴⁵⁴

In the general social science model, the conditions of individual action affect the individual action of people (arrow 2). This relationship reflects the major assumption of the theory of work performance: Each different configuration of the conditions of individual action “can be interpreted as constituting a course of action a person may choose to follow.”⁴⁵⁵ Arrow 3 represents this individual action resulting in social outcomes. The social outcome can be considered the performance dimension of the theory of work performance and represents the success of knowledge transfer in the knowledge management perspective. The impact of the knowledge transfer context on AMO is reflected by arrow 1 in the general social science model. Arrow 4 reflects the direct relationship between the knowledge transfer context and the knowledge transfer success as outlined in the knowledge management framework.

To sum up the theoretical framework: The theory of work performance states that AMO is responsible for a person’s performance. Transferred to the knowledge transfer context, this means the AMO to transfer and receive knowledge is responsible for people’s knowledge transfer behavior that results in the respective levels of knowledge transfer success (arrows 2, 3). The knowledge management framework states that the properties and context of the knowledge transfer affect knowledge transfer success and the AMO of people (arrow 1, 4). Thus a combined consideration reflects the logic of the

⁴⁵⁴ The general social science model was developed by Coleman (1990).

⁴⁵⁵ Blumberg & Pringle (1982), p. 566.

general social science model and provides a stable theoretical framework in which to theorize the roles and effects of governance mechanisms and knowledge types.

4.4 Theory Application

The focus of this thesis is governance mechanisms and their joint effects with different types of knowledge on the knowledge transfer success in buyer-supplier relationships.

In order to explain their joint effects on the social outcome of the knowledge transfer – the knowledge transfer success –, this thesis combines the theory of work performance and the knowledge management perspective and thereby creates a theoretical framework that allows theorizing according to the logic of the general social science model.

In this logic, governance mechanisms and knowledge characteristics are propositions of the knowledge transfer context.⁴⁵⁶ Thus they are interpreted to be “social facts” for buyer and supplier. The arrows 1 and 4 in Figure 24 represent their impact on the AMO of individuals and on the success of knowledge transfer respectively. Arrow 4 represents the direct effects of knowledge type and governance mechanisms on knowledge transfer success whereas arrow 1 suggests an indirect influence via the relationship with AMO. In order to provide a stable system of hypotheses, governance mechanisms as well as knowledge types are discussed in in the light of AMO in the following. First however, definitions of the theoretical concepts that are part of ToWP are defined within the knowledge transfer context and the basic theoretical connection is described.

4.4.1 The theory of work performance in a knowledge transfer context

The theory of work performance (ToWP) has four central concepts: ability, motivation, opportunity, and performance. In order to apply this theory on the knowledge transfer between supplier and buyer, this section specifies these concepts in relation to this specific task. This thesis analyzes exclusively one-directional knowledge transfer from

⁴⁵⁶ Cf. Argote et al (2003).

supplier to buyer. Although important as a research arena, the reverse transfer from buyer to supplier is not the subject of this thesis.

The knowledge management perspective on knowledge transfer requires the four phases of the knowledge transfer process to be completed to transfer knowledge from supplier to buyer.⁴⁵⁷ This process defines knowledge transfer as completed only after the buyer has established the knowledge in his organizational knowledge base.⁴⁵⁸

Two groups of individuals accomplish the tasks of the knowledge transfer: The supplier has the task of transferring the knowledge (i.e. adopting, explaining, and handing it over) whereas the customer has the task of receiving the knowledge (i.e. understanding, using, and integrating it). Consequently, AMO has to be specified for the task of the buyer and the supplier alike.

Already at this point, it shall be noted that this thesis takes the buyer perspective – i.e. it will analyze the performance attributes of the customer team to receive the knowledge exclusively. However, for theoretical completeness and clear separation, AMO is specified for supplier and buyer alike in the following.

4.4.1.1. Ability

Ability refers to “physiological and cognitive capabilities that enable an individual to perform a task effectively.”⁴⁵⁹ It “represents the individual’s skills or knowledge base related to the action.”⁴⁶⁰

In the context of knowledge transfer from supplier to buyer, individuals need the ability to transfer and receive knowledge. Suppliers need the physiological and cognitive capabilities to adapt knowledge to customer needs, to explain it, and to hand it over (tasks of the sender in the knowledge transfer process). Buyers need the physiological and cognitive ability to understand the knowledge in question, use it, and integrate it in their organization (tasks of the receiver in the knowledge transfer process).

Since transfer projects with a pure knowledge focus are not subject to physical work but to mental, the physiological capabilities to transfer knowledge can be neglected, as long

⁴⁵⁷ Cf. Szulanski (1996), Von Krogh/Köhne (1998).

⁴⁵⁸ Cf. Szulanski (1996), Von Krogh/Köhne (1998).

⁴⁵⁹ Blumberg & Pringle (1982), p. 563.

⁴⁶⁰ Siemsen et al. (2008), p. 427 with reference to Rothschild (1999).

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as the individual is in a health condition allowing work; i.e. as long as he or she is not suffering illnesses that would require sick leave. Ability to transfer knowledge thus can be defined as the cognitive (mental) capabilities to receive and transfer knowledge. These capabilities are his or her knowledge as well as skills about and during the transfer and reception of knowledge.⁴⁶¹ The supplier with a high ability knows how to enact the transfer, how to explain the knowledge, and how it is adapted to the specific context of the buyer e.g. in terms of branch-, company-, or country-specific requirements. The buyer with a high ability knows how to receive and use the knowledge. He has the knowledge and skills to draw knowledge from an external supplier, he knows the procedure of a transfer project and is familiar with the knowledge context.

With these capabilities, both parties of the transfer may work at a high performance, i.e. a high ability to transfer and receive knowledge leads to a high success in knowledge transfer.⁴⁶²

4.4.1.2. Motivation

Motivation is the force that directs individuals towards goals.⁴⁶³ It is defined by “psychological and emotional characteristics that influence the degree to which an individual is inclined to perform a task.”⁴⁶⁴

In the knowledge transfer context, motivation is the supplier’s desire and readiness to transfer the knowledge of interest and the buyer’s desire and readiness to absorb the knowledge respectively.⁴⁶⁵ The motivated supplier is energized, willing, and ready to teach the knowledge of interest. The motivated buyer is energized, willing, and ready to learn and absorb the knowledge of interest. “Motivation [...] plays a critical factor in determining the level of engagement in the transfer process for both the buyer firm and the supplier firm.”⁴⁶⁶ Conceptual as well as empirical research has highlighted the

⁴⁶¹ Cf. Siemsen et al. (2008), p. 427

⁴⁶² Cf. Argote et al. (2003), P. 575.

⁴⁶³ Cf. Gruen et al. (2007), P. 539.

⁴⁶⁴ Blumberg & Pringle (1982), p. 563.

⁴⁶⁵ Siemsen et al. (2008), p. 432.

⁴⁶⁶ Squire et al. (2009), p. 467.

pivotal role of motivation as a determinant of successful knowledge sharing.⁴⁶⁷ Common sense says that if a person does not want to share knowledge, there will be no knowledge sharing.⁴⁶⁸ Thus a project team that is provided with highly motivated suppliers and buyers performs on a high level in terms of successful knowledge transfer.⁴⁶⁹

4.4.1.3. Opportunity

Opportunity is “the extent to which a situation is conducive to achieve a desired outcome.”⁴⁷⁰ With reference to MACINNIS AND JAWORSKI (1989), situational factors that enhance or limit the achievement of a desired outcome are for example the time available, the attention paid, the number of distractions, the number of repetitions, or the availability of something.⁴⁷¹ Thus in this thesis, the opportunity to transfer knowledge is defined as “the combination of direct and, at least in the short run, uncontrollable factors surrounding”⁴⁷² the supplier and buyer. In other words, the opportunity to transfer knowledge is the task environment that inhibits or enables the sharing or reception of knowledge.

Opportunity can be considered from two different angles. A positive perspective on the opportunity of a situation indicates factors facilitating the creation of a conducive context.⁴⁷³ This perspective is used in situations that are time-constrained (e.g. face-to-face user group or association meetings) because the given opportunity need to be used as effectively as possible. This means participants will concentrate on factors that provide as much opportunity as possible.

In situations that are not time-constrained (e.g. online user groups, that can meet when and where they like), the perspective on the opportunity of the situation needs to be negative. This perspective indicates factors that impede the given opportunity, e.g.

⁴⁶⁷ Cf. Argote et al. (2003); Van Wijk et al. (2008).

⁴⁶⁸ Siemsen et al. (2008), p. 432.

⁴⁶⁹ Cf. Argote et al. (2003), p. 575; Osterloh/Frey (2000).

⁴⁷⁰ Gruen et al. (2007), p. 539.

⁴⁷¹ Cf. MacInnis/Jaworski (1989); Gruen et al. (2007).

⁴⁷² Siemsen et al. (2008), p.433.

⁴⁷³ Cf. McAlexander et al. (2002).

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problems of bandwidth, firewalls, or company policies. All of them pose obstacles to the opportunity to participate.

The project character of a buyer-supplier relationships limits the time available to transfer the knowledge. First, because the overall project duration is limited. Second, because the tasks of the participants are not limited to this one project but their attention needs to be apportioned to several projects and tasks in their organizations. This applies both to the supplier's as well as for the buyer's team members. In the context of this thesis, the situation can be considered time-constrained, and the positive perspective of opportunity is relevant.

A situation that is positive and conducive to a transfer of knowledge provides supplier and buyer with all the environmental needs to accomplish the four phases of knowledge transfer: It provides the time and means to teach and learn as well as opportunities to evaluate and test the knowledge and its use. A high opportunity environment has policies that create acts of others that are beneficial to solving the task like frequent and intense communication. When a knowledge transfer project offers an environment that provides these opportunities to transfer and receive knowledge for the project team, the knowledge transfer is suggested to be highly successful.⁴⁷⁴

4.4.1.4. Performance

The performance in the focus of this thesis is the success of knowledge transfer between supplier and buyer. Success of knowledge transfer in this thesis is defined as the accomplishment of the four stages of knowledge transfer (cf. Chapter 2). Accordingly, the performance in knowledge transfer success is defined by the extent to which knowledge has been integrated.⁴⁷⁵

The description of the organizational integration phase (phase 4)⁴⁷⁶ asks for the institutionalization of routines, roles, and responsibilities, joint experience with the knowledge and a reasonable behavior. Considering this process from an organizational

⁴⁷⁴ Cf. Argote (2003), p. 575.

⁴⁷⁵ This view is completely different from the knowledge base view, which would define success by the extent of knowledge that has been integrated. The knowledge base view focuses on how much knowledge is integrated whereas the process-oriented view is interested in how deep the knowledge is integrated.

⁴⁷⁶ Cf. Chapter 2.

learning perspective, the organizational integration is successful when many individuals on the recipient side have understood⁴⁷⁷ the knowledge, repatriated and absorbed the knowledge⁴⁷⁸, and the organization is able to create and manage the new organizational knowledge independently⁴⁷⁹. Organizational knowledge includes the interaction patterns among individuals either within a functional area or across functional areas. Thus it is more than the sum of individual knowledge.⁴⁸⁰

In order to propose the micro level relationships of the general model of social science explanation (cf. Figure 24) this thesis draws from the pure logic of ToWP and its application to knowledge transfer as described above. The basic theoretical propositions to describe how the conditions of individual action (AMO) affect the performance outcome of knowledge transfer success are:

H1: The higher a) the motivation, b) the ability, and c) the opportunity of the customer to receive the knowledge, the higher the knowledge transfer success.

4.4.2 Governance mechanisms and their impact on knowledge transfer success

Governance in the knowledge transfer context of this thesis is defined as the mode of organizing the transfer of knowledge from supplier to buyer. Governance mechanisms have the goal to coordinate and control moral hazard and adverse selection.⁴⁸¹ As introduced in Chapter Two, organizational design scholars established two common approaches to coordinating inter-firm-transactions and coping with these challenges: the use of formal governance mechanisms and the use of relational governance mechanisms.⁴⁸² These approaches separate governance mechanisms by their function in

⁴⁷⁷ Cf. Simonin (1999), p.601.

⁴⁷⁸ Cf. Simonin (1999), p.597.

⁴⁷⁹ Cf. Simonin (1999), p.600.

⁴⁸⁰ Cf. Jane Zhao, Anand (2009), pp. 960ff.

⁴⁸¹ Cf. Williamson (1975); Richter/Furbotn (2003); Mishra et al.(1998).

⁴⁸² Cf. Hoetker/Mellewigt (2009), Dekker (2004), Martinez/Jarillo (1989).

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order to specify their outcome or a behavior⁴⁸³ in advance, in contrast to their dependence on specific people and their relationship.⁴⁸⁴

The table below summarizes the central characteristics, coordination approaches, and bases of the two types of governance mechanisms as introduced in Chapter Two. Additionally, it presents the two underlying managing mechanisms this thesis is going to argue with: These consist of structures and targets. Formal mechanisms try to limit the consequences of moral hazard and adverse selection by setting targets for the expected outcome or behavior and monitoring these.⁴⁸⁵

Relational mechanisms, on the other hand, try to limit the actual need and danger of moral hazard and adverse selection by enhancing information sharing.⁴⁸⁶ Their underlying management mechanism is trust.⁴⁸⁷ Trust represents “positive expectations about another’s motives with respect to oneself in situations entailing risk”⁴⁸⁸, and “trust mitigates the extent of the uncertainty that exists between organizations which cannot control one another’s actions[;] it discourages opportunistic behavior [...]”⁴⁸⁹ Thus trust enhances the “opportunity for greater information sharing over time.”⁴⁹⁰

In summary, the formal mechanisms rather coordinate the efforts of partners⁴⁹¹ whereas informal mechanisms coordinate the partners (people).⁴⁹²

⁴⁸³ Cf. Dekker (2004).

⁴⁸⁴ Cf. Hoetker/Mellewigt (2009), p. 1027.

⁴⁸⁵ Sawers et al. (2008), p. 176.

⁴⁸⁶ Sawers et al. (2008), p. 177.

⁴⁸⁷ Cf. Eisenhardt (1985), Hoetker/Mellewigt (2009).

⁴⁸⁸ Boon and Holmes (1991), p. 194.

⁴⁸⁹ Hart and Saunders (1997), p. 30.

⁴⁹⁰ Hart and Saunders (1997), p. 30.

⁴⁹¹ Cf. Gulati (1995); Ryall and Sampson (2006); Sobrero and Schrader (1998).

⁴⁹² Sawers et al. (2008), p. 176.

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Governance approach	Formal	Relational
Central characteristics ⁴⁹³	Specifying and stipulating their outcome or a behavior in advance ⁴⁹⁴	Outcome cannot be pre-specified: it depends on interaction of individuals ⁴⁹⁵
	Independent of specific people involved ⁴⁹⁶ , “separated from the specific people and their relationships”	It matters who is involved
Coordination approach	Coordinating by structuring information flows and parties’ actions ⁴⁹⁷ (specifying roles, performance expectations, resolution mechanisms ⁴⁹⁸)	Coordinating by creating inter-firm communication and coordination routines ⁴⁹⁹
Reliance on:	Operating based on financial parameters and the drafting and implementation of formal contracts ⁵⁰⁰ , enforceable rules or standard procedures.	Operating based on trust, dependence, and cooperation ⁵⁰¹
Underlying managing mechanisms	Structures and targets	Cooperation & trust

Table 14: Underlying managing mechanisms of formal and relational governance mechanisms

4.4.2.1. Direct effects of governance on knowledge transfer success (arrow 4)

The state of the art analysis showed that both types of mechanisms have positive effects on the success of different stages of knowledge transfer (depending on the perspective of knowledge transfer success: knowledge base, performance, or process view). “Individuals can ease transfer difficulties by setting up communication channels, providing opportunities for dialogue, improving situations for team learning, and building informal ties (Argote et al., 2003; Uzzi & Lancaster, 2003; Zoogah, Vora, Richard, & Peng, 2011).”⁵⁰² Likewise, formal mechanisms, such as for example detailed legal knowledge transfer clauses, are effective in motivating knowledge disclosure.⁵⁰³

⁴⁹³ Developed by Hoetker/Mellewigt (2009).

⁴⁹⁴ Cf. Dekker (2004).

⁴⁹⁵ Cf. Das and Teng (1998); Makhija and Ganesh(1997); Williamson (1979); Sobrero/Schrader (1998).

⁴⁹⁶ Cf. Telser and Higinbotham (1977); Williamson (1979).

⁴⁹⁷ Cf. Galbraith (1977); Gulati and Sytch (2005).

⁴⁹⁸ Cf. Poppo and Zenger (2002).

⁴⁹⁹ Cf. Dyer/Singh (1998), Eisenhardt (1985), Hoetker/Mellewigt (2009).

⁵⁰⁰ Cf. Ferguson, Paulin, and Bergeron (2005), p.217.

⁵⁰¹ Cf. Eisenhardt (1985), Hoetker/Mellewigt (2009).

⁵⁰² Chang et al (2012), p. 930.

⁵⁰³ Cf. Faems et al. (2007).

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This thesis analyses knowledge transfer success from a process perspective. Thus the organization's performance in managing the new organizational knowledge independently⁵⁰⁴ is the value that needs to be governed. Knowledge integration (independent management of the new knowledge) is as endangered by moral hazard and adverse selection as every other inter-organizational outcome, because asymmetric information is the initial characteristic of the relationship, especially in a sender-receiver knowledge transfer. Thus, in line with the existing research on the governance of knowledge transfer success based on the theoretical arguments of TCE and relational theory, this thesis adopts the established hypotheses for positive effects of governance mechanisms on knowledge transfer success and proposes:

H2: The more relational governance is used, the higher is the knowledge transfer success.

H3: The more formal governance is used, the higher is the knowledge transfer success.

4.4.2.2. Indirect effects of governance on knowledge transfer success (arrow 1)

In addition to the direct effects of governance on knowledge transfer success, the micro level of the general model of social science explanation defines an indirect effect of governance mechanisms on knowledge transfer success. The application of ToWP on the knowledge transfer context defines the success of knowledge transfer as a performance dimension. A performance in knowledge transfer is dependent on the AMO to receive the knowledge. Consequently, the function of governance in knowledge transfer is also the coordination and control of AMO. In order to govern the transfer, the AMO of people that have to receive this knowledge has to be managed.⁵⁰⁵ Therefore, the governance system with all its mechanisms needs to be designed to

⁵⁰⁴ Cf. Simonin (1999), p.600.

⁵⁰⁵ This logic of application can be compared to that used by TCE to theorize governance effects based on their opportunism or uncertainty-solving capabilities. In contrast to the TCE that argues from a cost or problem avoidance perspective, ToWP argues from a value-enhancing perspective.

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maximize the AMO of buyers.⁵⁰⁶ It can be viewed as a composition of the three dimensions intended to enhance the customer's ability, motivation, and opportunity, respectively. CHANG ET AL. (2012) showed that it is fruitful to conceptualize the capabilities of expatriates as falling into one of the dimensions of AMO, and JIANG ET AL. (2012) showed the same for HR practices. In line with these recent approaches this thesis theorizes an AMO-creating function of the traditional governance clusters of formal and relational mechanisms and thereby its indirect effect on knowledge transfer success, respectively.

The general assumptions of the following propositions thus are:

- a) Governance mechanisms can create different conditions of individual actions for a person (in terms of ability, motivation, or opportunity).
- b) These conditions cause different behavior of people and thus explain different outcomes in knowledge transfer success (H1a-c).

In other words, the effects of relational and formal governance on knowledge transfer success are mediated by the conditions of individual action (AMO).

The positive, direct effects of MAO on knowledge transfer success have already been derived by H1a-c. Thus for theorizing the mediation role of the individual performance of the customer team (AMO), the question is: How do relational and formal governance mechanisms affect the motivation, ability, and opportunity of the customer to receive the knowledge?⁵⁰⁷

The table below provides an overview of the structure of the following hypotheses and summarizes the underlying managing mechanisms that are crucial for the development of propositions.

⁵⁰⁶ In a professional buyer-supplier relationship, the AMO of the supplier is equally important. For reasons of scope, the author had to choose one side of the transfer partners.

⁵⁰⁷ To theorize a mediation role of AMO the effects of governance mechanisms on AMO shall be theorized profoundly in addition to the effects of AMO on KNT success. A lack of theoretical reasoning for either connection results in impossibility to theorize a mediation effect. (Cf. Baron & Kenny (1986))

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			Type of governance mechanisms	
			Formal	Relational
		Underlying, managing mechanisms ⁵⁰⁸	Structures & targets	Cooperation & trust
Conditions of individual performance	Motivation	Relevance of the task Consequences of the task	H3a (+)	H2a (+)
	Ability	Familiarity with knowledge structure	H3b (0)	H2b (+)
	Opportunity	Distance: physically or psychologically ⁵⁰⁹	H3c (0)	H2c (+)

Table 15: Structure of mediation hypotheses for governance effects

4.4.2.2.1. Mediation effect of motivation

Motivation is the force that directs individuals towards goals.⁵¹⁰ The motivation of the customer to receive the knowledge was defined as the direction and intensity of the willingness to receive the knowledge.

Influencing the motivation of people to achieve a certain behavior has been the subject of motivation theory for years.⁵¹¹ Research on motivation differentiates extrinsic and intrinsic motivation.⁵¹² Intrinsic motivation results from a person's values in context to the task. "Motivation is intrinsic if an activity is undertaken for the immediate satisfaction of one's needs."⁵¹³ It is the willingness to do something because it gives the person joy or personal fulfillment whereas extrinsic motivation is the willingness to do something because the persons gains benefits for it. "Intrinsic motivation can be directed"⁵¹⁴ but it is fostered by the commitment to the work itself, which must be both satisfactory and fulfilling for the employees."⁵¹⁵ Intrinsic motivation thus can be managed only by increasing the relevance of the task for a person.^{516, 517}

⁵⁰⁸ For the central mechanisms that manage the levels of motivation, ability and opportunity cf. the work of Andrews (1988), Batra/Ray (1986), and Petty/Cacioppo (1986).

⁵⁰⁹ Argote et al. (2003), p. 575.

⁵¹⁰ Cf. Gruen et al. (2007), p. 539.

⁵¹¹ Cf. Siemsen et al (2008), p.430; Latham (2006).

⁵¹² Cf. Osterloh (2002), p. 64.

⁵¹³ Osterloh (2002), p. 64.

⁵¹⁴ Osterloh (2002), p. 64.

⁵¹⁵ Osterloh (2002), p. 64.

⁵¹⁶ CF. Andrews (1988), p. 221.

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Extrinsic motivation comes from other reasons than the actual subject of action.⁵¹⁸ The action is taken because of the consequences of the action⁵¹⁹ – e.g. to avoid punishment or gain benefits.⁵²⁰ Thus extrinsic motivation can be managed by adapting the consequences of people's actions.

Formal governance mechanisms depend on structures with the goal to set and monitor targets. These targets define the consequences of the transfer action. Consequently, formal mechanisms can operate only as extrinsic motivation.⁵²¹ WANG ET AL. (2008) for example state that “[c]ontractual governance also explicitly defines the division of benefits arising from creative thinking and heightens the motivations for and interest in creating value (Ghosh & John, 1999).”⁵²² Thus if the customer wants this consequences in terms of results and wants to avoid the consequences in terms of specified penalties, he has to direct his willingness toward the integration of the knowledge. In other words, formal mechanisms increase the intensity of the willingness and define the direction of this willingness by specifying the expected outcomes of the transfer or the explicit behavior of people.

Established formal governance mechanisms which increase the intensity of someone's willingness are for example providing incentives, career opportunities, or promotions to the employees.⁵²³ In addition, WANG ET AL. (2008) found that contractual mechanisms encourage a learning orientation and motivate top management support.⁵²⁴

⁵¹⁷ The theoretical work of Andrews (1988), Batra/Ray (1986), and Petty/Cacioppo (1986) defined more mechanisms as able to affect motivation. However, explaining the effect of governance through the relevance of the task was most suitable.

⁵¹⁸ Cf. Myers (2004), p. 330 f.

⁵¹⁹ The theoretical work of Andrews (1988), Batra/Ray (1986), and Petty/Cacioppo (1986) defined this as the “need for cognition”.

⁵²⁰ Cf. Myers (2004), p. 330 f.

⁵²¹ Foss et al. (2010:471) even state that high-powered performance incentives or extensive monitoring can even perceived as controlling, which can reduce the motivation to share knowledge.

⁵²² Wang et al.(2008), p. 117.

⁵²³ Cf. Jian et al. (2012), p.1267; Osterloh (2002), p.64.

⁵²⁴ Wang et al.(2008), p. 117.

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The direction of the willingness, i.e. the active integration of knowledge, can be coordinated by clearly laying out the goals and work targets of the project to each person.⁵²⁵ “Targets foster hard work and clear, precise effort on the project.”⁵²⁶ Thus “when management clearly specifies engaging and challenging performance targets, the team has a clear goal.” This clear goal “can lead to better outcomes by providing a focus that will motivate a search for information that will help achieve that goal.” “In contrast, a lack of clear project goals or continuously shifting goals and product definitions makes it difficult for a team to achieve positive outcomes promptly.”⁵²⁷

In summary, by defining structures and targets, formal mechanisms create extrinsic motivation, because they define the consequences of actions that people engage in and direct their engagement towards. ToWP defines motivation as causal for the success of knowledge transfer (H1a). Taken together, an indirect effect of formal governance on knowledge transfer success via motivation is defined. This means that formal governance increases knowledge transfer success because it increases motivation.

However, the general model of social science explanation also implies direct effects of formal governance (H3) on knowledge transfer success. Thus, motivation is considered only partly relevant to explaining this direct effect. In other words, the theoretical approach does not predict that the entire effect of formal governance works through motivation but predicts partial mediation by motivation.

H3a: The positive effect of formal governance on knowledge transfer success is mediated by the motivation of the customer to receive the knowledge.

Relational mechanisms rely on cooperation with each other. When applying relational mechanisms, there is no defined outcome since the outcome of cooperation cannot be pre-specified in advance. However, through cooperation, relational governance mechanisms increase the job involvement of the customer, e.g. through joint problem

⁵²⁵ Cf. Bstieler/Hemmert (2010), p. 490.; Siemsen et al.(2008), p. 430.

⁵²⁶ Bstieler/Hemmert (2010), p. 490; Bonner et al.(2002); Hackman (1987).

⁵²⁷ Bstieler/Hemmert (2010), p. 490; Cf. Barczak/Wilemon (2003).

solving. Being involved in a task affects the personal relevance of the task.⁵²⁸ Tasks that are relevant to people are first of all done for their own purposes but not to achieve consequences. Thus the reason why relational governance mechanisms can increase motivation to receive knowledge is by addressing the intrinsic motivation of the customer. They increase the relevance of the integration activity.

Cooperation has an additional motivation aspect. If there is a cooperative relationship, people can relax and concentrate on the integration of the knowledge instead of checking each other. “A high level of trust contributes to information sharing and learning because decision makers do not feel that they have to protect themselves from the other’s opportunistic behavior (Child and Faulkner 1998).”⁵²⁹ In contrast, without trust, people “are unwilling to take the risks associated with sharing more valuable information.”⁵³⁰ People that cooperate with each other trustfully may have the desire to reciprocate and maintain a balanced relationship.⁵³¹ Consequently, they are not motivated by the task to receive knowledge but by the way it is done. Being motivated by the desire to work this way therefore means being motivated by the consequences of actions. “Social relationships also provide individuals with the incentives to participate in the process.”⁵³² Therefore relational mechanisms also have extrinsic motivation effects.

In summary, through cooperative trustful interaction, relational mechanisms create intrinsic motivation, because they make the knowledge integration personally relevant for the people involved. In addition, they serve as extrinsic motivation because they create a desirable way of working that the participants want to maintain.

Since ToWP defines motivation as causal for the success of knowledge transfer, the described effect of relational governance mechanisms on motivation defines that relational governance mechanisms have an indirect effect on knowledge transfer

⁵²⁸ Cf. Andrews (1988), p. 221.

⁵²⁹ Inkpen, Pien (2006), p. 783.

⁵³⁰ Inkpen, Pien (2006), p. 783.

⁵³¹ Cf. Reagans/McEveil (2003); Granovetter (1973); Heider (1958).

⁵³² Argote et al. (2003b), p. 475.

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success. In other words, relational governance mechanisms increase knowledge transfer success because they increase motivation.

However, the general model of social science explanation also implies direct effects of relational governance (H3) on knowledge transfer success. Thus, motivation is considered only partly relevant to explain this direct effect. In other words, the theoretical approach does not predict that the entire effect of relational governance works through motivation but predicts partial mediation by motivation.

H2a: The positive effect of relational governance on knowledge transfer success is mediated by the motivation of the customer to receive the knowledge.

4.4.2.2.2. Mediation effect of ability

“Ability refers to the personal capacity in terms of knowledge, skills, and experience to perform a task.”⁵³³ People have the ability to perform when they “are able to do the job because they possess the necessary knowledge and skills.”⁵³⁴ BLUMBERG & PRINGLE (1983) defined all “physiological and cognitive capabilities that enable an individual to perform a task effectively”⁵³⁵ to create the ability of an individual. Thus governance mechanisms (GMs) that enhance the ability to receive knowledge are those governance mechanisms that increase the buyer’s physiological and cognitive ability to understand the knowledge in question, use it, and integrate it into their organization.

Physiological capabilities and cognitive capabilities are innate, can be trained, or result from experience.⁵³⁶ Experience results in the capacity to understand knowledge because in areas where people have previous experience, they learn or absorb knowledge by associating it with what they already know. Training provides people with a familiarity of tasks, because the training situation is similar to the real life task. “Similarity between tasks makes the transfer easier.”⁵³⁷

⁵³³ Chang et al. (2012), p. 928.

⁵³⁴ Raiden et al (2006), p. 884.

⁵³⁵ Blumberg & Pringle (1982), p. 563

⁵³⁶ Cf. Argote et al. (2003), p. 575 with reference to Nadler et al. (2003).

⁵³⁷ Argote et al. (2003), p. 575 with reference to Darr/Kurtzberg (2000).

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The underlying concept to influence ability thus is familiarity⁵³⁸ with the knowledge structure (or scheme).

“A knowledge structure (or scheme) is a mental template that individuals impose on an information environment to give it form and meaning (Chase & Simon, 1973). Built on past experiences with a particular concept, type of stimulus, or information domain, a knowledge structure lies at the heart of ‘expertise’ (Hogarth, 1987); it facilitates the encoding and retrieval of information from memory (Anderson & Pichert, 1978), provides experts with a reliable basis for making inferences (Snyder & Urbanowitz, 1978), and speeds problem solving (Taylor et al., 1978).”⁵³⁹

Companies engage in buyer-supplier relationships for knowledge transfer because they want to receive new knowledge. Thus the total⁵⁴⁰ knowledge structure is always new to the buyer. The question is how relational and formal mechanisms might affect the development of knowledge structures for this new knowledge.

Relational mechanisms operate based on cooperation and trust and rely on socialization mechanisms (social control).⁵⁴¹ They establish frequent interaction between the buyer and the supplier of the knowledge. This personal interaction helps the buyer to become “familiar with the particular information domain, its semantics (vocabulary, facts, symbols, etc.) and episodes (the various types of challenges or problem settings encountered in the domain).”⁵⁴² Furthermore, using the mechanisms “training, and/or experimentation, the individual begins to form weak cause/effect cognitive linkages between the semantics and hypotheses as to how the various episodes might moderate the interpretation of the semantics.”⁵⁴³ In other words, cooperation

⁵³⁸ Familiarity is a determinant of ability also focused on in the marketing research application of the AMO-concept. Cf. for example Andrews (1988), Batra/Ray (1986), and Petty/Cacioppo (1986).

⁵³⁹ Lubatkin et al. (2001), p. 1355

⁵⁴⁰ Parts of the knowledge structure are present because the buyer identified this knowledge to be worth buying. To identify the value of the knowledge, he needed to know at least the context or aligning knowledge.

⁵⁴¹ Cf. Dyer/Singh (1998), Eisenhardt (1985), Dekker (2004); Hoetker/Mellewig (2009).

⁵⁴² Cf. Lubatkin et al. (2001), p. 1355.

⁵⁴³ Lawson et al. (2009), p. 159.

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enables the buyer to perform two stages⁵⁴⁴ of developing knowledge structures and thus ability: developing know-what and developing know-how.⁵⁴⁵

This means that as relational governance mechanisms rely on cooperation they have the function to increase ability. LAWSON (2009) for example argues that cooperation in terms of “socialization mechanisms improve the compatibility of operating styles, enabling the partners to ‘communicate with each other, having a language that they all understand [and] behavioral styles that are compatible’ (Lorange, 1988, p. 372). “⁵⁴⁶ Cooperation in terms of “joint problem solving” enables the two parties to learn the decision structure of the respective other party and thus to gain familiarity with the underlying knowledge.⁵⁴⁷ Finally, a prominent example for the ability-increasing function of relational mechanisms is the mechanism of “personnel transfer.” “Toyota transfers its personnel to the supplier (on a temporary or permanent basis) to increase the supplier's ability to assimilate and apply the new knowledge.”⁵⁴⁸

In summary, relational governance mechanisms increase the ability of the buyer to receive the knowledge because the frequent contact in cooperative relationships leads to more effective communication through the development of relationship-specific heuristics.⁵⁴⁹ Considering the direct effect of relational governance mechanisms from this perspective, parts of this effect can be explained by the effect relational governance mechanisms have on the ability of the buyer to receive the knowledge. In other words, relational governance increases knowledge transfer because it increases ability.

However, the general model of social science explanation also implies direct effects of relational governance (H3) on knowledge transfer success. Thus, ability is considered only partly relevant to explaining this direct effect. In other words, the theoretical approach does not predict the entire effect of relational governance working through ability but predicts partial mediation by ability.

⁵⁴⁴ Cf. Fiske & Dyer (1985).

⁵⁴⁵ Cf. Lubatkin et al. (2001), p. 1355.

⁵⁴⁶ Lawson et al. (2009), p. 159.

⁵⁴⁷ Cf. Bstieler, Hemmert (2010).

⁵⁴⁸ Dyer, Singh 1998, p. 666.

⁵⁴⁹ Cf. Uzzi (1997); Reagans/McEveil (2003).

H2b: The positive effect of relational governance on knowledge transfer success is mediated by the ability of the customer to receive the knowledge.

Formal mechanisms do not depend on specific people and their relationships⁵⁵⁰ but specify an outcome or a behavior⁵⁵¹. The absence of personal contacts clearly disables the development of relationship-specific heuristics. By concentrating on defining the outcomes, formal mechanisms do not manage to “form cause/effect cognitive linkages between the semantics and hypotheses as to how the various episodes might moderate the interpretation of the semantics.”⁵⁵² As a result, defining structures and targets cannot increase the familiarity with the know-how; i.e. the second stage of the development of knowledge structures cannot be completed.

However, what can be done with structures and targets is specifying the know-what. Detailed transfer outcomes, as for example single milestones or tasks that need to be done, can create “familiarity with the particular information domain, its semantics (vocabulary, facts, symbols, etc.) and episodes (the various types of challenges or problem settings encountered in the domain)”⁵⁵³. Giving such detailed structures of the knowledge components or the transfer process, the buyer’s familiarity with the new information increases, because he obtained more detailed information about it. ARGOTE ET AL. (2003) for example mentioned transactive memory systems and common short-hand languages as affecting the ability of a person to transfer knowledge. Such systems help the sender and receiver of the knowledge to understand each other because their potential knowledge bases are aligned in one language. Still, this is limited to the information, the know-what, and the components of the knowledge but not to the interaction of the components, their usage, and their effects (their know-how).

⁵⁵⁰ Cf. Hoetker/Mellewigt (2009), p. 1027.

⁵⁵¹ Cf. Dekker (2004).

⁵⁵² Lawson et al. (2009), p. 159.

⁵⁵³ Lawson et al. (2009), p. 159.

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In summary, formal mechanisms are able to increase⁵⁵⁴ information by defining detailed targets or transfer structures but they cannot increase the buyer's familiarity with the underlying knowledge structure of the know-how. Since this thesis focuses on buyer-supplier relationships with a pure knowledge focus, the information-enhancing effect of formal governance mechanisms is necessary but not sufficient in order to affect the ability of the buyer to receive the knowledge. Thus a negligible effect of formal governance on the ability to receive knowledge is proposed. Without a significant relationship between formal governance mechanisms and the ability to receive knowledge, ability cannot operate as a mediator for formal governance.⁵⁵⁵

H3b: The effect of formal governance on knowledge transfer success is negligibly⁵⁵⁶ mediated by the ability of the customer to receive the knowledge.

4.4.2.2.3. Mediation effect of opportunity

Opportunity is "the extent to which a situation is conducive to achieve a desired outcome."⁵⁵⁷ A situation is formed by the natural conditions and the acts of others.⁵⁵⁸ With reference to MACINNIS AND JAWORSKI (1989), situation factors that enhance or limit the achievement of a desired outcome are for example the time available, the attention paid, the number of distractions, the number of repetitions, or the availability

⁵⁵⁴ It is important to differentiate increasing personal ability from providing ability for the transfer. Formal mechanisms such as for example the staffing of a transfer project define the ability status of the people involved but they do not increase their personal ability.

⁵⁵⁵ Cf. Hair et al. (2013), Baron & Kenny (1986).

⁵⁵⁶ While it is generally inappropriate to test a null hypothesis, Cohen (1988, 1990) notes that the absence of a relationship is a valid phenomenon of interest when a theory calls into question previously accepted relationships. Since formal and relational governance mechanisms have both been proposed to govern buyer-supplier relationships without reference to the AMO of individuals involved, Hypothesis 3b and the following 0-hypotheses represent such questioning and are thus appropriate to be tested.

⁵⁵⁷ Gruen et al. (2007), p. 539.

⁵⁵⁸ Cf. Pringle /Bumberg (1986), p.12.

of something.⁵⁵⁹ In other words, people have the opportunity to perform a task when they have the necessary resources, avenues for expression, and work environment.⁵⁶⁰

The opportunity to process information is influenced by the factors distraction, exposure time, message length, message comprehensibility, number of message arguments, and message medium clutter.⁵⁶¹ ARGOTE ET AL. (2003) summarized these factors for the knowledge management contexts: Direct or indirect experience that provides individuals with the opportunities for learning and knowledge transfer creates effective knowledge management.⁵⁶² Thus opportunity to receive the knowledge means having the time and means to learn as well as opportunities to evaluate and test the knowledge and its use.

The underlying principle of the factors creating opportunity is to reduce the distance either physically or psychologically between people⁵⁶³ in order to let the knowledge flow. When buyer and supplier are physically close, the buyer can learn by observation (indirect experience by watching a task) or accumulate knowledge directly. When people are psychologically close, they create a proximity of knowledge⁵⁶⁴ e.g. they know who knows what and where to search.

Relational mechanisms operate based on cooperation and trust and rely on socialization mechanisms (social control).⁵⁶⁵ Since relational mechanisms depend on the repeated interaction of personnel⁵⁶⁶, they decrease both the physical as well as the psychological distance between buyer and supplier. One example for relational governance mechanisms is shared problem solving and decision making. It creates contact between the buyer and the supplier as well as proximity of knowledge, because it gives people the opportunity to understand the underlying principles of the knowledge in question and how they can be dealt with. In line with this argumentation,

⁵⁵⁹ Cf. MacInnis/Jaworski (1989), Gruen et al. (2007).

⁵⁶⁰ Cf. Chang et al (2012), p. 928.

⁵⁶¹ Cf. Andrews (1989).

⁵⁶² Cf. Argote et al. (2003), p. 575f.

⁵⁶³ Argote et al. (2003), p. 575.

⁵⁶⁴ Cf. Argote et al. (2003), p. 576.

⁵⁶⁵ Cf. Dyer/Singh (1998); Eisenhardt (1985); Dekker (2004); Hoetker/Mellewigt (2009).

⁵⁶⁶ Cf. Hoetker/Mellewigt (2009), p. 1029.

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BSTIELER/HEMMERT (2010) found that shared problem solving is positively related to learning in inter-organizational new product development teams.

To put this more generally, reduced physical distance results from the simple fact that relational mechanisms always create contact between buyer and supplier. Reduced psychological distance results from the cooperative approach of relational governance mechanisms to create trust. “Trust mitigates the extent of the uncertainty that exists between organizations which cannot control one another’s actions, it discourages opportunistic behavior [...].”⁵⁶⁷ Thus trust enhances the “opportunity for greater information sharing over time.”⁵⁶⁸ Even if trust has not been established yet, the personal relationship between the parties makes it easier to understand each other. ARGOTE ET AL. (2003) for example argue that personal relationships (informal ties) make knowledge more proximate⁵⁶⁹ and state that “social relationships provide individuals with the opportunity to create, retain, and transfer knowledge.”⁵⁷⁰

In summary, relational mechanisms increase the opportunity to receive knowledge by reducing the physical and psychological distance between buyer and supplier, because they increase personal contact and trust. Due to this effect on opportunity and the positive effect of opportunity on knowledge transfer success (H1c), the direct effect of relational governance on knowledge transfer success (H2) can be partly explained through the indirect effect via opportunity. In other words, relational governance increases knowledge transfer because it increases opportunity. However, the general model of social science explanation also implies direct effects of relational governance (H3) on knowledge transfer success. Thus, opportunity is considered only partly relevant to explaining this direct effect. In other words, the theoretical approach does not predict that the entire effect of relational governance goes through opportunity but predicts partial mediation by opportunity.

⁵⁶⁷ Hart and Saunders (1997), p. 30.

⁵⁶⁸ Hart and Saunders (1997), p. 30.

⁵⁶⁹ Argote et al. (2003), p. 576.

⁵⁷⁰ Argote et al. (2003b), p. 475.

H2c: The positive effect of relational governance on knowledge transfer success is mediated by the opportunity of the customer to receive the knowledge.

For **formal mechanisms**, the effect on the opportunity factors (physical and psychological contact) needs to be considered separately. By defining structures and targets in the relationship, formal mechanisms can define the outcome of the transfer and the behavior of the people involved. That is, they can reduce the physical distance between sender and receiver by defining a certain behavior or work environment. One way to reduce the physical distance is to provide teams with enough time to get in touch with each other. “One of the most important operational constraints among coworkers is time.”⁵⁷¹ Thus providing the team with enough time to contact each other e.g. via detailed project planning or meeting structures, might increase the opportunity of the knowledge transfer, because the physical contact is increased.

Formal mechanisms cannot reduce the psychological distance between buyer and supplier, because they do not consider the persons involved. In fact, increased formal structures can even lead to a situation where no time is left to achieve a deep contact; i.e. if the project is over-controlled and leaves no time for social contact. Then formal governance may even lead to a negative effect on the opportunity

In summary, formal mechanisms can decrease the physical distance of the buyer and the supplier by implementing a respective standard procedure but they cannot decrease the psychological distance between buyer and supplier. Thus they cannot create knowledge proximity. In fact, overly formal mechanisms might even limit the opportunity to create psychological contact.

In knowledge transfer, creating physical contact is necessary whereas proximity of knowledge is the sufficient criterion to establish the opportunity to receiving the knowledge. This leaves a rather negligible role for formal governance in affecting the opportunity to receive knowledge.

Without a significant effect of formal governance on the opportunity to receive knowledge, opportunity cannot operate as a mediator for formal governance effects on knowledge transfer success.⁵⁷² Therefore, the direct effect of formal governance on

⁵⁷¹ Siemsen et al. (2008), p. 433.

⁵⁷² Cf. Hair et al. (2013), Baron & Kenny (1986).

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knowledge transfer success cannot be further explained by the opportunity of the customer to receive the knowledge.

H3c: The effect of formal governance on knowledge transfer success is negligibly mediated by the opportunity of the customer to receive the knowledge.

4.4.3 Knowledge characteristics and their impact on knowledge transfer success

4.4.3.1. Direct effects of knowledge characteristics on knowledge transfer success (arrow 4)

Organizations often experience difficulties when transferring knowledge. These difficulties are also called “internal stickiness.”⁵⁷³ Stickiness results from the characteristics of the knowledge itself.⁵⁷⁴ More specifically, ambiguity of knowledge is a major driver for stickiness and limits knowledge transfer.⁵⁷⁵

Ambiguity on its part is driven by the “simultaneous effects of tacitness, specificity, and complexity of the underlying knowledge to be transferred.”⁵⁷⁶ Consequently, this thesis theorizes a direct negative effect of the knowledge characteristics of tacitness, complexity, and specificity on the success of knowledge transfer, because these characteristics create difficulties in the transfer⁵⁷⁷ (arrow 4). In general, knowledge that is more tacit, complex, or specific will create more difficulties than knowledge that is explicit, simple, or standardized.⁵⁷⁸

Research has so far concentrated on the explanation of tacitness and the way it hinders knowledge transfer.⁵⁷⁹ The way in which complexity and specificity create difficulties,

⁵⁷³ Cf. Szulanski (1996).

⁵⁷⁴ Cf. Szulanski (1996).

⁵⁷⁵ Cf. Szulanski (1996) for stickiness. Cf. Levin/Cross (2004), Simonin (1999), Szulanski (2004) for negative effects on KNT.

⁵⁷⁶ Van Wijk et al. (2008), p.833 with reference to Reed /DeFilippi (1990).

⁵⁷⁷ Cf. Kogut/Zander (1993), Simonin (1999), Chan et al. (2012), p. 929.

⁵⁷⁸ Cf. Argote et al. (2003).

⁵⁷⁹ Cf. Chapter 3.

though, has remained unclear.⁵⁸⁰ This thesis adopts the established hypotheses for the three knowledge characteristics as having negative effects on knowledge transfer success.

Tacitness refers to the codifiability⁵⁸¹, teachability⁵⁸², and predictability of knowledge⁵⁸³. Tacit knowledge is part of our subsidiary or preconscious awareness, constituting something that an individual is vaguely aware of but cannot specify, e.g. intuition and personal experiences.⁵⁸⁴ It is “rooted in action and an individual’s commitment to a specific context.”⁵⁸⁵ The less tacit the knowledge, the clearer and easier it can be formalized explicitly, i.e. it can be documented.

To fulfill the knowledge transfer process, the task for the buyer is to understand, use, and integrate this knowledge. On the other hand, the supplier has to adapt, explain, and hand over this tacit knowledge to the buyer⁵⁸⁶. As the supplier can hardly explain something that he or she is vaguely aware of, difficulties are likely to arise in transfers of highly tacit knowledge.⁵⁸⁷ The challenge of tacit knowledge is determining its boundaries, i.e. to manifest what is the subject of transfer or reception in the first place. To integrate something that is not manifest appears rather difficult. Thus, in line with former research⁵⁸⁸, this thesis proposes a negative effect of tacitness on the success of knowledge transfer, because tacit knowledge is difficult to manifest.

H4: The more tacit the knowledge, the lower is the knowledge transfer success.

⁵⁸⁰ Cf. Meier (2010).

⁵⁸¹ Zander, Kogut (1995); Simonin (1999).

⁵⁸² Zander, Kogut (1995).

⁵⁸³ McEvily, Chakravarthy (2002).

⁵⁸⁴ Cf. Polanyi (1966) p. 4.

⁵⁸⁵ Chang et al. (2012), p. 929 with reference to Nonaka/Takeuchi (1995).

⁵⁸⁶ The tasks are based on the definition of the KNT process introduced in Chapter 2.

⁵⁸⁷ Cf. Nonaka (1991), Argote et al. (2003), p. 574.

⁵⁸⁸ Cf. Chen (2004), Hamel (1991), Inkpen (2000), Inkpen/Pien (2006), Kogut/Zander (1992), Zander/Kogut (1995), Grant (1996 a,b).

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Complexity is defined by the number of knowledge elements and the degree of their interaction.⁵⁸⁹ It is described by “interdependent techniques, routines, individuals, and resources”⁵⁹⁰ bound to a specific knowledge.

Complex knowledge has “numerous as well as varied parameters [...],” that may be gained “from distinct and multiple functional areas or disciplines.”⁵⁹¹ Simple knowledge on the other hand has only little inner interdependence and few resources or skills that have to be combined.

In contrast to the transfer of tacit knowledge, complex knowledge can easily be codified and articulated. Difficulties arising in the transfer and reception of complex knowledge lie in the explanation and capturing of the numerous interactions of the single knowledge parts and the ability to cover all the different disciplines⁵⁹² that are part of the knowledge. It is the mental challenge that makes the transfer difficult. If the recipient does not capture all the relevant components of the knowledge, the integration of the knowledge is limited, because of the obstacles to setting up effective rules and responsibilities to make use of the knowledge again.⁵⁹³

H5: The more complex the knowledge, the lower is the knowledge transfer success.

The dimension of **specificity** originates from transaction cost economics (TCE) that was mainly defined by WILLIAMSON in 1985.⁵⁹⁴ Specificity refers to the dependence of knowledge on a specific context and its interdependence.⁵⁹⁵ Specific knowledge is not standardized, neither usable universally⁵⁹⁶ nor in autarky, and not discrete. Specificity results from system dependency.⁵⁹⁷ To overcome this dependency, significant

⁵⁸⁹ Cf. Zander, Kogut (1995); Simonin (1999).

⁵⁹⁰ Simonin (1999).

⁵⁹¹ Turner, Makhija (2006), p. 200.

⁵⁹² Zander/Kogut (1995), p. 79 argue that knowledge is more complex when it draws upon distinct and multiple kinds of competencies.

⁵⁹³ Proposition is in line with Simonin (1999 a,b).

⁵⁹⁴ Cf. Reed/Defillippi (1990); Meier (2010).

⁵⁹⁵ Cf. Zander, Kogut (1995); De Luca & Atuahene-Gima (2007).

⁵⁹⁶ Cf. McEvily, Chakravarthy (2002).

⁵⁹⁷ Cf. Zander, Kogut (1995).

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investments in specialized equipment, facilities, and skilled human resources during the transfer process are required.⁵⁹⁸ Specificity can lead to numerous and competing goals, resulting from the diverse interests of more or less autonomous stakeholders of the system.⁵⁹⁹ The opposite of complex knowledge is standardized knowledge. It can be applied to many different contexts, industries, tasks, or countries without adapting it or considering the diverse goals of stakeholders. Standardized knowledge is thus ready to be transferred without any adaptation, specific investments, or goal alignments.

To transfer highly specific knowledge, the supplier has to adapt the knowledge to the context of the buyer. The more specific the knowledge is, the more goals have to be served, which can create irritation and ambiguity.⁶⁰⁰ To fulfill the knowledge transfer process, the supplier needs to explain the knowledge in this very exact context to create the value for the client. “He might have to step into new content and context every day to fulfill the whole adaptation of the knowledge to the client’s needs – i.e. the fulfillment of the transfer has to cover all sorts of rules of the customer that do not always appear to the sender immediately and completely.”⁶⁰¹ The higher the specificity, the less is the chance for the supplier to use these investments ever again.

The customer has to invest in assessing the fit of this particular knowledge and has to engage in the discussion of goal alignment without being able to use this knowledge again in any other context. “Specificity is a particularly critical issue for I-O teams where can lead to increased ambiguity.”⁶⁰²

In summary, the difficulty resulting from specificity in the knowledge transfer process is neither the capability to manifest the knowledge nor the mental capture of its interdependence. It is the uncertainty of how the knowledge components interact with and unfold in the specific context of the buyer. An additional difficulty is the willingness to invest specifically in this transfer when never being able to use this investment again. Within the process-based definition of the knowledge transfer success, this argument appears even more obvious: The buyer will not successfully

⁵⁹⁸ Cf. Simonin (1999); Williamson (1985), pp. 55, 95 f.

⁵⁹⁹ Cf. Bstieler/Hemmert (2010), p.490.

⁶⁰⁰ Cf. Bstieler/Hemmert (2010), p.490.

⁶⁰¹ Lam 1997, p. 977.

⁶⁰² Bstieler/Hemmert (2010), p.490.

integrate specific knowledge, because the knowledge cannot be reused independently; specific knowledge is not designed to be reused in any other context.

H6: The more specific the knowledge, the lower is the knowledge transfer success.

4.4.3.2. Indirect effects of knowledge characteristics on knowledge transfer success (arrow 1)

The direct relationship between knowledge type and knowledge transfer success (H4-6) is established in literature.⁶⁰³ The theoretical framework of this thesis defines knowledge as a context factor like governance. Consequently, the mediating role of AMO is theorized for knowledge characteristics, too. The framework states that properties of knowledge transfer context like knowledge characteristics influence the AMO of people but not that they have to.⁶⁰⁴ Thus the mediating role of AMO for each of the effect of tacitness, complexity, and specificity on knowledge transfer success is analyzed.

Since the ToWP-based hypotheses (H1a-c) have already defined a positive effect of AMO on knowledge transfer success, the question explaining a mediating role of AMO for the knowledge effects is: How do knowledge characteristics limit a buyer's AMO to receive the knowledge?

The table below provides an overview of the structure of the following hypotheses and summarizes the underlying management mechanisms that are crucial for reasoning how knowledge characteristics limit AMO.

⁶⁰³ Cf. Argote et al. (2003).

⁶⁰⁴ Cf. Argote et al. (2003), p.575.

		Underlying, managing mechanisms ⁶⁰⁵	Type of governance mechanisms		
			Tacitness	Complexity	Specificity
Conditions of individual performance			Not codifiable and difficult to articulate	High number of parameters and variance of knowledge	Context/System dependency
	Motivation	Relevance of the task Consequences of the task	H4a (-)	H5a (0)	H6a (+)
	Ability	Familiarity with knowledge structure	H4b (0)	H5b (0)	H6b (0)
	Opportunity	Distance: physically or psychologically ⁶⁰⁶	H4c (0)	H5c (0)	H6c (0)

Table 16: Structure of mediation hypotheses for knowledge effects

4.4.3.2.1. Mediation effect of motivation

In the knowledge transfer context, motivation is the supplier's desire and readiness to transfer the knowledge of interest and the buyer's desire and readiness to absorb the knowledge respectively.⁶⁰⁷ As explained in detail in the mediation hypotheses of governance, the underlying mechanisms that manage motivation are the relevance of the task (intrinsic motivation) and the consequences of the task (extrinsic motivation). In addition, motivation always consists of the direction and intensity of a person's willingness.

Knowledge types on the other hand have different characteristics that create different difficulties during transfer: Tacit knowledge is not manifested, complex knowledge has a high variance, and specific knowledge is bound to a context (cf. Table 16). Faced with different types of knowledge in a knowledge transfer, it is not likely that the intrinsic motivation of the buyer to receive the knowledge changes due to the different task per se: The buyer has ordered the respective type of knowledge, thus the relevance of the task of receiving it is not higher or lower, regardless of the actual type of knowledge. In other words, the relevance of the task of receiving the knowledge does not change whether it is tacit, complex, or specific knowledge. However, the consequences of receiving the knowledge may differ:

⁶⁰⁵ For the central mechanisms that manage the levels of motivation, ability and opportunity cf. the work of Andrews (1988), Batra/Ray (1986), and Petty/Cacioppo (1986).

⁶⁰⁶ Argote et al. (2003), p. 575.

⁶⁰⁷ Siemsen et al. (2008), p. 432.

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Tacit knowledge cannot be formalized and codified and is thus difficult to articulate. It cannot be manifested at all. Without such manifestation, it is obviously difficult to define the consequences of receiving this knowledge.⁶⁰⁸ The benefits of directing his energy on receiving tacit knowledge cannot be clearly specified by the buyer. The decision whether or not to engage in a knowledge transfer bears some resemblance to cost-benefit analysis. CABRERA & CABRERA (2002) found: “[W]hen individuals perceive a link between knowledge sharing behaviors... and organizational rewards... they will be more inclined to participate in knowledge sharing activities.”⁶⁰⁹ Without such a cost-benefit link, individuals will be less inclined to participate in the transfer of tacit knowledge. Additionally, even if the receiver is willing to receive tacit knowledge, he would not know where to direct his energy as the knowledge to be received cannot be defined.

In summary, there is a lack of positive consequences that would motivate the buyer to receive the tacit knowledge. Accordingly, people will limit the intensity of their willingness to receive knowledge when it is tacit. In addition, the direction of the intensity is affected negatively by tacitness: If you cannot define exactly what you want to receive, you cannot direct your energy and willingness towards it.

Not perceiving any benefits and not knowing where to direct his energy are likely to cause demotivation on the buyer side of knowledge transfer. This demotivation on the micro level of knowledge transfer provides an additional explanation of why tacitness affects knowledge transfer success negatively. In other words, the motivation of the buyer to receive knowledge also takes a mediating role for the effect of tacitness on knowledge transfer success.

H4a: The negative effect of tacitness on knowledge transfer success is mediated by the motivation of the customer to receive the knowledge.

⁶⁰⁸ Cf. Hoetker/Mellewigt (2009) argued that the ability to develop performance criteria in advance for knowledge-based (tacit characteristic is addressed) is lower than for property-based assets.

⁶⁰⁹ Cabrera et al. (2006) p. 251.

Complex knowledge has a high number of different parameters.⁶¹⁰ Unlike tacit knowledge, its complex counterpart can be codified and articulated.

Consequently, the buyer can specify clearly the consequences of engaging in a knowledge transfer. Difficulties arising in the reception of complex knowledge lie in the capturing of the numerous interactions of the single parts and the ability to cover all the different disciplines⁶¹¹ that are part of the knowledge. The mental challenge makes the transfer difficult. On the other hand, such mental challenges might be motivating for some people in a professional business context.⁶¹² In contrast, for other people, this task might mean quite the opposite, because they do not like solving mental challenges. In other words, it is not likely that motivation changes due to the degree of complexity of the knowledge subject. Rather, the relationship depends on the cognition of the single person that is involved.⁶¹³ However, this concern is beyond the focus of this thesis.

In conclusion, the relationship between complexity and knowledge transfer success cannot be further explained by the motivation of the buyer to receive the knowledge, because complexity is not likely to affect the motivation of the individual at all. The mediating role of motivation thus does not hold for the effect of complexity.

H5a: The effect of complexity on knowledge transfer success is negligibly mediated by the motivation of the customer to receive the knowledge.

Specific knowledge is designed or adapted to the special needs of the buyer and the task he has to fulfill. If knowledge is "custom-made," the buyer has a clear notion of the benefits of the transfer. The consequences of receiving specific knowledge are theorized to be positive, because specific knowledge creates a unique advantage for the individual receiver: Since specific knowledge is fitted to the buyer's very context or task, it directly increases his performance. Increased performance is the best way to show off in

⁶¹⁰ Turner, Makhija (2006), p. 200.

⁶¹¹ Zander/Kogut (1995), p. 79 argue that knowledge is more complex when it draws upon distinct and multiple kinds of competencies.

⁶¹² For example Blumberg & Pringle (1982) have emphasized techniques like job enrichment and work redesign to motivate people.⁶¹²

⁶¹³ Cf. Foss et al. (2010) who theorized that the heterogeneity of individuals is a micro level mechanism that explains KNT success.

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an organization, and thus the individual engagement in acquiring specific knowledge is increased. In addition to increased willingness to receive the knowledge, the individual receiver can also clearly direct his engagement toward the task, because the goal is specifiable. In conclusion, specificity increases the individual's motivation to receive the knowledge, because it creates a unique advantage for him. In other words, his extrinsic motivation is increased, because he can gain benefits from receiving the knowledge no one else can.

Explaining that specificity increases motivation to receive knowledge and that motivation increases knowledge transfer success (cf. H1a) creates a counter hypothesis to H6. The traditional hypothesis proposes a negative effect of specificity on knowledge transfer success, because it requires transaction-specific investments on the firm level, and knowledge cannot be reused in the organization. On the individual level of AMO, this negative effect cannot be seen. As described above, the buyer of the knowledge will be motivated to receive the knowledge because he gains a unique advantage for his task. If this specific knowledge results in better performance of the buyer, said individual might even expect to be promoted due to the reception of this specific knowledge. Thus in contrast to H6, the consideration of the micro level implies that specificity has a positive effect on knowledge transfer success through increased motivation of the buyer to receive the knowledge.

H6a: The effect of specificity on knowledge transfer success is mediated by the motivation of the customer to receive the knowledge.

4.4.3.2.2. Mediation effect of ability

Ability to transfer knowledge is defined as the cognitive (mental) capabilities to receive and transfer knowledge. These capabilities are someone's knowledge and skills about and in the transfer and reception of knowledge.⁶¹⁴

Skills and experience reside within the person.⁶¹⁵ They are innate or trained.⁶¹⁶ The characteristics of knowledge in knowledge transfer tasks do not to change these innate

⁶¹⁴ Cf. Siems et al. (2008), p. 427.

⁶¹⁵ Cf. Siems et al. (2008), p. 427.

⁶¹⁶ Cf. Argote et al. (2003), p. 575 with reference to Nadler et al. (2003).

or trained skills and experiences. Thus they have no influence on the ability of the buyer.

Ability is influenced by the familiarity⁶¹⁷ with the knowledge structure (or scheme). In line with this argument, some researchers found knowledge distance (no knowledge overlap with the knowledge one receives) to cause limited knowledge transfer.⁶¹⁸ Obviously, the fact that knowledge is familiar to some extent increases the ability to receive it. In general, the knowledge a buyer receives from the supplier is new to him, because he would not need to purchase it otherwise. Thus the knowledge distance is the same for each type of knowledge and the ability to receive it is not affected at all.

The descriptions of the three knowledge types could suggest that specific knowledge is adapted to the buyer's needs and context and thus could be more familiar. However, only the knowledge components are customized to the needs of the buyer. The knowledge itself is not changed in any way (e.g. phrasing it in the buyer's wording) to make the knowledge more familiar to the buyer.

In summary, the ability of the buyer to receive knowledge is not affected by tacitness, complexity, or specificity at all. Consequently, the ability to receive knowledge cannot be theorized to have a profound mediating role for the effects of knowledge characteristics on knowledge transfer success.

H4b: The effect of tacitness on knowledge transfer success is negligibly mediated by the ability of the customer to receive the knowledge.

H5b: The effect of complexity on knowledge transfer success is negligibly mediated by the ability of the customer to receive the knowledge.

H6b: The effect of specificity on knowledge transfer success is negligibly mediated by the ability of the customer to receive the knowledge.

⁶¹⁷ Familiarity is a determinant of ability also focused on in the marketing research application of the AMO-concept. Cf. for example Andrews (1988), Batra/Ray (1986), and Petty/Cacioppo (1986).

⁶¹⁸ Cf. Cohen and Levinthal (1990); Van Wijk et al. (2008).

4.4.3.2.3. Mediation effect of opportunity

Opportunity is “the extent to which a situation is conducive to achieve a desired outcome.”⁶¹⁹ A situation is formed by the natural conditions and the acts of others.⁶²⁰

In order to positively influence the opportunity for knowledge transfer, the physical or psychological distance between people has to be reduced.⁶²¹

When buyer and supplier are physically close, the buyer can learn by observation or accumulate knowledge directly. When people are psychologically close, they create proximity of knowledge⁶²², e.g. they know who knows what and where to search.

Neither tacit nor complex nor specific knowledge changes the location of the people in the transfer relationship. The proximity of knowledge does not change due to its type. People do not know who knows what and where to search more or less due to any specificity, complexity, or tacitness of knowledge.

In summary, the characteristics of knowledge cannot influence the physical or psychological distance between buyer and supplier in the knowledge transfer.

Thus opportunity cannot be theorized to have a profound mediation role for the effects of knowledge characteristics on knowledge transfer success.

H4c: The effect of tacitness on knowledge transfer success is negligibly mediated by the opportunity of the customer to receive the knowledge.

H5c: The effect of complexity on knowledge transfer success is negligibly mediated by the opportunity of the customer to receive the knowledge.

H6c: The effect of specificity on knowledge transfer success is negligibly mediated by the opportunity of the customer to receive the knowledge.

⁶¹⁹ Gruen et al. (2007), p. 539.

⁶²⁰ Cf. Pringle /Blumberg (1986), p.12.

⁶²¹ Cf. Argote et al. (2003), p. 575.

⁶²² Cf. Argote et al. (2003), p. 576.

4.4.4 Governance mechanisms for the transfer of different knowledge characteristics

The presented system of hypotheses described the relationships of governance and knowledge characteristics on knowledge transfer success on the macro- and micro level. The macro level described the direct effects while the micro level described the indirect effects via AMO. The combined consideration of the two levels reveals the recommendations for an effective fit between governance mechanisms and knowledge characteristics:

Each micro level mechanism of AMO “serves only as necessary, but not sufficient condition”⁶²³ for performance (first principle of ToWP). According to the second principle of ToWP, the absence of any single mechanism of AMO removes an essential ingredient for performance.⁶²⁴ Governance is a central means for the strategic management of the performance of knowledge transfer in buyer-supplier relationships. Thus when a micro mechanism is limited, governance has to be applied to increase this specific mechanism. For example, if motivation is limited, management needs to apply governance mechanisms that increase motivation to balance the magic triangle of performance. Performance in knowledge transfer thus can only be managed by keeping the triangle of AMO in balance.

The previous hypotheses proposed that relational governance can increase all three AMO mechanisms whereas formal governance can increase only motivation. In addition, limited motivation was the reason why tacitness has negative effects on knowledge transfer success, and increased motivation is the reason why specificity is theorized to have positive effects on knowledge transfer success (cf. Figure 25).

⁶²³ Andrews (1988), p. 220.

⁶²⁴ Cf. Gruen et al. (2007), p. 539.

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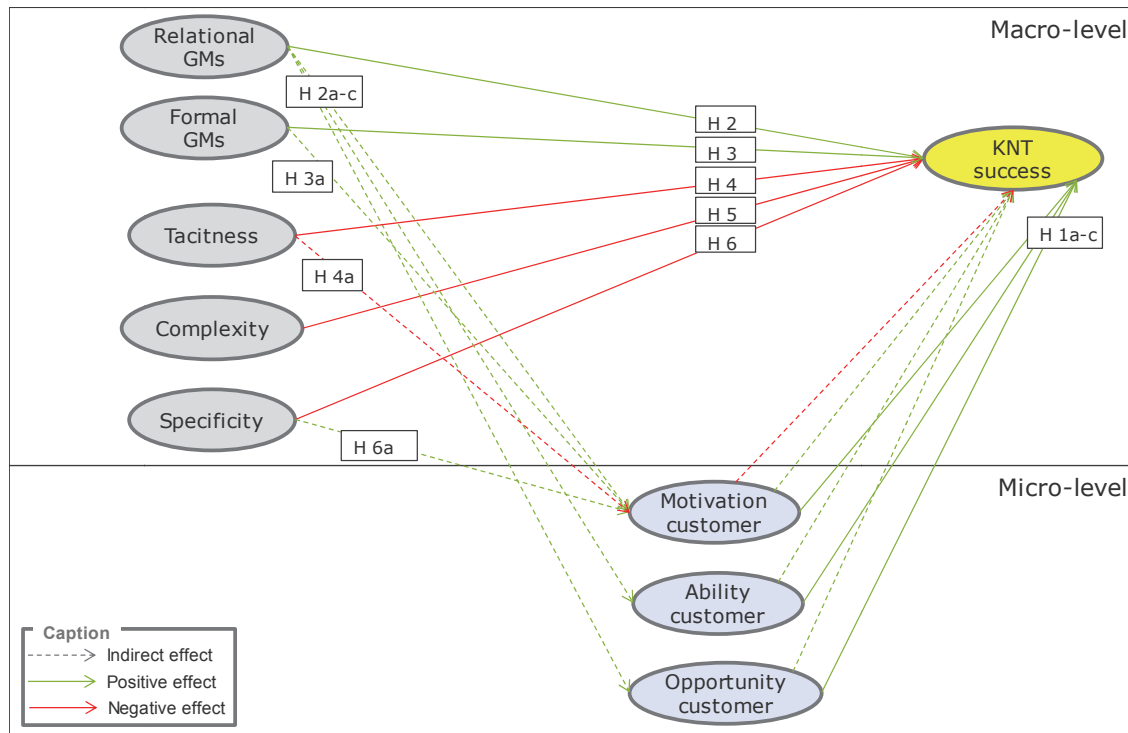


Figure 25: Overview of hypotheses 1-6⁶²⁵

From a micro level perspective, the system of hypotheses developed so far identifies motivation as the central mechanism explaining the effects of relational governance mechanisms, formal governance mechanisms, tacitness, and specificity. Motivation mediates these effects (all a-hypotheses).

In conclusion, these factors are linked because they influence the same mechanism on the micro level. For the question of effective governance of knowledge transfer, this implies that when increasing relational or formal governance, the effects of tacitness and specificity on knowledge transfer success can be influenced by increasing motivation.

4.4.4.1. Managing tacitness

Tacitness effects can be managed by formal and relational governance mechanisms. Increasing formal and relational governance would buffer the negative effect of tacitness on knowledge transfer, because governance and tacitness have contrary effects on motivation.

⁶²⁵ 0-hypotheses are not presented in favor of clarity.

Relational governance mechanisms create social benefits for the buyer when he engages in the knowledge transfer. They balance the missing specification of benefits for the reception of knowledge that came with tacitness. The level of motivation thus can be balanced by applying increased relational governance to a knowledge transfer that is characterized by tacit knowledge. This argument is in line with NADLER ET AL. (2003) who state that tacit knowledge is “best transferred through rich communication media such as observation [...]”⁶²⁶ CHANG ET AL. (2012) put it similarly by saying: “Tacit knowledge is difficult to articulate, and its transfer requires extensive interactions and focused efforts.”⁶²⁷

Formal governance creates extrinsic motivation, which is missing when receiving tacit knowledge, by defining the benefits of clearly receiving this knowledge. Even if the buyer does not exactly know what he will receive, the defined benefits are clearly laid out and will motivate him to engage in attempting to acquire it. These benefits will fill the lack of motivation. Thus formal governance is also able to balance the level of motivation in a knowledge transfer characterized by tacitness. In conclusion, applying governance (formal as well as relational) means restructuring the payoff so that the buyer perceives the transfer as beneficial⁶²⁸, i.e. the original effect of tacitness on knowledge transfer success is changed by governance.

In summary, the micro level perspective identified a mediating role of motivation for both the effects of governance and the effect of tacitness on knowledge transfer success. Thus relational as well as formal governance mechanisms are effective in managing the negative effects of tacitness in a knowledge transfer in such a way that:

H7: The negative effect of tacitness on knowledge transfer success is weakened by 1) relational governance and 2) formal governance.

⁶²⁶ Argote et al. (2003), p. 574.

⁶²⁷ Chang et al. (2012), p. 929.

⁶²⁸ Cf. Minbaeva et al. (2012); Foss et al. (2009).

4.4.4.2. Managing specificity

Specificity effects can be managed by formal and relational governance mechanisms. Increasing formal and relational governance would support the positive effect of specificity on knowledge transfer success, because the two factors both have positive effects on motivation.

Again, **relational governance** creates social benefits for the buyer when he engages in the knowledge transfer, and **formal governance** creates specific calculable benefits to the buyer. In combination with the theorized positive effect of specificity on knowledge transfer success through motivation (H6a), this implies that the positive effect of specificity increases under higher levels of governance, because there is no lack of AMO to be managed, but the total level of motivation increases.

If specificity in fact increases the knowledge transfer success, the task for strategic management of knowledge transfer characterized by specific knowledge is not to balance AMO to secure an effective transfer, but to increase the efficiency of the transfer. When transferring highly specific knowledge, investments in governance can be decreased, because specificity itself drives the motivation of the buyer to receive the knowledge which in turn results in higher levels of knowledge transfer success. Still, increased governance can increase the knowledge transfer success even more.

The link on the individual level mentioned above describes a moderation effect. The effect of specificity on knowledge transfer success is expected to change under different levels of governance in such a way that:

H8: The positive effect of specificity on knowledge transfer success is strengthened by 1) relational governance and 2) formal governance.

4.4.4.3. Managing complexity

The discussion of complexity revealed no relevant influence at the individual level. None of the AMO variables could be theorized to profoundly mediate the negative effect of complexity on knowledge transfer success, because complexity could not be argued to affect the individual performance conditions of the buyer at all. Thus complexity does not share an explanatory mechanism with any type of governance mechanism in the theoretical model of the micro level of knowledge transfer. In other words, complexity and governance cannot be linked by any explanation on the micro level. For the question of governance of complexity in knowledge transfer, this implies that increased governance cannot change the effect of complexity on knowledge transfer success. Governance may operate as a positive counterbalance for the level of knowledge transfer success to the extent that it increases the individual performance conditions but, to a varying degree, governance does not change the direct negative effect of complexity on knowledge transfer success.

H9: The negative effect of complexity on knowledge transfer success is negligibly weakened by 1) relational governance and 2) formal governance.

Comparing all impacts of relational governance in contrast to formal governance, relational governance appears to be more powerful in managing knowledge transfer success. Relational governance increases all of the AMO variables whereas formal governance increases only motivation. Since the application of governance mechanisms requires investments in time and resources, the overall impact of the mechanisms defines the return on investment. As a result, relational governance mechanisms are the more efficient way to increase the overall knowledge transfer success.

H 10: The impact of relational governance on knowledge transfer success is higher than the impact of formal governance on knowledge transfer success.

In conclusion, relational mechanisms are the appropriate counterbalance for complex knowledge. Their counterbalance for the unchangeable effect of complexity is higher than that of formal governance mechanisms.

4.4.5 Summary of the hypotheses

This chapter discussed the effects of governance mechanisms and knowledge types on knowledge transfer success in light of the general model of social science explanation and the ToWP. This combined theoretical approach defined six basic propositions:

- The basic proposition of ToWP is that the individual performance conditions, namely motivation, ability, and opportunity to receive the knowledge, increase the success of knowledge transfer (H1 a-c).
- Based on the macro level of the social science model, this thesis theorizes positive direct effects of formal and relational governance mechanisms (H 2, 3) and negative direct effects of tacitness, complexity, and specificity of knowledge (H4-6) on the success of knowledge transfer.

The discussion of governance and knowledge on the micro level of the social science model proposed mediation effects of motivation, ability, and opportunity for the effects of governance mechanisms and knowledge characteristics on knowledge transfer success (H (x) a-c) as follows:

- **Relational governance** mechanisms provide the team with cooperation and trust. These mechanisms result in higher performance conditions of all three AMO variables, and therefore the knowledge transfer success is increased (H2a-c).
- The positive effect on knowledge transfer success through favorable conditions for individual performance also applies to formal governance. However, **formal governance** only acts through more motivation but not by creating more or less ability and opportunity (H3a-c).
- While governance creates positive performance conditions for the individual, **tacitness** hinders people enacting knowledge transfer because tacitness limits the motivation to receive knowledge (H4a).
- In contrast to established theories about the effect of **specificity**, the discussion of the micro level showed that specificity in fact has a positive effect on the motivation of the customer to receive knowledge. It creates a positive effect on knowledge transfer success through its effect on motivation (H6a).

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- **Complexity**, as the third characteristic of knowledge, could not be argued to profoundly influence any of the individual performance conditions (H7a-c). Thus complexity is theorized to affect knowledge transfer success only directly.

Organizations employ governance mechanisms to achieve a successful knowledge transfer. Variations in governance mechanisms are variations in AMO and thus in the performance conditions of the individual to receive knowledge.⁶²⁹ Poor knowledge transfer success occurs when the conditions of individual action are not properly managed.⁶³⁰ When the buyer does not have enough A, M, or O to cope with the difficulties of the transfer, the transfer completes with lower performance: Knowledge is less integrated.

The strategic fit perspective is clear: The level of AMO requirements defined by knowledge characteristics should be appropriately matched to the level of AMO conditions influenced by governance in order to achieve effective success of knowledge transfer. In the words of ARGOTE ET AL. (2003): “Knowledge management outcomes are affected by the ‘fit’ or congruence between properties of knowledge, properties of units, and properties of relationships between units.”⁶³¹ The differentiated fits between single governance mechanisms and knowledge characteristics that explain the effectiveness of governance for single characteristics of knowledge is stated straightforwardly by H7-10.

- By adapting the ToWP principles to the context of knowledge transfer, this thesis proposes that the transfer difficulties posed by the **tacitness** of the knowledge can be governed by formal as well as relational governance mechanisms (H7).
- Aside from that, both governance mechanisms have the power to enhance the effect of **specificity** due to their effect on motivation (H8). This provides managers with new efficiency options.
- The effect of **complexity** cannot be changed by any type of governance (H9). Formal as well as relational governance mechanisms can only counterbalance

⁶²⁹ In line with the argument of Galbraith (1977); p. 39; Stock/Tatikonda (2000), p.722.

⁶³⁰ For a contingency approach cf. Galbraith (1977); Stock/Tatikonda (2000); Tushman/Nadler (1978).

⁶³¹ Argote et al. (2003), p. 576.

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the negative effect of complexity on knowledge transfer success by creating positive effects at the same strength as complexity creates negative ones on the knowledge transfer success. To do so, relational governance is theorized to be more efficient because the effect of relational governance is proposed to be higher than that of formal governance mechanisms (H10).

Table 17 lists all hypotheses.

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Part of the model		No	Hypothesis
AMO	Direct	H1 a-c	The higher a) the motivation, b) the ability, and c) the opportunity of the customer to receive the knowledge, the higher the KNT success.
Effects of governance mechanisms	direct	H2	The more relational governance is used, the higher is the KNT success.
		H3	The more formal governance is used, the higher is the KNT success.
	Indirect	H2a-c	The positive effect of relational governance on KNT success is mediated by a) the motivation, b) the ability, and c) the opportunity of the customer to receive the knowledge.
		H3a	The positive effect of formal governance on KNT success is mediated by the motivation of the customer to receive the knowledge.
		H3b,c	The effect of formal governance on KNT success is negligibly mediated by b) the ability, and c) the opportunity of the customer to receive the knowledge.
	Effects of knowledge types	direct	H4
H5			The more complex the knowledge, the lower is the success of KNT.
H6			The more specific the knowledge, the lower is the KNT success.
Indirect		H4a	The negative effect of tacitness on KNT success is mediated by the motivation of the customer to receive the knowledge.
		H4b,c	The effect of tacitness on KNT success is negligibly mediated by b) the ability or c) the opportunity of the customer to receive the knowledge.
		H5a-c	The effect of complexity on KNT success is negligibly mediated by a) the motivation, b) the ability, or c) the opportunity of the customer to receive the knowledge.
		H6a	The effect of specificity on KNT success is mediated by the motivation of the customer to receive the knowledge.
		H6b,c	The effect of specificity on KNT success is negligibly mediated by b) the ability, or c) the opportunity of the customer to receive the knowledge.
Simultaneous effects of governance and knowledge		H7	The negative effect of tacitness on KNT success is weakened by 1) relational governance and 2) formal governance.
		H8	The positive effect of specificity on KNT success is strengthened by 1) relational governance and 2) formal governance.
		H9	The negative effect of complexity on KNT success is negligibly weakened by 1) relational governance and 2) formal governance.
		H10	The impact of relational governance on KNT success is higher than the impact of formal governance on KNT success.

Table 17: Overview of hypotheses⁶³²

⁶³² Fields marked in gray indicate a 0-hypothesis.

4. Theoretical model for the governance of different types of knowledge

The system of hypotheses contains hypotheses that propose significant effects as well as hypotheses that propose non-significant effects (0-hypotheses). Figure 26 displays all hypotheses that propose significant effects. This system of significant hypotheses suggests that the effects of tacitness and specificity can be influenced by governance – formal as well as relational. In contrast, the negative effect of complexity cannot be changed by applying governance mechanisms. It can only be counterbalanced by governance mechanisms that create high AMO. In other words, the transfer difficulties posed by the characteristics of the knowledge that is transferred can be effectively influenced by governance mechanisms so long as both affect the individual performance conditions. Otherwise governance generates a positive counterbalance to knowledge effects but does not change the effect of knowledge characteristics. In all cases, relational governance mechanisms are more efficient means in managing knowledge transfer success because they have more impact than formal governance mechanisms.

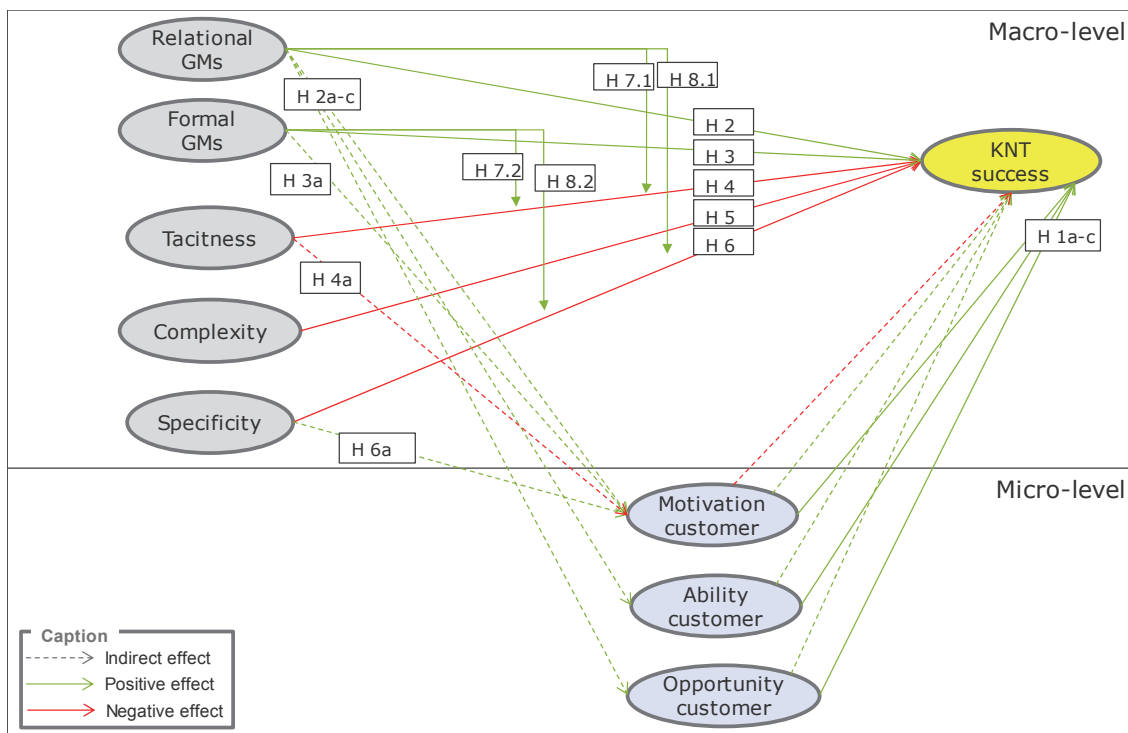


Figure 26: Overview of significant hypotheses

Effective governance of knowledge management thus is about choosing the governance mechanisms that create the conditions which are critical for the people in the transfer process. **Efficient governance** is about knowing which effects of knowledge characteristics cannot be changed but have to be counterbalanced. And thus

4. Theoretical model for the governance of different types of knowledge

efficiency can only be managed when knowing about the total power of governance mechanisms within the complex knowledge transfer process from person to person, and only that will allow the organization to receive the best return from investment in governance mechanisms.

These resulting answers to the three initial research questions are summarized in Figure 27:

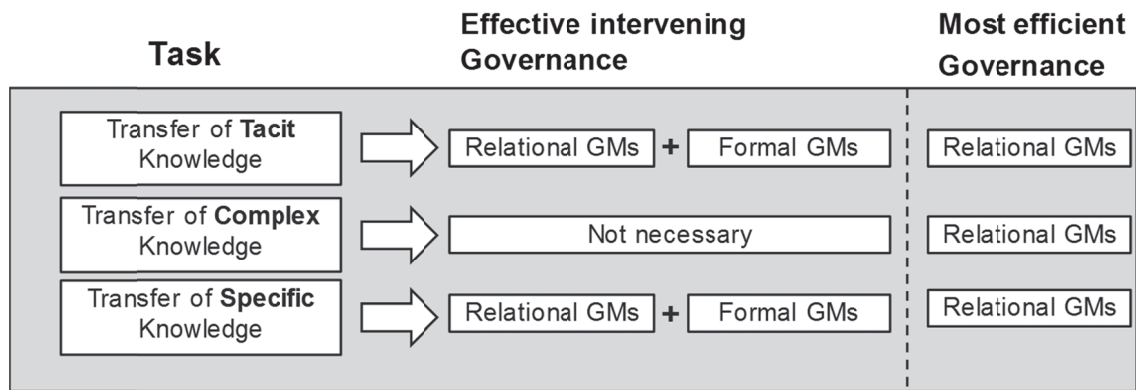


Figure 27: Summary of hypotheses in the light of the research question

4. Theoretical model for the governance of different types of knowledge

5 EMPIRICAL ANALYSIS AND METHODS

Scientific findings are generated when theory-based hypotheses are confirmed by empirical tests and data. The most important methodological challenges of an empirical test of hypotheses include making decisions on how to: identify and select potential sample members, choose the method of data collection, contact sampled individuals and collect data from those who are hard to reach (or reluctant to respond), design, evaluate, and test questions, and check data files for accuracy and internal consistency.⁶³³ The following subchapters describe how these challenges have been handled in this thesis.

5.1 *Selection and characteristics of the industry for the empirical analysis*

The empirical analysis of knowledge transfer in buyer-supplier relationships is done within the consultancy industry. Consultants function as suppliers of knowledge for their customers (buyers).

This industry is especially suited for the empirical analysis, because it meets all of the requirements for testing the system of hypotheses:

- The buyer-supplier relationship is knowledge-intensive. There are no physical goods involved. For that reason, the empirical analysis concentrates on the differences between knowledge types.
- It covers different types of knowledge delivered to the customer, e.g. management skills and methods, strategic recommendations, organizational concepts, operative processes, specifications for systems or machines or analytic methods.
- The knowledge is transferred within a project from the consultants' to the customer's project team. The teams are clearly defined transfer units that enable the analysis of the individual condition of each team.
- The project teams are governed by a joint contract and work together very closely in a well defined organizational structure. Thus the conditions of the

⁶³³ Cf. Bortz/Döring (2006), p.490.

5. Empirical analysis and methods

project teams can be identified clearly by referring to the specific project organization and situation.

The relationship of consultants and customer comes with special characteristics and problems that are a major variable influencing the process of knowledge transfer and the variables that affect it.⁶³⁴ Therefore, these special characteristics of the customer-consultant relationship will be described below by reflecting the knowledge transfer process in light of a consultancy project.

Figure 28 compares the phases of a consulting project to the knowledge transfer process. The initiation phase of knowledge transfer represents the contracting between consultant and customer. Implementation and ramp-up phase are included in the project phase. The integration phase matches the post-project phase of a consulting project.

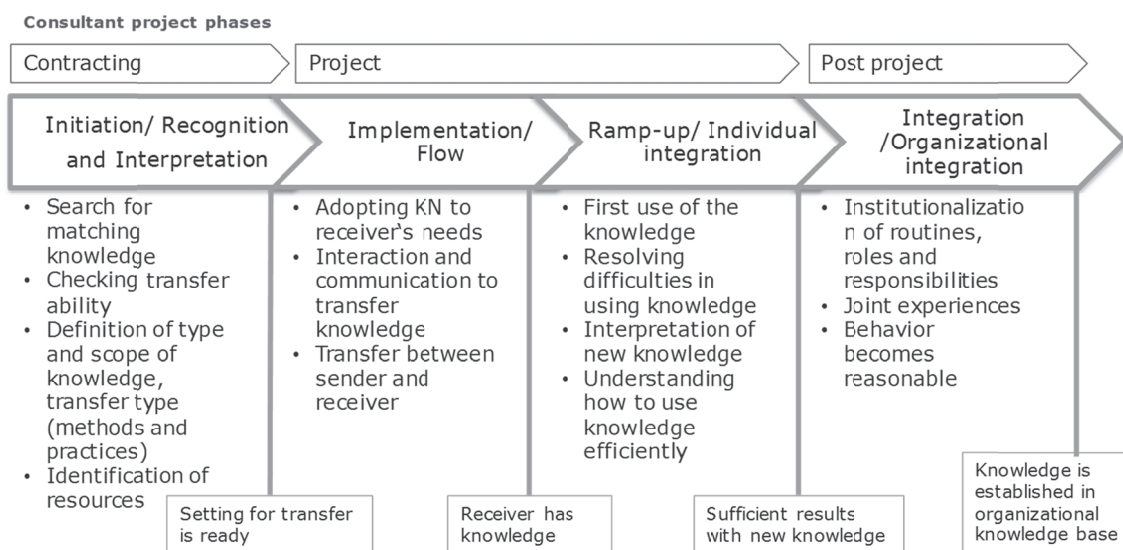


Figure 28: The knowledge transfer process in the consulting context⁶³⁵

⁶³⁴ In their review of papers for the special issue on inter-organizational knowledge transfer (JoMS 2008) Easterby-Smith, Lyles, and Tsang argue that the processes of intra- and inter-organizational transfers of knowledge are different phenomena because they involve different kinds of boundaries, each with distinct characterizations and problems.

⁶³⁵ Adopted from Szulanski (1996) and von Krogh/Köhne (1998).

The **initiation (contracting) stage** aims to prepare everything for the transfer. This demands the identification of the proper knowledge, and resources and the agreement between both parties on the transfer methods and the scope of knowledge.

Consultant-customer relationships are inter-organizational relationships. The parties are independent - i.e. they do not interact in hierarchical governance structures⁶³⁶, but their interaction is managed by the market, i.e. the price mechanism. From a customer perspective, the market is the place to search for matching knowledge. The consultants on the other hand use this market to offer their knowledge for a certain price. The definition of the knowledge type and transfer methods, what is to be transferred, is the subject of a contract negotiation between the sales and purchasing departments of the consultant and customer firms. Thus the legal boundaries of customer-consultant relationships are managed only by contracts instead of having hierarchical options like e.g. alliances. Therefore, this first stage of knowledge transfer “Initiation” can be considered as the “contracting” phase in the consultant-customer relationship.

Contracts specify the roles and responsibilities of the customer-consultant relationship *ex ante*, and thus all conditions of the knowledge transfer are transparent and fixed, so that partners do not need to engage in *ex post* negotiations during further stages of the knowledge transfer. In addition, in case of conflict, the contract can be easily enforced by third parties. Since *ex ante* costs occur only by the design of the contract, standard contracts are used frequently in the consulting business. However, the intensity of the definition of roles and responsibilities may differ.

In addition to roles and responsibilities, each contract specifies the type and scope of the knowledge that is the subject of the transfer. These are the deliverables of the consultant firm. To control that the deliverables are provided, “completion certificates” and “acceptance certificates” are regularly passed between consultant (contractor) and customer (cf. Figure 29) during the project (stages 2 and 3 of the knowledge transfer process).

⁶³⁶ Cf. Wang et al. (2008), p. 115.

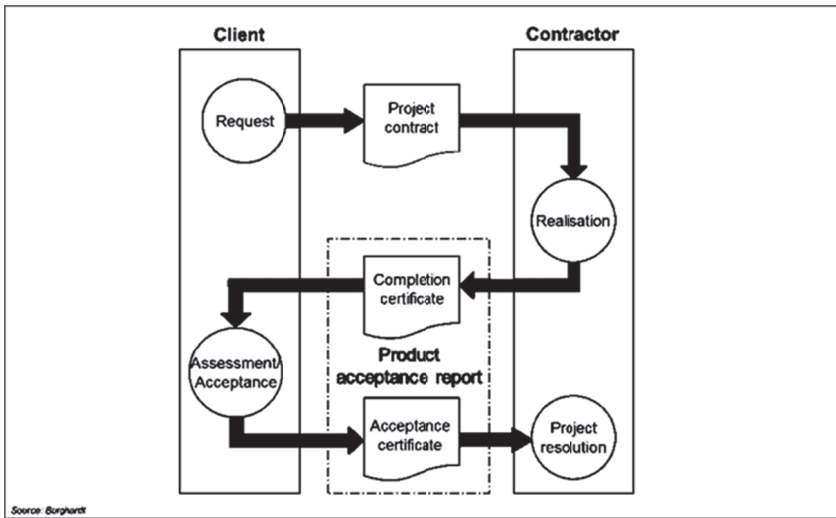


Figure 29: The legal end of a consultant-customer relationships⁶³⁷

These certificates can refer to either the fulfilled deliverables of work or the delivered service. These different types of certificates reflect the contract type chosen for the project: contracts for employment (service certificates) and contracts for work (certificates with deliverables of work). The fundamental difference between the contract of employment and contract for work is that the contract for work owes a success/a trade. In contrast, the contract of employment only owes the effort.

The choice of contract depends on the type of demand of the customer, i.e. the type of work the consultant is asked to do. When the demand is to deliver a solution, contracts for work are preferred whereas in case of enabling demands, contracts for employment are chosen.

Contract of employment	Contract for work
I. Contractual responsibilities <ol style="list-style-type: none"> 1. Consulting as contractual obligation 2. Scope of consultation: the less knowledge of the clients, the higher the demand for advice 	I. Contractual responsibilities <ol style="list-style-type: none"> 1. Requirement engineering/ description by corporation 2. Acceptance 3. Liability for defined output
II. Warranty/ Claims for damages <ol style="list-style-type: none"> 1. No right of warranty, as no trade 2. Claims for damages only applies to the supplier in the event of culpable behavior 	II. Warranty/ claims for damages <ol style="list-style-type: none"> 1. Improvement 2. Reduction 3. Withdrawal 4. Compensation in place of delivery Regulation in §§ 280, 281, 283 BGB
III. Limitation In general for 3 years	III. Limitation In general for 2 years
IV. Payment The fee claim in services has to be paid immediately after the provision of the service. In case of poor performance the client has to h. M. basically no right to reduce remuneration.	IV. Payment The right to compensation comes into being if the work has been flawless delivered and accepted by the client.

Figure 30: Differences in consultancy contracts⁶³⁸

⁶³⁷ Translated from Burkhardt (2007).

The identification of resources necessary to completing the setting of the knowledge transfer (the first stage) is mainly a personnel selection process in the consultant as well as in the customer firm. The consultant firm chooses a project team that is appropriate in qualification, availability, and costs as defined by the contract. The customer firm on the other hand chooses a project team that needs the knowledge and can assess the quality of the deliverables.

In summary, the “initiation” stage of knowledge transfer reflects the contracting and staffing processes in the consultant-customer relationship.

The **implementation and ramp-up (project phase)** results in a customer project team that has the knowledge. The ramp up phase results in a customer project team that gains sufficient results with the knowledge. These two stages define the results of a project between consultant and customer.

The project is the organizational form of the knowledge transfer in consultant-customer relationships, which defines the structure of the relationship. “The structure of the inter-organizational relationship refers to the context in which knowledge transfer takes place, and the transfer mechanisms, which are established within that context.”⁶³⁹ OXLEY & WADA (2009) found that this context matters for the choice of the perspective on the transaction and for the relevance of different antecedents and mechanisms: For example, “administrative structures that reduce technology leakage are a key feature of the equity joint venture, a result that is inconsistent with a ‘pure’ knowledge-based perspective on alliances.”⁶⁴⁰ Thus the special mechanisms of consultant projects need to be considered alike.

Scholars agree that consultant firms are a special reflection of professional service firms, which are mainly characterized by the interaction between highly qualified personnel and customers,⁶⁴¹ high contact time, high people focus, high customization,

⁶³⁸ UNITY AG.

⁶³⁹ Easterby-Smith, Lyles, Tsang (2008), p.679

⁶⁴⁰ Oxley & Wada (2009).

⁶⁴¹ Cf. Gillmann (2002), p.17.

5. Empirical analysis and methods

high discretion, and a high process focal point.⁶⁴² Consultants are paid to transfer knowledge to their buyers. It is a major part of their business. Thus they have norms, values and standards of exchange and cooperation with their customers to coordinate and control a project. These standards are developed by the Project Management Institute (PMI) and listed in Figure 31. These tasks are recommended to manage a project successfully. Applying them to a project creates the professional structure and thereby the context of the relationship between customer and consultant.

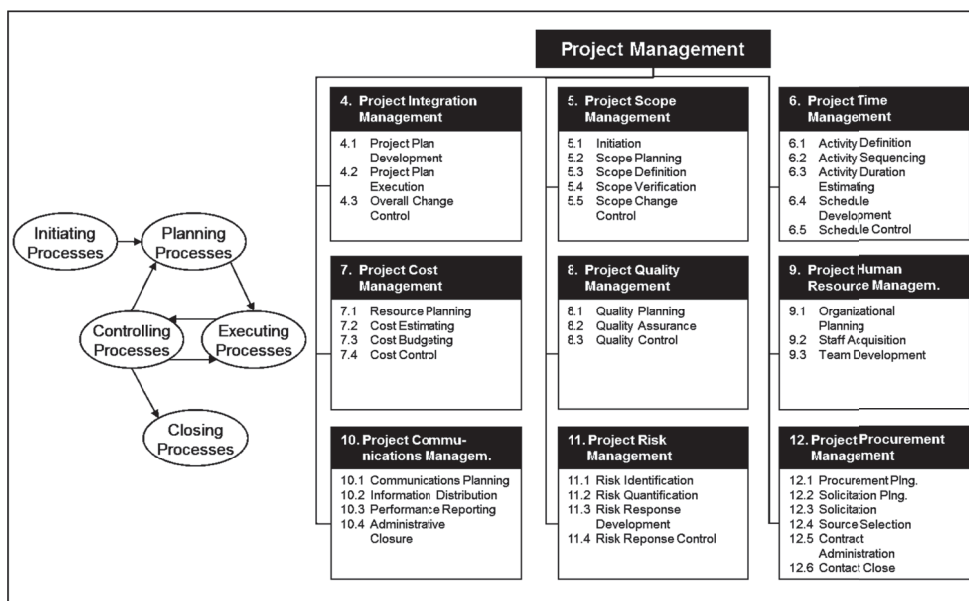


Figure 31: Project management body of knowledge (PMBok)

The relationships between consultants and their customers have been a topic in academic research since 1938⁶⁴³. Predominantly, the roles and tasks, challenges and opportunities as well as the practices of most successfully gaining customer satisfaction have been discussed and analyzed:

Customer-consultant interaction is the most important factor for the success of consulting projects and, consequently, for the survival of every consulting company.⁶⁴⁴

The interaction of consultant and customer and the roles the parties play have been characterized many ways, e.g. the customer-expert interaction⁶⁴⁵, symbolic

⁶⁴² Cf. Fitzgerald et al. (1991), p.12.

⁶⁴³ Worthy (1962) is the earliest paper due to an abstract search in Business Source Premier, Academic Source Premier and Social Science Index based on the key words "consultan*" and "customer."

⁶⁴⁴ Cf. Schon (1983).

⁶⁴⁵ Cf. Abbott (1988); Kubr (1996); Schein (1987, 1988).

interaction⁶⁴⁶, the agent's agent⁶⁴⁷, and a social learning relationship⁶⁴⁸. Two of these views fit the context of this thesis very well. In the customer-expert view, "the role of the customer is reduced to that of being an information supplier during problem diagnosis, without being actively involved in the creative part of the actual problem-solving process."⁶⁴⁹ "The role of the consultants is to adapt their abstract, general knowledge to the specific customer situation in order to generate an adequate problem solution."⁶⁵⁰ The social learning view of consultant and customers in a social learning relationship emphasizes an equal role of customers in problem diagnosis and solution generation. "The customer-consultant interaction is seen as a participative learning process, in which both customers and consultants contribute valuable knowledge and ideas to a project."⁶⁵¹ The latter view reflects the idea of the two-sided knowledge transfer framework as introduced by EASTERBY-SMITH ET AL. (2008) whereas the customer-expert view reflects the one-directional transfer from supplier to buyer rather well. The combination of these two views allows the roles of customers and consultants to be defined: Consultants are experts, and customers are their learning partners.

The **integration (post-project phase)** results in a change of the customer's knowledge base. In a consultant-customer-relationship, this means that not only the project team gains sufficient results with the new knowledge but that the customer organization has institutionalized routines, roles, and responsibilities to use the knowledge without the consultants. The new knowledge has been integrated into their organization, and they have become independent from the original source of the consultant.

This stage is considered the post-project phase because the deliveries of the contracts end with the acknowledgement of the sufficient results with the knowledge. Of course, consultants may support the design of the roles and responsibilities, but the final, institutional establishment is a responsibility and task that lies with the customer

⁶⁴⁶ Cf. Alvesson (1993, 2001); Clark (1995); Clark & Salaman, (1998a, 1998b).

⁶⁴⁷ Cf. Fincham (2002,2003).

⁶⁴⁸ Cf. Lilja & Poulfelt (2001); McGivern & Fineman (1983); Schein (1999); Schon (1983); Walsh (2001).

⁶⁴⁹ Nikolova et al. (2009), p.289.

⁶⁵⁰ Nikolova et al. (2009), p.289.

⁶⁵¹ Nikolova et al. (2009), p.289.

organization exclusively. Consequently, the impact a consultant can have on the last milestone of the knowledge transfer process is limited to a certain extent.

In summary, the knowledge transfer between consultant and customer is influenced by the following characteristics of consulting projects:

1. Knowledge transfer from consultant to customers is organized as contract-based project work.
2. Consultants are professional project managers applying professional project management means to govern the knowledge transfer.
3. Consultants have limited involvement in the integration phase of knowledge transfer.
4. The consultant has an expert role whereas the customer takes a learning role.

These characteristics define the appropriate operationalization of the variables that are needed to test the hypotheses and determine the research design.

5.2 Research design

In order to test the system of hypotheses empirically, data for four types of constructs are necessary: data for knowledge transfer success, AMO, knowledge characteristics, and governance mechanisms. Secondary data for such a specific research subject was not available at the time of analysis wherefore a primary analysis needed to be conducted to collect the required data.

The following sub-chapters describe the processes of sample selection, instrument development and design, data collection, and the evaluation of method failures.

5.2.1 Sample selection

In general, the empirical analysis has to be conducted based on a random sample of all knowledge transfers from consultant to customer, but this thesis follows the recommendation of GULATI AND SYTCH (2007/2008): It limits the sample to one selected company since a holistic approach based on multiple companies is not possible.

The information transferred from a consultant to a customer is usually sensitive. Additionally, information about the individual AMO of the customers is needed in order to test the system of hypotheses. Companies hesitate to provide such deep insights into the results of their projects and to address their customers for the same.

The consultancy company that offered to provide such deep insights into their projects is the UNITY AG, a management consulting company in Germany.

The company operates four competence centers, which provide the appropriate capabilities and the know-how required for solving complex management tasks and for developing tailor-made solutions. These competence centers are strategic management, IT management, production and digital planning management, and development management.

To deliver integrated solutions to its customers, the company organizes temporary project teams composed of members drawn from the relevant areas of competence and expertise (e.g. business administration, economics, information technology, applied science, engineering, materials, etc.). Given the need to provide integrated solutions that draw on skills from different areas of expertise, project success depends critically on the individuals' ability to transfer knowledge effectively.

Consistent with the short-term, integrative nature of the work, the company has a very flat hierarchy and is organized in a matrix structure. The majority of employees are business economists, engineers, and business data processing specialists holding master's degrees and doctorates.

At the time of the empirical analysis (June 2013), the firm employed 180 people and had been operating for 18 years.

During these years, the four competence centers managed over 1000 projects in SMEs as well as in DAX 30 companies. This heterogeneity makes the data basis very attractive for the purpose of this work, because findings are not limited to one industry or organizational type. In addition, the multiple knowledge subjects that are transferred provide rich data to differentiate the three characteristics of knowledge. In conclusion, while the sample is selected to some extent, it remains random within the company.

5.2.2 Development of the instrument

The development of the instrument to collect the data is based on a structured process. This process has to be aligned to the research question and to the character of the sample.⁶⁵²

The type of hypotheses developed needs to be analyzed by multi-variant methods. Consequently, standardized data is needed for all variables in the system of hypotheses.

„Data on interorganizational processes and knowledge acquisition are often difficult to obtain.”⁶⁵³ To estimate the success of knowledge transfer, some scholars used explicit measures, such as counts of cross-patent citations.⁶⁵⁴ This research project requires measures and data collection processes that allow identifying the degree of internalization of the received knowledge (stage 4 of knowledge transfer). Likewise, in order to handle the project-team-based and hard-to-identify nature of the knowledge involved, explicit measures are not appropriate.⁶⁵⁵ In addition, the constructs of AMO are quite personal latent variables that are theorized to change with the project situation. A hard measurement based on e.g. HR data is therefore not appropriate for the research subject of this thesis.

Consequently, the phenomena of AMO, knowledge transfer, and knowledge type have to be measured by a survey that detects the personal estimation⁶⁵⁶ of the situation of the project team and provides standardized data for the multi-variant analyses.⁶⁵⁷

When using surveys, a frequent problem in the data is a single source bias.⁶⁵⁸ A single source bias is a systematic influence in the data caused by the source itself in such a way that any defect in that source contaminates the dependent and independent variables.⁶⁵⁹ In other words, it can occur when dependent and independent variables are measured only by one and the same data source.

⁶⁵² Cf. Kaya (2007); Schnell et al. (2005).

⁶⁵³ Mesquita, Anand et al. (2008), p. 920.

⁶⁵⁴ Cf. Mowery et al. (1996; 1998).

⁶⁵⁵ Cf. Mesquita, Anand et al. (2008), p. 920.

⁶⁵⁶ Cf. Schnell et al. (2005), p. 321.

⁶⁵⁷ Cf. Schnell et al. (2005), p.321.

⁶⁵⁸ Cf. Podsakoff/Organ (1986), p. 533.

⁶⁵⁹ Cf. Podsakoff/Organ (1986), p. 533.

To prevent this bias, the needed data was collected by using two surveys and a database: One survey was designed for the customer party. It contains different variables to measure the knowledge transfer success in terms of knowledge transfer phase results (project success, knowledge integration, and knowledge ownership) and the variables of the individual performance conditions (motivation..., ability..., opportunity to receive knowledge).

A different survey was designed for the consultancy party. It contains the variables for the knowledge characteristics (complexity, tacitness, specificity), variables to measure relational governance (social ties, shared problem solving, informal socialization)⁶⁶⁰, and one variable to measure the formal project management intensity.

As a third source the contracts are used to measure an additional formal variable – the contract intensity.⁶⁶¹

Figure 32 sums up the whole research design and displays the instruments used to collect the data for each construct.

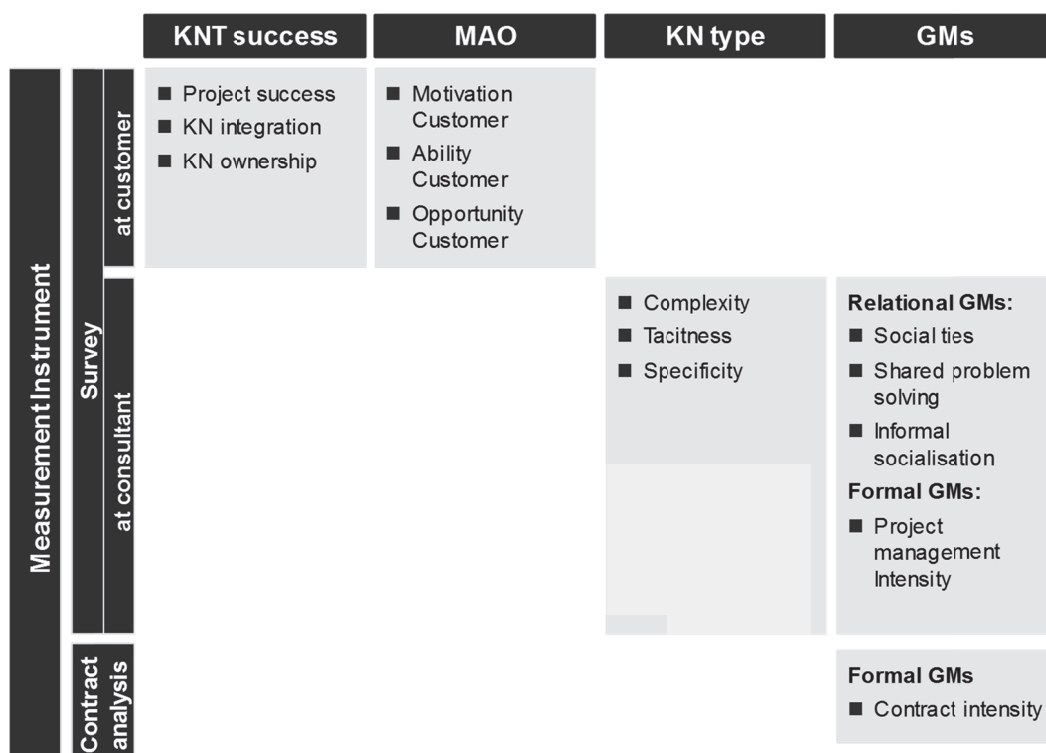


Figure 32: Research design

⁶⁶⁰ See Chapter 4.5. for the reasoning for these variables.

⁶⁶¹ See Chapter 4.5. for the reasoning for these variables.

In general, surveys can be conducted by a face-to-face interview or by sending out questionnaires to receive results more or less anonymously.⁶⁶²

Since personal interviews can deform the results of surveys⁶⁶³, the surveys for this thesis were conducted via a standardized questionnaire that sent out and returned by e-mail.

When conducting surveys without personal interviews, communication and representation create frequent problems that need to be limited as far as possible to secure the data quality.⁶⁶⁴ Communication problems are problems of interpretation and general understanding.⁶⁶⁵ Representation problems are final data samples that are too small to identify significant effects because the answers are too limited.⁶⁶⁶

To prevent these problems, the following established approaches have been applied:

1. The questionnaires are standardized to secure a comparability of data.⁶⁶⁷ Thus each respondent has to answer the same questions in the same order with the same information given to him or her.
2. Almost all variables are measured on a 5 point rating scale which is the most common scale in social science research.⁶⁶⁸ The scale ranges from 1: not at all to 5: to a very high extent. In cases where items of the original construct are measured by Likert scales (agreement scale), a five-point Likert scale ranging from 1: I do not agree at all to 5: I agree to a very high extent was used. An odd-numbered scale was chosen so as not to force respondents into a specific decision and to prevent a deformation of the data.⁶⁶⁹
3. To define the unit of analysis clearly for both customer and consultant respondents, all projects were summarized by the individual list of deliverables that have been

⁶⁶² Cf. Kaya (2007), Schnell et al. (2005).

⁶⁶³ Cf. Schnell et al. (2005), p. 358 ff.

⁶⁶⁴ Cf. Fritz (1995), p. 94.

⁶⁶⁵ Cf. Amshoff (1995), p 29.

⁶⁶⁶ Cf. Friedrichs (1985), p. 237.

⁶⁶⁷ Cf. Schnell et al. (2005), p. 321.

⁶⁶⁸ Cf. DeVellis (2003), p. 78 ff.

⁶⁶⁹ Cf. Weiber/Mühlhaus (2010), p. 96.

the subject of the contract. In addition, the starting date of the project and name of the leading consultant and customer respectively were also included.⁶⁷⁰

4. Whenever possible, survey items to measure the theoretical constructs were adapted from existing scales in the literature that had shown significant levels of reliability and validity. Thus a broad and thorough literature review informed the generation of the initial constructs and the a priori assignment of items to measure those constructs. To ensure content validity for the new constructs, 3 academics and 5 industry contacts were asked whether they feel that the items accurately captured the relevant construct.
5. The survey was pilot tested in two phases.⁶⁷¹ The draft questionnaire was first discussed with three academics (experts in their areas) who were asked to comment on the content, clarity, translation, and scaling of the instruments. Changes in item translation were made as a result of this feedback. Second, the questionnaire was sent to 6 consultants and 6 customers, who completed the survey with a specific focus on the content, clarity, and usability of the instrument.⁶⁷² As a result, the subject of analysis was specified on a project level instead of using a work package approach.⁶⁷³ In addition, some minor design changes were made at this stage.
6. Considerable attention was also paid to the design of the questionnaire regarding the ease of use, the burden on the respondent, and the maintenance of respondents' interest until the survey was completed.⁶⁷⁴ "A failure to consider these issues is often cited as a major factor driving the lower response rates."⁶⁷⁵ In-depth clinical

⁶⁷⁰ Cf. approach by Steensma and Corley (2000). They used an announcement database for sample selection and the data contained therein for purposes of defining the knowledge transfer project for the respondents.

⁶⁷¹ This procedure is also used by Squire, Cousins et al. (2009), Mesquita, Anand et al. (2008) and Hambrick (1981), Lawson et al. (2009).

⁶⁷² The respondents were asked to complete the questionnaire and provide comments on the wording, understandability and clarity of the items, as well as on the overall appearance and content of the instrument.

⁶⁷³ A project consists of multiple milestones. To describe these milestones, single work packages are defined in the contract. The feedback showed that this level of analysis was too detailed to be assessed.

⁶⁷⁴ Cf. Dillman (2000); Cummings, Teng (2003).

⁶⁷⁵ Cummings, Teng (2003), p.56.

work, consultation with subject experts and feedback obtained when piloting the questionnaire helped to refine the final construct and design of the questionnaires.

The development of the instrument started in October 2011 and was finished in June 2013 when the final questionnaire was sent out to consultants and their customers.

5.2.3 Data collection

All projects from UNITY AG have been initially reviewed based on the information in the company's contract database. The database contains all offers made to customers. The document of the offer becomes the contract between buyer and consultancy when the buyer countersigns the offer. Thus this document precisely describes the unit of analysis – the content of knowledge transfer – and needs to be analyzed for each project that will be part of the empirical analysis by the questionnaire.

The review revealed that not all of these projects are suited to be analyzed for the purpose of this thesis. Therefore, some exclusion criteria were developed:

Stage 4 of the knowledge transfer process demands the integration of the new knowledge within the organization and for performing results. Thus projects need to be finished at least half a year ahead of the empirical analysis to allow the stage 4 results to be achieved and measured. The questionnaires were sent out in June 2013. Thus all projects finished after December 31st 2012 were cut from the sample.

Interviews with project managers of the consulting company revealed that they are not able to remember precisely what governance mechanisms were applied to a project more than 6 years ago. In order to gain reliable results when questioning project managers about their governance mechanisms, projects older than 6 years were excluded from the final sample.

To identify those contracts that have become valid - i.e. contracts that have been the basis for a knowledge transfer project -, all "lost order" offers were deleted from the project database.

The consulting company runs separate companies for Austria, Switzerland, and Egypt. Contracts between those country companies (inter-company business), research projects (e.g. BMBF Projects) and event management (e.g. fees for innovation days) do not fit the subject of inter-organizational knowledge transfer and were excluded as well.

A consulting project sometimes consists of multiple offers. To understand the content of the knowledge transfer (the unit of analysis), the project scope has to be understood. Consequently, not single offers but projects need to be identified in the data base. A filter analysis based on the project number for each contract revealed 902 projects in the database. However, not all contract numbers were listed in the system. This impeded the precise identification of the relevant PDF contract documents. Consequently, all projects that had missing contract numbers – projects, for which not all contract documents could be identified precisely – were excluded. In a last step, very small projects (<5,000€) were removed so as not to deform the answers and ensure the comparability of the projects.

These 6 steps of exclusion criteria revealed a total of 509 projects. Table 18 shows an overview of the procedure and the number of remaining contracts and projects respectively.

1	Projects from January 2006 to December 2012	1964 contracts
2	Delete Lost Order offers.	1930 contracts
3	Delete intercompany business, research projects, and event fees.	1622 contracts
4	Filter contracts based on project number	902 Projects
5	Clear match with contract	616 Projects
6	Exclude projects below 5,000€	509 projects based on 899 contracts

Table 18: Exclusion analysis for the project sample

The application of the exclusion criteria left a sample of 509 projects. These projects were analyzed on meeting additional inclusion criteria by interviewing each head of the competence centers and one representative from each sales department. These people were chosen because the competence centers account for the project quality and the sales department for the customer communication and management.

The survey asks for project data from the consultant as well as from the customer. Thus the project manager of the consulting company as well as the project manager of the customer company has to be addressable to answer the questionnaire. In interviews with the heads of the competence centers and the representatives of the sales departments, the remaining projects were discussed one by one to identify those projects that meet this “two-sided” requirement.

Questioning project managers of customers is a sensitive issue, because they are usually very busy. Thus asking for their time to answer a questionnaire might affect their relationship to the consultant company. Since relationships are an important asset of any consulting company, the heads of the CC and the representatives of the sales departments had the chance to exclude single projects for political or strategic reasons during the interviews. Still, special interest and effort was placed in the discussions on not excluding projects because the feedback could be negative: Before starting the review, each of the participants was informed about the bias he/she would cause when selecting only “good/successful” projects. In addition, the selection process was accompanied by the author asking in every single case for the reason for exclusion.

To gain a good response rate for the questionnaires, a personal connection to the respective person is helpful. Therefore, the selection process was used to decide on the person addressing the customer (e.g. the consultant project manager, the sales person, the head of the CC, or some other person in the company with personal ties to the customer’s project manager). Having finished the selection discussions, 177 projects were left for the empirical data collection.

In order to collect the empirical data, the 177 project managers (PMs) of the consultancy and the customer received the questionnaire and the individual project summary.

Projects managers were chosen for several reasons. First, and in line with common practice in prior knowledge transfer studies, knowledge recipients should be used as respondents.⁶⁷⁶ This is based on project managers playing a critical role in the assessment of the success of the project⁶⁷⁷, because they can determine whether the knowledge has been transferred or not.⁶⁷⁸ Second, PMs are in charge of project management, have decision-making authority, and know best about the applied governance mechanisms and forms. In addition, they have extended knowledge of what happened during the project, because they had day to day contact with the other partner and can therefore also evaluate the relational mechanisms.

⁶⁷⁶ Cf. Jane Zhao, Anand (2009), p. 971.

⁶⁷⁷ Cf. Koh et al. (2004), p. 359.

⁶⁷⁸ Cf. Simonin (1991).

In line with prior research, efforts were made to enhance the response rate⁶⁷⁹:

The project summary and the questionnaire were sent to each single PM individually.⁶⁸⁰

In order to generate a high personal involvement of the respondent, the individual e-mail was sent by the previously identified “strong-tie” persons.⁶⁸¹

The customer was contacted via telephone to announce or remind him of the e-mail and to ask for his support personally. In addition, the e-mail contained a letter signed by the author and her professor. It explained the research task, offered respondents a composite summary of results⁶⁸², and set out an incentive for the ten fastest respondents. The incentive was one of the books written by members of the board of management of the consulting firm. The type of book was adapted individually to the customer. For example, hospital managers were offered a book about industrial clinic management whereas SME managers were offered a book about future-oriented business management, and PMs of IT projects were offered an IT-related book.

After two weeks of non-response, the author reminded the “strong-tie” persons to ask the customers for their support again or did it herself. Reminders were sent by e-mail, or the customer was called. As soon as customers returned the questionnaire or promised their support, the respective questionnaire for the consultant PM was sent to him or her.

The data collection was conducted from June 2013 to September 2013. Response durations of customers ranged from 30 minutes up to 60 days. Finally 101 two-sided project evaluations (101 consultant questionnaires and 101 customer questionnaires) were returned. This reflects a returning rate of 57.05%. Compared to other research in the knowledge transfer field, this is extraordinarily high⁶⁸³ and reflects the great efforts during the data collection phase: In particular, but not exclusively, a) the high investment to identify the people that have personal ties to the customer, b) the personal and repeated reminding of all participants, and c) the personal relationship of the author to customers and consultants can explain this success.

⁶⁷⁹ Cf. Lawson et al. (2009); Forza (2002).

⁶⁸⁰ Cf. Cummings, Teng (2003), p.56.

⁶⁸¹ Cf. Cummings, Teng (2003), p.56.

⁶⁸² Cf. Lawson et al. (2009); Forza (2002).

⁶⁸³ Usually response rates for surveys range from 1% to 5%.

5. Empirical analysis and methods

A missing value analysis revealed that the answer quality was very good, too. None of the items misses more than 2% of the data (cf. appendix G) for the results of the whole analysis. Hair et al. (2013) define 5% missing values per indicator as reasonable.

The following tables show the allocations of the projects based on industry, CC, sales department, and company size. In order to check for a distribution that reflects the main population of all 509 projects a Chi-Square test of homogeneity was conducted.⁶⁸⁴ The test supported the 0-hypotheses that the allocation of projects within the four competence centers in the sample can be considered equal compared to the allocation in the project base of 509 projects. Consequently, the sample is perceived as a proper reflection of the main population project base.

Sales Department⁶⁸⁵

	Frequency	Percent	Valid Percent	Cumulative Percent	
Valid	Automotive Corporations	16	15.8	15.8	15.8
	SME	37	36.6	36.6	52.5
	Switzerland	38	37.6	37.6	90.1
	Total	10	9.9	9.9	100.0
	Total	101	100.0	100.0	

Competence Center⁶⁸⁶

	Frequency	Percent	Valid Percent	Cumulative Percent	
Valid	Development Management	16	15.8	15.8	15.8
	IT Management	23	22.8	22.8	38.6
	Production & Digital Planning	38	37.6	37.6	76.2
	Strategy & Business Development	24	23.8	23.8	100.0
	Total	101	100.0	100.0	

⁶⁸⁴ The results of the Chi-Square test are reported in appendix O).

⁶⁸⁵ Projects are sorted based on membership of the sales person, not based on company type.

⁶⁸⁶ Projects are sorted to CCs based on membership of the responsible project manager. For projects of the Austrian and Switzerland companies, the project title was used to assign the project to a CC.

		Industry			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Automotive	17	16.8	16.8	16.8
	Service Management	8	7.9	7.9	24.8
	Energy	4	4.0	4.0	28.7
	Health Care	21	20.8	20.8	49.5
	IT	8	7.9	7.9	57.4
	Aerospace	11	10.9	10.9	68.3
	Pharmaceuticals and Chemicals	12	11.9	11.9	80.2
	Production Industry	20	19.8	19.8	100.0
	Total	101	100.0	100.0	

		Company type			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	SME	18	17.8	17.8	17.8
	Corporation	83	82.2	82.2	100.0
	Total	101	100.0	100.0	

Table 19: Overview of sample distribution

Since many multivariate analyses require having normally distributed data, each item of the questionnaire was analyzed for normal distribution by using the Kolmogorov-Smirnov test. This test assesses normality by comparing the data to a normal distribution with the same mean and standard deviation as the sample.⁶⁸⁷ It tests the 0-hypothesis of normally distributed data.⁶⁸⁸

Appendix E) reports the results and indicates that none of the items is distributed normally. Therefore, statistical methods that rely on parametric tests like for example PLS regression cannot be applied to test the hypotheses with this data.

5.2.4 Estimating method failures

In classic test theory, it is assumed that the measured value of an item is the sum of the true value and a measurement error.⁶⁸⁹ Any measurement error causes limited measurement quality and thereby can cause a false interpretation of the relationship of constructs - i.e. the variance explained results from measurement errors and not from

⁶⁸⁷ Cf. Mooi & Sarstedt (2011).

⁶⁸⁸ Cf. Hair et al. (2013), p. 54.

⁶⁸⁹ Cf. Nunnally (1978).

the explaining constructs. Measurement errors can be systematic (caused by method errors) or random.⁶⁹⁰ Systematic errors occur due to three potential method failures and can be evaluated by assessing the key informant bias, the common method bias, and the non-response bias.⁶⁹¹

In order to collect the data, this thesis uses the project managers of the consultancy and the customer as **key informants**. If key informants are used to answer a questionnaire, measurement errors may occur, because there is a bias between the subjective assessment of the informants and the objective value of a measure. According to ERNST (2003), this difference in the assessment of results mainly stems from different information available to the informants, due to their function or hierarchy level.⁶⁹²

The project managers this thesis used as respondents have comparable tasks and responsibilities for a project. In other words, these persons have all the information and competencies of the project and its members to assess the questioned information. Thus key informant bias is negligible in this study.⁶⁹³

Following PODSAKOFF ET AL. (2003), three reasons for **common method bias** need to be assessed: 1) single source bias, 2) single context bias, 3) item characteristic bias.

A single source bias can occur if dependent and independent variables are measured only by one and the same data source. "Because both measures come from the same source, any defect in that source contaminates both measures, presumably in the same fashion."⁶⁹⁴ Since the data for this study was collected based on three different sources - the consultant, the customer, and a contract database - single source bias is not a problem with the data.

A single context bias is caused by an identical context of the measurement, e.g. time of questioning, identical place of questioning, or identical instrument of questioning – i.e. the context is assumed to generate a modified measured value but not the true value.

⁶⁹⁰ Cf. Nunally (1978).

⁶⁹¹ Cf. Podsakoff et al. (2003), Bagozzi et al. (1991).

⁶⁹² Cf. Ernst (2003), p. 1267.

⁶⁹³ Cf. Ernst (2001), p. 89.

⁶⁹⁴ Podsakoff/Organ (1986), p. 533.

As introduced in the previous chapters, the instrument was designed individually for consultants and customer, sent out per e-mail, and was sent out first to customers and only in case of a response to consultants. Consequently, an identical context was eliminated, and context bias is not a problem in the data.

However, context bias can also occur on the item level (item-context bias). That is, an item is assessed in the context of its place and time (position) in the questionnaire and therefore contains measurement errors due to spillover effects of the items nearby.⁶⁹⁵ To test for item-context bias, the Harman's one-factor test⁶⁹⁶ was used for each of the questionnaire sources.^{697, 698} A principal factor analysis of all measurement items of the consultant questionnaire yielded 4 factors with eigenvalues larger than one. These factors accounted for 55.6 percent of the variance. The first factor accounts for 17.3 percent of the variance suggesting a single factor does not account for most of the variance.

For the customer items, 7 factors with an eigenvalue higher than one were extracted. The first factor accounts for 25.3 percent of the variance and 7 factors for 68.5 percent of the variance.

Since no single factor emerged as dominant in both item sets, neither item-context bias nor single source bias are likely to be a serious problem in the data.⁶⁹⁹

An item-characteristic bias occurs if the characteristics of the item itself cause measurement errors. These characteristics are for example wording, implicit answers, or standardized item format.⁷⁰⁰ As introduced in the development of the instrument (5.2.2), much effort and academic discussions have been undertaken to generate neutral and distinct items. In addition, the assurance of anonymity and the explicit note that there are no wrong or right answers for the questionnaires form the basis for a honest assessment instead of an intention-driven assessment for certain results.

⁶⁹⁵ Cf. Podsakoff et al. (2003), p. 884.

⁶⁹⁶ Cf. Podsakoff/Organ (1986), Jane Zhao, Anand (2009), p. 971.

⁶⁹⁷ Cf. procedure of Im, Rai (2008), p. 1289.

⁶⁹⁸ Test results are documented in Appendix D).

⁶⁹⁹ Cf. Podsakoff/Organ (1986), Jane Zhao, Anand (2009), p. 971.

⁷⁰⁰ Cf. Podsakoff et al. (2003), pp. 884f.

Non-response bias produces measurement errors due to systematic differences between answering and non-answering persons (or alternatively late answering persons⁷⁰¹).⁷⁰²

In order to test for non-response bias, two analyses were performed. In line with ARMSTRONG AND OVERTON (1977), the first analysis tests a bias caused by very early respondents. It compares responses received within three days (26.7% of the sample) to later respondents (responses received later than 3 days). The second analysis tests for a bias caused by very late respondents. It compares responses received later than 20 days (26.8% of the sample) to all earlier respondents (responses received within 20 days).

Both analyses are based on a two-tailed *t*-test, which compares the means of each of the main variables used in the system of hypotheses for each group.

The results (reported in appendix D) indicate that very late respondents use significantly more governance than the rest of the respondents ($p=0.07$ (formal governance mechanism), 0.01 (relation governance mechanism)) and that very fast respondents use significantly less formal governance mechanism ($p=0.5$). In addition, the analysis showed that very fast respondents have significantly lower motivation to receive knowledge ($p=0.02$).

Since the motivation variable reflects the motivation to learn and integrate new knowledge, the significant difference for early respondents is quite obvious. Answering questionnaires and reflecting on one's actions requires personal motivation to learn. Therefore, this analysis supports that this construct of motivation indeed reflects a personal attribute of the respondent.

Governance (formal as well as relational) represents the intensity of coordination and control of a task. This variable thus is influenced by the very personal affinity for management and control. Fast respondents can be considered people that do not control much whereas late respondents can be considered to control and coordinate a task very intensely. Thus late respondents need more time for a task.

In summary, the bias between the respondents can be explained due to this analysis collecting data based on the personal attributes of respondents. These attributes are and

⁷⁰¹ If data of non-answering persons is not available, late respondents are assumed to be similar to non-respondents.

⁷⁰² Cf. Armstrong et al. (1977), p. 396.

have to be personally different for the purpose of this thesis. Thus this focus explains to some extent the answering habit. However, although the personal attributes are part of the system in the analysis, the variables identified above will be considered carefully when interpreting the results of the empirical analyses.

5.3 Statistical Method

5.3.1 Selection of the statistical method

In order to identify the appropriate statistical method to test the hypotheses, this thesis analyzed the system of hypotheses and its type of variables based on WEIBER AND MÜHLHAUS' (2010) decision model (cf. Figure 33).

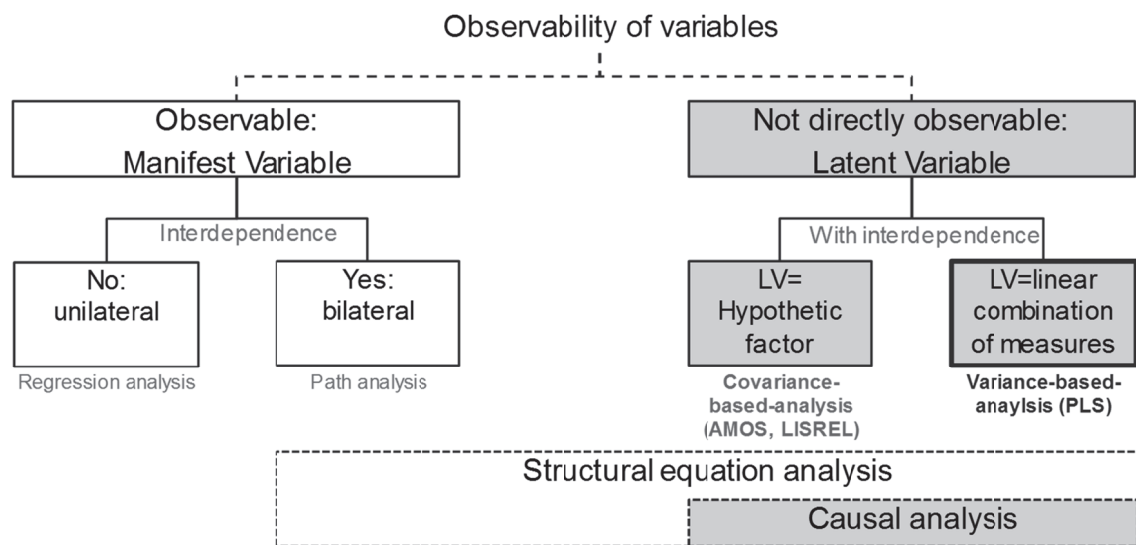


Figure 33: Decision model for statistical analysis approaches⁷⁰³

The system of hypotheses contains variables like motivation, opportunity, knowledge transfer success, and governance clusters. These variables cannot be observed directly but have to be measured by indicators that define their value. Thus they are latent variables.⁷⁰⁴ In addition, the system of hypotheses theorizes interaction between variables (e.g. relational governance mechanisms interact with tacitness). This means interdependence between some of the variables. With reference to the decision model of

⁷⁰³ Adopted from Weiber/Mühlhaus (2010), p.20.

⁷⁰⁴ Cf. Weiber/Mühlhaus (2010), p.20.

WEIBER & MÜHLHAUS (2010), latent, inter-dependent variables have to be analyzed by causal equation analysis in contrast to regression or path analysis (cf. the darker marked part of the model).

In order to decide which SEM technique is appropriate, the data and model characteristics need to be examined.⁷⁰⁵ The model (system of hypotheses) of this thesis is rather complex (many indicators and many constructs) compared to the sample size (101). With reference to WEIBER AND MÜHLHAUS (2010) as well as to HAIR ET AL. (2013), these are conditions that recommend the usage of PLS instead of AMOS for two main reasons. First, PLS is more flexible than AMOS because it is not constrained by the identification of constructs and other technical issues.⁷⁰⁶ Second, when facing small sample sizes, PLS has the great advantage of providing high statistical power. High statistical power means that with PLS, it is more likely to render a specific relationship significant when it is in fact significant in the population.⁷⁰⁷

In addition, the analysis of the data showed that most of the items and resulting constructs are distributed non-normally, and some of them are measured by single items (cf. Chapter 5.4.). These conditions of non-normal distribution and single item measurement⁷⁰⁸ violate the data assumptions of using the covariance-based approach (AMOS).⁷⁰⁹ With PLS, these conditions are not an issue.⁷¹⁰ PLS operates with the Ordinary Least Squares (OLS) algorithm and places minimal demands on measurement scales, so that single items constructs do not cause identification problems and distributional assumptions.⁷¹¹ Besides, PLS is less rigid in variable normality and randomness; i.e. PLS does not assume any specific distribution of the data.⁷¹²

However, some limitations of the PLS method have to be considered. First, PLS cannot be applied when the structural model contains causal loops or circular relationships

⁷⁰⁵ Cf. Hair et al. (2013), pp. 16.f.

⁷⁰⁶ Cf. Hair et al (2013), pp.14 ff, 23.

⁷⁰⁷ Cf. Hair et al (2013), p.15.

⁷⁰⁸ Cf. Hair et al. (2013), p. 24.

⁷⁰⁹ Cf. Hair et al. (2013), pp. 18.

⁷¹⁰ Cf. Hair et al. (2013), p. 23.

⁷¹¹ Cf. Wold (1980); Chin (1998); Wold (1982).

⁷¹² Cf. Hair et al. (2013), p. 23.

between the latent variables.⁷¹³ This is not relevant for this thesis, since the system of hypotheses only describe one-directional relationships or interactions. Second, although not relevant for most applications, some bias and consistency problems may occur with a few parameter estimates (known as the so called PLS-SEM bias).⁷¹⁴ This phenomenon thus needs to be taken into particular and careful consideration when specifying the model. Third, PLS lacks a global goodness of fit criterion, thus the user has to consider and compare a sum of different quality criteria.⁷¹⁵ This might limit the ability for overall theory testing and confirmation.

In summary, the data and model characteristics used in this thesis violate some of the assumptions for using the covariance-based approach (AMOS, LISREL) but none of the PLS approach. In addition, the type of model and sample can use some of the considerable advantages of PLS. Consequently, the PLS approach of causal SEM will be used as the statistical method to test the system of hypotheses of this thesis.

5.3.2 Principles of PLS-based SEM

The algorithm for the variance-based PLS approach was invented by WOLD (1975) and later extended by LOHMÖLLER (1989). It is based on the ordinary least squares (OLS) regression technique but considers only the indicator (item) values as known⁷¹⁶ and calculates all unknown parameters and relationships (indicator –construct-, construct-construct-relationships, and construct scores).⁷¹⁷ It follows an iterative procedure: first it calculates the scores of all constructs; second, it uses the scores as input for the partial regression models of the SEM to estimate the final indicator-construct-relationships and the relationships between the constructs.⁷¹⁸ The calculated construct scores are treated as perfect substitutes for the items. Thereby the algorithm uses all the variance from the

⁷¹³ Cf. Hair et al. (2013), p.18.

⁷¹⁴ Cf. Hair et al. (2013), p.18.

⁷¹⁵ Cf. Hair et al. (2013), p.18.

⁷¹⁶ In contrast, OLS-based simple regression considers construct values as known.

⁷¹⁷ Cf. Hair et al. (2013), p. 76.

⁷¹⁸ Cf. Hair et al. (2013), p. 76.

items to explain the variance of the construct. It calculates each construct as an exact linear combination of its items.

The algorithm estimates all unknown parameters in a way that maximizes the explained variances of the dependent construct.⁷¹⁹ This implies the joint minimization of measurement-mistakes variance and construct variance.⁷²⁰ Consequently, PLS considers confounded variances instead of extracting the measurement mistakes in the structural model.⁷²¹ This approach is due to the focus of PLS on the discrepancy between approximated values of the dependent constructs and the values predicted by the model in question.⁷²² “Therefore the focus of PLS-SEM is more on prediction than on explanation [...]”⁷²³ An alternative term for PLS and more correct according to WOLD ET AL. (2010) is *projection to latent structures*. According to HAIR, RINGLE, SARSTEDT (2011), this characteristic makes PLS particular useful for success driver studies as in the focus of this thesis.

In line with the systematic of the algorithm, the PLS method uses a two-staged analysis: First, the “*measurement model*” for the latent variables is defined, and for each LV, a construct value is calculated. Second, these construct values are used to estimate the “*structural model*” based on regression analysis.⁷²⁴

The structural model aims to test the structure of the variables’ relationships as theorized by the system of hypotheses. Since a SEM is a multi-equation system, the variables of this system can have multiple roles; i.e. within the system of hypotheses in a SEM, variables can simultaneously take on roles as independent and dependent variable.

Variables that take both roles are called “*intervention variables*.” Variables that have an independent role exclusively are “*exogenous variables*,” whereas variables that are dependent of any other variable in the SEM are called “*endogen variables*.” The goal of the SEM is to explain the endogen variable via the impact of the exogenous variables.

⁷¹⁹ Cf. Hair et al. (2013), p. 74.

⁷²⁰ Cf. Weiber/Mühlhaus (2010), p. 58.

⁷²¹ Cf. Weiber/Mühlhaus (2010), p. 58.

⁷²² Cf. Hair et al. (2013), p. 78.

⁷²³ Hair et al. (2013), p. 78.

⁷²⁴ Cf. Weiber/Mühlhaus (2010), p. XX (Introduction).

Therefore, endogenous variables are sometimes also called criteria variable, and exogenous variables are also called predictor variables.⁷²⁵ For each endogenous variable, the SEM defines one regression equation.

In this study, the endogenous variable of knowledge transfer success is explained by the exogenous variables of governance and knowledge characteristics respectively, as well as by the intervention variables of the conditions of individual action (AMO) (cf. Figure 34).

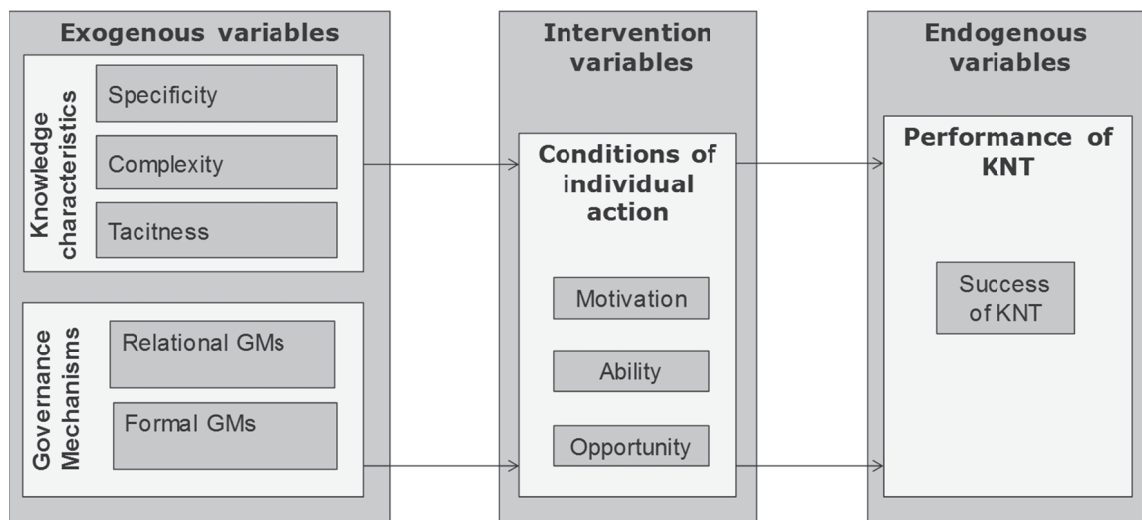


Figure 34: Classification of hypothesized variables in the SEM

All of these variables are latent variables (LV). *Latent variables* are variables that cannot be measured directly in empery (manifest variables).⁷²⁶ To measure empirical values for these LVs, “*indicators*” (items) are needed. The system of indicators to calculate empirical values for each latent variable is called the “*measurement model*.”⁷²⁷ A PLS-based SEM allows for formative as well as reflective measurement of LVs. The construction of the measurements is not constrained.

⁷²⁵ Cf. Weiber/Mühlhaus (2010), p. 18.

⁷²⁶ If only manifest variables, which do not interact with each other, are part of the system, classic regression analysis is the appropriate instrument. In case of any interaction of manifest variables, path-analysis is needed. Only when latent variables are included in the system of hypotheses is causal SEM appropriate.

⁷²⁷ This measurement model represents the construction of the measurements by single items as known from classic regression analysis.

The classification of the measurement type for each variable will be decided based on the diagnostic questionnaire for formative as opposed to the reflective measurement by JARVIS, MACKENZIE AND PODSAKOFF (2003) (cf. Appendix C). These detailed constructions of the variables are specified in Chapter 5.4.

The combination of measurement model and structural model (as defined by the system of hypotheses) is called the path diagram and displayed in Figure 35.

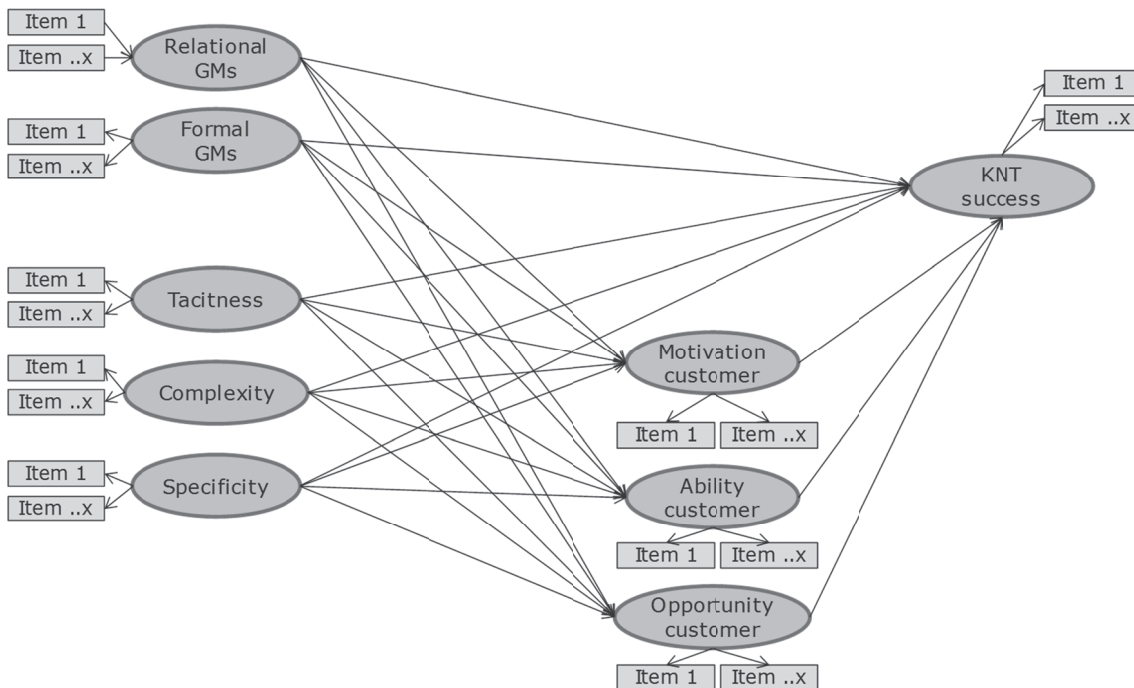


Figure 35: Path diagram⁷²⁸

The connections between the items (boxes) and the LVs (circles) represent the measurement model, and the connections between the LVs represent the structural model.

Relationships between indicators and constructs as well as between constructs are represented by arrows. The arrows are single-headed. The head represents the direction of the predicted relationship.

Within the measurement model, arrows pointing to a LV indicate a formative measurement whereas arrows pointing from the LV to the indicators represent reflective constructs. Single item measures are by convention always included as reflective in

⁷²⁸ The measurement model is an example. It does not represent the construction of the constructs.

PLS-SEMs.⁷²⁹ The displayed relationships between construct and indicators are considered “weights”⁷³⁰ for formative constructs and “loadings”⁷³¹ for reflective constructs.⁷³²

Reflective constructs and all endogenous variables contain error terms associated with each indicator and with the explaining construct respectively.⁷³³ Error terms represent the unexplained variance when the path model is estimated.⁷³⁴ Formative measures and exogenous variables are assumed to be error-free since they are the entities that explain the dependent variables in the path model.⁷³⁵

Within the structural model, direct effects are relationships represented by arrows that link only one LV with another. In contrast, “indirect effects involve a sequence of relationships with at least one intervening construct”⁷³⁶ - i.e. indirect effects are represented by multiple arrows. The displayed value for the relationship between two constructs is named the “path coefficient” (p).

All ovals contain an individual R^2 value. R^2 is the coefficient of determination and reflects the variance of that construct. A construct’s variance is explained by all other constructs pointing to it. The PLS algorithm aims to maximize the explained variance of each construct and thereby to predict the constructs.⁷³⁷

Consequently, for each dependent variable, a linear equation can be defined based on the structural path model in such a way that arrows in the path diagram are represented via “path coefficients” in the equations.⁷³⁸

⁷²⁹ Cf. Hair et al. (2013), p. 58.

⁷³⁰ Weights are estimated by a partial multiple regression where the constructs represent a dependent variable and the indicators independent variables.

⁷³¹ Loadings are estimated through single regression for each indicator on the construct.

⁷³² Cf. Hair et al. (2013), p. 76.

⁷³³ Cf. Hair et al. (2013), p. 12.

⁷³⁴ Cf. Hair et al. (2013), p. 12.

⁷³⁵ Cf. Diamantopoulous (2011), Hair et al. (2013).

⁷³⁶ Hair et al. (2013), p. 35.

⁷³⁷ Cf. Hair et al. (2013), p. 83.

⁷³⁸ Weiber/Mühlhaus (2010), p.43f.

Although PLS is often cited as a soft-modeling approach due to its considerable flexibility and no distributional assumption, it still has one central assumption⁷³⁹ that must not be violated for a proper interpretation of the results.⁷⁴⁰ This is the sufficient sample size for the model that is tested.

A guideline for the minimum sample size is the 10 times rule: The minimum sample size should be 10 times the maximum number of arrowheads (structural paths) pointing at a latent variable anywhere in the model.⁷⁴¹ The structural model in this thesis contains 8 independent variables (relational governance mechanisms, formal governance mechanisms, motivation, ability, opportunity, tacitness, complexity, and specificity) that explain knowledge transfer success. Thus the minimum sample size is 80 observations. The data basis contains 101 observations. Thus the central assumption of a PLS-based SEM is fulfilled.

Since the PLS-SEM builds on the properties of OLS regression, researchers can revert to rules of thumb for statistical regression models.⁷⁴² More detailed and specified considerations of the appropriate sample size can be performed for each part of the model by using power analysis.⁷⁴³ Therefore, this thesis uses G*Power⁷⁴⁴ to carry out the power analyses specifically for the model setups in the single empirical analyses.

5.3.3 Quality criteria for measurement and structural model

CHIN (1998b) suggests assessing the criteria of the structural model first and the criteria of the measurement model second. HAIR ET AL. (2013) recommend doing this

⁷³⁹ Further assumptions such as for example non-collinearity are addressed by the explicit quality criteria to evaluate the model and thus will be explained in line with their introduction in the next section.

⁷⁴⁰ Cf. Hair et al. (2013), p.22.

⁷⁴¹ Cf. Hair et al. (2013), p. 20.

⁷⁴² Cf. Hair et al. (2013), p. 18.

⁷⁴³ Cf. Hair et al. (2013), p. 18.

⁷⁴⁴ Free of charge at <http://www.psych.uni-duesseldorf.de/abteilungen/aap/gpower3/download-and-register> (assessed November 11th 2013).

just the other way round. Nonetheless, the whole model can be considered a good fit and reliable only if all relevant criteria are fulfilled.⁷⁴⁵

5.3.3.1. Structural model

The PLS-based SEM approach does not have a global goodness of fit criteria; rather a synopsis of several criteria needs to be assessed.⁷⁴⁶ Since the focus of PLS-SEM is prediction rather than explanation, the criteria to assess the model quality are measurements indicating the model's predictive capabilities – i.e. nonparametric evaluation criteria. In addition, procedures such as bootstrapping and blindfolding are used to evaluate the findings.

Table 21 presents an overview of all measurements and their required values as recommended by WEIBER & MÜHLHAUS (2010) to assess the structural model.

Criteria	Minimum requirement	Relevant for
Collinearity Check		
VIF	<5	All single regression models
Relevance of relationships (size and significance of path coefficients)		
Size of standardized path coefficients	>0.2 better 0.3 ⁷⁴⁷	All constructs
Significance of path coefficients (T-test via Bootstrapping)	t> 1.96 ⁷⁴⁸ , t>1.65 ⁷⁴⁹	All constructs
Explanatory power and robustness of constructs		
Explanatory power (Coefficients of determination (Adjusted R ²))	>0.19 weak; >0.33 moderate; > 0.66 substantial ⁷⁵⁰	All constructs
Prediction relevance (Redundancy: Stone-Geisser-Criteria)	Q ² >0 q ² >0.02 weak, >0.15 medium, >0.35 substantial	Reflective, endogenous constructs
Effect strength (f ²) (importance of impact)	f ² >0.01 low relevance. ⁷⁵¹ f ² >0.15 medium relevance f ² >0.35 very relevant	All constructs

Table 20: Quality criteria of the structural PLS model

A formal method to detect **collinearity** is the Variance Inflation Factor (VIF). VIF is defined as the extent to which “the standard error has been increased due to the presence

⁷⁴⁵ Cf. Weiber/Mühlhaus (2010), p. 259.

⁷⁴⁶ Cf. Weiber/Mühlhaus (2010), p. 259.

⁷⁴⁷ Cf. Chin (1998a), p.11.

⁷⁴⁸ Cf. Weiber/Mühlhaus (2010), p. 256.

⁷⁴⁹ Cf. Hair et al. (2013), p.186.

⁷⁵⁰ Cf. Chin (1998b), p. 232.

⁷⁵¹ Cf. Chin (1998b), p. 317.

of collinearity.”⁷⁵² The VIF measures how much variance of estimated regression coefficients are inflated when compared to having uncorrelated predictors.⁷⁵³

In the case of collinearity, the variance of the regression coefficients increases by the VIF value – i.e. higher VIFs result in imprecise parameters.

“In the context of PLS-SEM a VIF value of 5 and higher indicates a potential collinearity problem.”⁷⁵⁴ This level indicates that 80% of an indicator’s variance is accounted for by the remaining indicators of the construct.⁷⁵⁵

PLS does not offer the VIF in its reports thus it is computed separately by running a regression on a random item using all scores of the LVs as independent variables.⁷⁵⁶

The dependent variable can be any other variable that is not the LV scores.⁷⁵⁷

Relevant relationships in the structural model are identified by standardized path coefficients higher than 0.2.⁷⁵⁸

Since a PLS-based SEM does not specify any distribution of its variables, common tests for parametric significance of path coefficients cannot be performed.⁷⁵⁹ The significance of path coefficients in a PLS-SEM is tested by bootstrapping⁷⁶⁰ and t-test. Bootstrapping generates random control samples to test the model several times. Consequently, a t-test of the standard errors of all estimated values in these control samples can test for the 0-hypotheses, i.e. path coefficients do not differ significantly from 0.⁷⁶¹ For t values higher than 1.96, the 0-hypothesis is neglected – i.e. the respective parameter is significant for the structural model at a significance level of 5% (two tailored test).⁷⁶²

⁷⁵² Hair et al. (2013), p. 125.

⁷⁵³ Cf. Weiber/Mühlhaus (2010), p. 207.

⁷⁵⁴ Hair et al. (2013), p. 125.

⁷⁵⁵ Cf. Hair et al. (2013), p. 125.

⁷⁵⁶ Cf. Hair et al. (2013), pp. 125, 154.

⁷⁵⁷ Cf. Hair et al. (2013), p. 154.

⁷⁵⁸ Cf. Chin (1998a), p.11.

⁷⁵⁹ Cf. Hair et al. (2013), p. 130.

⁷⁶⁰ For further description of the bootstrapping procedure consult Davison/Hinkley (1997); Efron/Tibshirani (1986).

⁷⁶¹ Cf. Hair et al. (2013), p. 130.

⁷⁶² Cf. Weiber/Mühlhaus (2010), p. 256; Hair et al. (2013), p. 134.

For a significance level of 1%, the t-value needs to reach 2.57 whereas for significance level of 10%, a t-value of 1.65 is sufficient.⁷⁶³

Since the number of random samples defined via bootstrapping should be sufficient and the sample size should match the original size, 5000 samples⁷⁶⁴ with 100 cases are bootstrapped.⁷⁶⁵

However, extremely non-normal data is known to increase standard errors obtained from bootstrapping. To limit their likelihood, some relationships were assessed as significant.⁷⁶⁶

In order to analyze the **explanatory power** of a PLS-based SEM, the adjusted R^2 for each LV is calculated. R^2 defines how much of the percentage of the variance of an endogenous LV is explained by its exogenous variables. The adjusted R^2 is corrected for the number of repressors because R^2 is influenced by this number as defined by the following formula:

$$\bar{R}^2 = 1 - (1 - R^2) \frac{n - 1}{n - p - 1} = R^2 - (1 - R^2) \frac{p}{n - p - 1}.$$

Following CHIN (1998b), values between 0.19 and 0.33 are considered weak, values between 0.33 and 0.66 are considered moderate, and values above 0.66 are considered substantial.⁷⁶⁷

In order to assess the power of an exogenous variable to explain another LV, f^2 is calculated. f^2 is called *effect strength* and explains the difference in R^2 of a LV when the exogenous variable is not included in the estimation of the LV. Thus f^2 higher than 0.35 define the exogenous variable as very relevant to explaining the LV whereas values between 0.15 and 0.35 define medium relevance, and values between 0.01 and 0.15 define low relevance.⁷⁶⁸

⁷⁶³ Cf. Hair et al. (2013), p. 134.

⁷⁶⁴ Cf. Hair et al. (2013), p. 132.

⁷⁶⁵ Cf. Weiber/Mühlhaus (2010), p.256.

⁷⁶⁶ Cf. Hair et al. (2013), p. 54.

⁷⁶⁷ Cf. Chin (1998b), p. 232.

⁷⁶⁸ Cf. Chin (1998b), p. 317.

f^2 is defined as “the relative impact of a predictor construct on an endogenous construct”⁷⁶⁹ and calculated using the following formula:

$$f^2 = (R^2 (\text{included}) - R^2 (\text{excluded})) / 1 - R^2 (\text{included})$$
⁷⁷⁰

To estimate the R^2 (excluded) values, the model is re-estimated after deleting a specific predecessor of a latent endogenous variable.⁷⁷¹

For reflective endogen LVs, WEIBER AND MÜHLHAUS (2010) recommend assessing the prediction power by calculating the Stone-Geisser criterion (Q^2). Using blindfolding, the Q^2 assumes parts of the original data as missing and recalculates them using the estimated parameter values. “Blindfolding is a sample reuse technique that omits part of the data matrix and uses the model estimates to predict the omitted part.”⁷⁷²

Q^2 values above 0 indicate that the model has prediction relevance; the value 0 indicates that the model can only recalculate the means of the missing data, and values below 0 indicate no prediction relevance of the model.⁷⁷³

The same method can be used to assess the prediction power of path coefficients by recalculating deleted exogenous variables. This criterion is q^2 .

Following the recommendations of HAIR ET AL. (2013) for all blindfolding procedures, this thesis uses an omission distance of 7 in order not to create an integer⁷⁷⁴ at the sample size of 101. That is, each seventh data point is deleted when applying the blindfolding procedure, and thus 1/7 of the data in the original data set is removed during each blindfolding round. Furthermore, the blindfolding procedure is conducted for one reflective, endogenous construct after the other, but not in a single blindfolding

⁷⁶⁹ Cf. Hair et al. (2013), p. 201.

⁷⁷⁰ Cf. Hair et al. (2013), p. 201.

⁷⁷¹ Cf. Hair et al. (2013), p. 196.

⁷⁷² Hair et al. (2013), p. 201.

⁷⁷³ Cf. Hair et al. (2013), p. 201.

⁷⁷⁴ According to Hair et al. (2013), p. 202, the omission distance must be between 5 and 10 but not an integer of the number of observations divided by the omission distance.

run, to calculate the exact values.⁷⁷⁵ The values for Q^2 and q^2 are estimated using the constructs' cross-validated redundancy⁷⁷⁶ estimates of the “sum of the squared observations” (SSO) and the “sum of the squared prediction errors” (SSE) as defined by the following formulas:

$$Q^2 = 1 - \text{SSE/SSO}$$

$$q^2 = (Q^2 \text{ (included)} - Q^2 \text{ (excluded)}) / 1 - Q^2 \text{ (included)}^{777}$$

5.3.3.2. Measurement Model

Since the PLS approach uses a two-staged analysis (first calculation of measurement model, second calculation of structural model)⁷⁷⁸, the quality of the structural model depends on the quality of the measurement model. Mistakes in the measurement model will consequently cause mistakes in the estimation of the variable relationships in the structural model.⁷⁷⁹ Thus intense quality tests of the measurement model, namely validity and reliability tests are recommended.⁷⁸⁰ Reliability criteria test for random errors in the construct whereas validity criteria assess all errors.

Reliability indicates that all items of a construct measure exactly this parameter – i.e. the dependability of the items and the accuracy of the construct.⁷⁸¹ Validity indicates that the average value of the items matches the average value of the true score of the variable – i.e. the conceptual correctness of the construct or the absence of errors (systematic and random).⁷⁸² This correctness is sorted into different types, namely content validity and construct validity (nomological validity, convergent validity, and discriminant validity).

⁷⁷⁵ Cf. Hair et al. (2003), p. 194.

⁷⁷⁶ In contrast to the cross-validated communality estimates, which use only the measurement model to obtain the Q^2 values based on the prediction of the data points, cross-validated redundancy also uses the structural model to obtain the Q^2 -values.

⁷⁷⁷ Cf. Hair et al. (2003), p. 194.

⁷⁷⁸ Cf. Weiber/Mühlhaus (2010), p. XX (Introduction).

⁷⁷⁹ Cf. Weiber/Mühlhaus (2010), p. 103.

⁷⁸⁰ Cf. Weiber/Mühlhaus (2010), p. 103.

⁷⁸¹ Cf. Weiber/Mühlhaus (2010), p. 103.

⁷⁸² Cf. Weiber/Mühlhaus (2010), p. 127.

Content validity is established when the items reflect all dimensions of the construct semantically, not leaving out a single portion of the construct's content in the measurement.⁷⁸³ This completeness of indicators cannot be assessed statistically but has to be evaluated by experts familiar with the facets of the constructs. Thus a careful selection of the indicators and the reflection with experts from research and management for example via pre-tests is considered a verification of content validity.⁷⁸⁴ As laid out previously, the development of the questionnaire was assisted by both research and managers as well as subject to a pre-test. Thus the constructs of this thesis are designed very carefully, and content validity can be assumed as established for all of them.

Construct validity is established when the measurement is not subject to systematic errors and not altered by other constructs.⁷⁸⁵ This establishes nomological validity, discriminant validity, and convergent validity.⁷⁸⁶

Nomological validity is established when causal relationships of the construct can be reasoned theoretically in terms of a nomological net. This derives a system of hypotheses including the construct and its theory-based inter-dependence with other constructs as well as defining the relationship between the construct and its indicators.⁷⁸⁷ Consequently, the assessment of nomological validity is the causal analysis of the system of hypotheses. If the complete SEM (measurement + structural model) supports the theorized relationships empirically, nomological validity can be assumed.

Convergent validity is established when the values of a construct, which are measured using two methods that are maximally diverse, are identical. Since finding two maximally diverse measurement methods is very difficult in research practice⁷⁸⁸, convergent validity often is assessed by simply using different multiple indicators.⁷⁸⁹ This approach cannot establish convergent validity but the convergence of the

⁷⁸³ Cf Weiber/Mühlhaus (2010), p. 127.

⁷⁸⁴ Cf Cronbach/Mehl (1955), p.282; Nunnally (1967), p79ff.; Weiber/Mühlhaus (2010), p. 127.

⁷⁸⁵ Cf. Weiber/Mühlhaus (2010), p. 131.

⁷⁸⁶ Cf. Peter (1981), p. 135.

⁷⁸⁷ Cf. Peter (1981), p. 135.

⁷⁸⁸ Cf. Bagozzi et al (1991), p. 425; Campell/Fiske (1959), p. 83f.; Weiber/Mühlhaus (2010), p. 132.

⁷⁸⁹ Cf. Fornell/Larcker (1981), p. 40; Anderson/Gerbing (1988), p. 416; Weiber/Mühlhaus (2010), p. 134.

measurement method and the distinction of the constructs.⁷⁹⁰ However, according to FORNELL/LARCKER (1981), convergent validity can be assumed when the construct explains more than 50% of the variance of its indicators. That is, there is less error in the items than variance explained by the construct.⁷⁹¹ Although this approach cannot prove convergent validity, it identifies constructs that lack convergent validity.⁷⁹²

Discriminant validity explains “the extent to which a construct is truly distinct from other constructs by empirical standards.”⁷⁹³ This means a construct is unique and does not capture phenomena represented by other constructs in the model.⁷⁹⁴

Reliability and validity need to be established for the items themselves (indicator level) and for the construct (construct level).⁷⁹⁵ Reliability can be established for a construct even when validity is not given but not vice versa.⁷⁹⁶ Thus reliability is a necessary and validity a sufficient characteristic of variables in the measurement model.

Evaluating the constructs of the measurement model, one needs to distinguish between the evaluation of formative and reflective constructs.⁷⁹⁷ According to JARVIS ET AL. (2003), reflective constructs imply the assumptions of classical test theory, which is not applicable to formative constructs because their items do not necessarily correlate per definition. The following sections describe this difference in more detail and introduce the respective quality criteria for each type of measurement

5.3.3.2.1. Reflective constructs⁷⁹⁸

With reference to FORNELL (1982), quality tests for reflective constructs are sorted into testing the first generation and testing second generation. Tests of the first generation mainly verify the reliability of constructs. This generation of tests requires one-dimensionality of each construct as defined by EFA before measuring item and

⁷⁹⁰ Cf. Bagozzi (1981b), pp. 375ff.

⁷⁹¹ Cf. Hair et al. (2013), p. 103.

⁷⁹² Cf. Weiber/Mühlhaus (2010), p. 131.

⁷⁹³ Hair et al (2013), p. 104.

⁷⁹⁴ Cf. Hair et al. (2013), p. 105.

⁷⁹⁵ Cf. Hair et al (2013), Weiber/Mühlhaus (2010).

⁷⁹⁶ Cf. Hair et al (2013), Weiber/Mühlhaus (2010).

⁷⁹⁷ Cf. Hair et al (2013), Weiber/Mühlhaus (2010).

⁷⁹⁸ Cf. Weiber/Mühlhaus (2010), pp. 105 ff.

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construct reliability. However, they do not test for measurement error and do not analyze the parameters of the model for their inference statistics.⁷⁹⁹

Second generation criteria are based on Confirmatory Factor Analysis (CFA) and consider validity tests as well as measurement errors. “Measurement error is the difference between a true value of a variable and the value obtained by a measurement.”⁸⁰⁰ If the error has a random source, it impacts the reliability of the variable, whereas a systematic source of the error threatens validity.⁸⁰¹

WEIBER/MÜHLHAUS (2010) recommend optimizing the constructs based on the first generation criteria and afterwards to assess the second generation criteria.

First generation criteria	Requirement	Valid to evaluate...
Reliability test on indicator level		
Communalities	≥ 0.5 ⁸⁰²	Reflective constructs
(Rotated) factor loading	≥ 0.4 ⁸⁰³	Reflective constructs
Corrected item-to-total correlation (CITC)	≥ 0.5 ⁸⁰⁴	Reflective constructs
Reliability test on construct level		
KMO	≥ 0.6 ⁸⁰⁵ ; > 0.5 ⁸⁰⁶	Reflective constructs
Bartlett test	denial ⁸⁰⁷	Reflective constructs
One-dimensionality	1 factor for each construct	Reflective constructs
Cronbach's Alpha	≥ 0.6 ⁸⁰⁸ ; ≥ 0.7 ⁸⁰⁹ ; ≥ 0.8 ⁸¹⁰	Reflective constructs
Inter-Item correlation (IIC)	≥ 0.3 ⁸¹¹	Reflective constructs

Table 21: First generation quality criteria for reflective constructs⁸¹²

Since the first generation criteria rely on the one-dimensionality of each construct, the first step is an EFA that identifies the potential components of a multidimensional construct. To perform an EFA, the indicators need to correlate sufficiently with each

⁷⁹⁹ Cf. Hildebrandt (1984), p.42; Hair et al. (2013), p. 49.

⁸⁰⁰ Hair et al. (2013), p. 97.

⁸⁰¹ Cf. Hair et al. (2013), p. 97.

⁸⁰² Cf. Weiber/Mühlhaus (2010), p.107.

⁸⁰³ Cf. Homburg/Giering (1996), p. 8.

⁸⁰⁴ Cf. Zaichkowsky (1985), p. 343; Shimp/Sharma (1987), p.282.

⁸⁰⁵ Cf. Kaiser/Rice (1974), p.111f.

⁸⁰⁶ Cf. Rinkenburger (2009), p. 464.

⁸⁰⁷ Cf. Dziuban/Shirkey (1974), p. 358 ff.

⁸⁰⁸ Defined sufficient for an explorative status of research by Robinson et al (1991), p. 13.

⁸⁰⁹ Cf. Nunally (1994), p. 245; Hair et al. (1998).

⁸¹⁰ Cf. Rossiter (2002), p.310.

⁸¹¹ Cf. Robinson et al. (1991), p. 13.

⁸¹² Adapted from Weiber/Mühlhaus (2010), p. 115.

other. The criterion that tests for this correlation is the Measure of Sampling Adequacy (MSA) or the communalities. In this thesis, the communalities are selected consciously. They explain how much of the indicator's variance can be explained by the extracted factors.⁸¹³ Indicators with a value below 0.5 should be deleted from the EFA because they do not have much in common with the other variables, and only a small portion of variance is explained by the extracted indicators.⁸¹⁴ The factor loadings indicate how much the respective indicator is associated with the extracted factor.⁸¹⁵ In the case of a one-dimensional construct, only a single factor is extracted, and all items clearly load onto this factor (the construct). If more than one factor is extracted, by convention, factor loading above 0.5 is considered high.⁸¹⁶ Thus items that load on a certain factor above 0.5 can be considered as building this dimension of the construct.⁸¹⁷ On the construct level, the Kaiser-Meyer-Olkin criterion (KMO) and the Bartlett Test assess the correlation of the indicators. The KMO aggregates MSA values and should be higher than 0.6.⁸¹⁸ The Bartlett Test tests the 0-hypotheses that the indicators are not correlated and should be declined.⁸¹⁹

If the EFA identifies more than one factor, the researcher needs to decide either to build two separate constructs based on the identified factors or to delete the factors that do not meet the central theoretical construct he wants to explain.⁸²⁰

If the EFA identified a one-dimensional construct, the reliability tests can be started.⁸²¹ For the reliability test on the construct level, Cronbach's alpha and the Inter-Item correlation (IIC) need to be calculated. The reliability test on the indicator level uses the

⁸¹³ Cf. Weiber/Mühlhaus (2010), p. 107.

⁸¹⁴ Cf. Weiber/Mühlhaus (2010), p. 107.

⁸¹⁵ Cf. Backhaus et al (2011), p. 362.

⁸¹⁶ Cf. Backhaus et al (2011), p. 362.

⁸¹⁷ Cf. Backhaus et al (2011), p. 362.

⁸¹⁸ Cf. Rinckenburger (2009), p. 464.

⁸¹⁹ Cf. Weiber/Mühlhaus (2010), p. 107.

⁸²⁰ Cf. Weiber/Mühlhaus (2010), pp. 108f.

⁸²¹ Cf. Weiber/Mühlhaus (2010), p. 109.

Corrected-Item-to-total (CITC) correlation. All these criteria assess the internal consistency of the construct.⁸²²

Cronbach's alpha is the average reliability when splitting the set of indicators into two and then comparing their correlations.⁸²³ It varies between 0 and +1, with higher values indicating a higher level of reliability.⁸²⁴ Values of 0.6 are considered acceptable in exploratory research⁸²⁵ whereas in advanced research, values higher than 0.7 can be considered satisfactory.⁸²⁶ Values above 0.8 are very good.⁸²⁷ Respectively, values lower than 0.6 indicate a lack of reliability.

The IIC measures the average correlation between the indicators of a construct.⁸²⁸ According to WEIBER & MÜHLHAUS (2010), a value above 0.3 indicates an adequate measurement of the construct.⁸²⁹

If ICC and Cronbach's alpha indicate a consistent construct, a sufficient reliability can be assumed. However, the reliability can be improved by considering deleting indicators that do not contribute significantly to the measurement of the construct.⁸³⁰ The CITC of each indicator is the criterion that indicates this contribution. It calculates the correlation of an indicator with the sum of the remaining indicators of the construct.⁸³¹ The value of CITC ranges from -1 to +1. If an indicator has values below 0.5, it should be deleted from the construct measurement.⁸³²

If a construct has passed all first generation tests, the tests of the second generation can be calculated. According to HAIR ET AL. (2013), these assess internal consistency,

⁸²² Cf. Weiber/Mühlhaus (2010), p. 110.

⁸²³ Cf. Nunnally (1994), p.252; Churchill (19979), p.68.

⁸²⁴ Cf. Weiber/Mühlhaus (2010), p. 110.

⁸²⁵ Cf. Bagozzi/Yi (1988), p. 82.

⁸²⁶ Cf. Nunally (1994), p. 245; Hair et al. (1998).

⁸²⁷ Rossiter (2002), p.310.

⁸²⁸ Cf. Weiber/Mühlhaus (2010), p. 112.

⁸²⁹ Cf. Weiber/Mühlhaus (2010), p. 112.

⁸³⁰ Cf. Weiber/Mühlhaus (2010), p. 112.

⁸³¹ Cf. Weiber/Mühlhaus (2010), p. 112.

⁸³² Cf. Nunnally (1967), p. 263.

convergent validity, and discriminant validity based on several criteria as presented in Table 22.

Second generation criteria	Requirement	Valid to evaluate...
Internal consistency		
Composite reliability	0.7 - 0.9 ⁸³³	Reflective constructs
Convergent validity		
Indicator reliability (Outer loadings of indicators)	≥0.7 ⁸³⁴ , <0.4 deletion of item	Reflective constructs
Average variance extracted (AVE)	≥0,5 ⁸³⁵	Reflective constructs
Discriminant validity		
Cross-loadings of items	< loading on own construct	Reflective constructs
Fornell-Larcker criterion	√AVE > correlation with other constructs	Reflective constructs

Table 22: Overview of second generation quality criteria for the reflective measurement model⁸³⁶

A very established but conservative measure to assess the **internal consistency** of a construct is Cronbach`s alpha as introduced within the first generation criteria. Alpha is considered conservative because it assumes that all items are equally reliable when calculating the inter correlation of the items.⁸³⁷ In addition, it is sensitive to the number of items in the scale and tends to underestimate reliability.⁸³⁸ A measure that taking different loadings of the items into account is the “composite reliability” (p_c). It is calculated as below:

$$P_c = (\sum_i l_i)^2 / (\sum_i l_i)^2 + \sum_i \text{var}(e_i)^{839}$$

With:

l_i = standardized outer loading of the indicator variable i

e_i = measurement error of indicator variable

$\text{Var}(e_i)$ = variance of measurement error ($1-e^i$)

Composite reliability varies between 0 and +1, with higher values indicating a higher level of reliability. Values of 0.6 are considered acceptable in exploratory research⁸⁴⁰

⁸³³ Cf. Nunally /Bernstein (1994); Hair et al. (2013), p. 102.

⁸³⁴ Cf. Hair et al. (2013), p.102.

⁸³⁵ Cf. Formell/Larcker (1981), p.46.

⁸³⁶ Adopted from Hair et al (2013), p. 107.

⁸³⁷ Cf. Hair et al. (2013), pp.102 f.

⁸³⁸ Cf. Hair et al. (2013), pp.102 f.

⁸³⁹ Hair et al. (2013), p. 101.

whereas in advanced research, values higher than 0.7 can be considered satisfactory. Values above 0.95 are not desirable because this would indicate that all items measure the same phenomenon and are unlikely to be a valid measure of the construct. Values lower than 0.6 indicate a lack of internal consistency reliability.

The extent to which an item correlates positively with alternative items of the same constructs is called **convergent validity**.⁸⁴¹ Establishing convergent validity means that all items of a construct converge or share a high proportion of variance.⁸⁴² To assess this measure, the outer loadings per item and the average variance extracted per construct (AVE) need to be analyzed.

With high outer loadings, items have much in common, which is reflected in the construct. Values above 0.7 are considered as sufficient indicator reliability.⁸⁴³ If items do not reach outer loadings above 0.4, they should be deleted from the scale.⁸⁴⁴ If they reach loadings between 0.4 and 0.7, they should be considered carefully for removal. In case a removal increases the composite reliability or the AVE deletion is recommended, the researcher can decide to keep them in the scale.⁸⁴⁵

Outer loadings measure validity on the item level, whereas AVE measures convergent validity on the construct level. AVE is defined as “the grand mean value of the squared loadings of the indicators associated with the construct.”⁸⁴⁶ AVE values of 0.5 or higher indicate that the construct explains more than 50% of the variance of its indicators. Thus an AVE value lower than 0.5 indicates that more error remains in the items than variance explained by the construct.⁸⁴⁷

Discriminant validity explains “the extent to which a construct is truly distinct from other constructs by empirical standards.”⁸⁴⁸ This means a construct is unique and does

⁸⁴⁰ Cf. Bagozzi/Yi (1988), p. 82.

⁸⁴¹ Cf. Hair et al. (2013), p.102.

⁸⁴² Cf. Hair et al. (2013), p.102.

⁸⁴³ Cf. Hair et al. (2013), p.102.

⁸⁴⁴ Cf. Hair et al. (2013), p.103.

⁸⁴⁵ Cf. Hair et al. (2013), p.103.

⁸⁴⁶ Hair et al. (2013), p. 103.

⁸⁴⁷ Cf. Hair et al. (2013), p. 103.

⁸⁴⁸ Hair et al. (2013), p. 104.

not capture phenomena represented by other constructs in the model.⁸⁴⁹ Discriminant validity is evaluated by analyzing the cross-loading of items. A more conservative approach is the Fornell-Larcker criterion⁸⁵⁰, which demands that the square root of each construct's AVE is greater than its highest correlation with any other construct in the model.⁸⁵¹ In case of higher AVE than correlations, the construct shares more variance with its items than with any other construct and is thus considered valid.⁸⁵² This is quite similar to the assessment of the cross-loadings: An item's outer loading to a construct should be higher than any cross-loading on other constructs to establish discriminant validity.⁸⁵³

Following WEIBER & MÜHLHAUS (2010), all reflective constructs in this thesis are first assessed and optimized based on the first generation criteria, which are calculated using IBM SPSS Statistics 21, and then tested by the second generation criteria using the respective PLS SEM reports of SMART PLS 2.0.

Finally, it shall be noted that the criteria for the evaluation of the reflective measurement model are not applicable to single-item constructs.⁸⁵⁴

5.3.3.2.2. Formative constructs

Reflective constructs imply the assumptions of classical test theory.⁸⁵⁵ Therefore, construct validation through second generation criteria based on Confirmatory Factor Analysis (CFA) (convergent and discriminant validity) and reliability testing (Cronbach's Alpha and Composite Reliability) is appropriate.⁸⁵⁶ Formative constructs on the other hand do not have a common cause for the items in the constructs but are

⁸⁴⁹ Cf. Hair et al. (2013), p. 105.

⁸⁵⁰ Cf. Hair et al. (2013), p. 105.

⁸⁵¹ Cf. Hair et al. (2013), p. 105.

⁸⁵² Cf. Hair et al. (2013), p. 105.

⁸⁵³ Cf. Hair et al. (2013), p. 105.

⁸⁵⁴ Cf. Hair et al. (2013), p. 99.

⁸⁵⁵ Cf. Jarvis et al. (2003).

⁸⁵⁶ Cf. Jarvis et al. (2003).

composed of different aspects of a construct.⁸⁵⁷ Consequently, formative items may be completely independent without any requirement to correlate.⁸⁵⁸

Collinearity among these factors, in fact, can cause significant problems because the weights linking the formative indicators with the construct can become unstable and non-significant.⁸⁵⁹ In addition, if multi-collinearity is present, it means that indicators are tapping into the same aspect of the construct.⁸⁶⁰ Thus, reliability in the internal consistency sense is not meaningful for formative constructs⁸⁶¹, but the first step to evaluating the quality of formative constructs is to assess the assumption of no multi-collinearity.⁸⁶²

The VIF as a treatment of collinearity was already introduced for the structural model. This procedure can be adapted to the level of items in such that the VIF is computed in SPSS by running a regression on a random item using all items of the formative construct as independent variables.⁸⁶³ The dependent variable can be any other variable that is not included in the formative construct.⁸⁶⁴

If collinearity is very high, “one should consider removing one of the corresponding indicators”⁸⁶⁵ unless this does not change the construct’s content from a theoretical perspective. Other means to deal with multi-collinearity are building higher order constructs or combining correlating indicators into a composite indicator based on their average value or factor score.⁸⁶⁶ When using factor scores, it has to be considered that “the individual effects of the indicators become confounded.”⁸⁶⁷ This can have adverse consequences for the content validity of the new composite indicator.⁸⁶⁸

⁸⁵⁷ Cf. Hair et al. (2013), p. 44; Diamantopoulos and Winklhofer (2001).

⁸⁵⁸ Cf. Hair et al. (2013), p. 44.

⁸⁵⁹ Cf. Hair et al. (2013), p. 44.

⁸⁶⁰ Cf. Petter et al. (2007), p.641.

⁸⁶¹ Cf. Weiber/Mühlhaus (2010), p. 205.

⁸⁶² Diamantopoulos and Sigauw (2006), Weiber/Mühlhaus (2019), p. 207.

⁸⁶³ Cf. HAIR ET AL. (2013), pp. 125, 154.

⁸⁶⁴ Cf. Hair et al.. (2013), p. 154.

⁸⁶⁵ Hair et al. (2013), p. 125.

⁸⁶⁶ Cf. Hair et al. (2013), p. 125.

⁸⁶⁷ Hair et al. (2013), p. 125.

⁸⁶⁸ Cf. Hair et al. (2013), p. 125.

If multi-collinearity is not a problem or has been treated successfully, the quality assessment formative construct proceeds with validity tests.

According to DIAMANTOPOULOS ET AL. (2008) and HARDIN ET AL. (2008), validity assessment is the most controversial issue in formative measurement because there are limitations of the applicability of statistical procedures. Therefore, for the assessment of the validity of formative constructs, “researchers should focus on establishing content validity before empirically evaluating formatively measured constructs. This process requires ensuring that the formative indicators capture all (or at least major) facets of the construct.”⁸⁶⁹ As described in the development of the questionnaire, a great deal of effort was exerted to ensure the correct design of the constructs (cf. Chapter 5.4.2/3). Thus this type of validity is considered to be established for the constructs of this thesis.

Still, indicator validity and construct validity have to be assessed for formative constructs. Since the CFA is not appropriate for formative measurements, different approaches need to be applied.⁸⁷⁰

In the research on SEM, the **indicator validity** is assessed by analyzing the prediction relevance of the indicators.⁸⁷¹ Indicators that have a significant outer weight are considered to have a relevance to explaining the formative construct.⁸⁷² Outer weights are the results of a multiple regression using all formative indicators as independent variables and the LV as a dependent variable.⁸⁷³ Since formative indicators define a construct as a linear combination of them, 100% of the construct is explained by these indicators, and R^2 is 1. Thus the values of the outer weights represent the relative importance of each item.⁸⁷⁴ However, the outer weight does not define whether the item truly (significantly) contributes to forming the construct. In order to test if the outer

⁸⁶⁹ Hair et al. (2013), p. 119.

⁸⁷⁰ Cf. Weiber/Mühlhaus (2020), p. 209.

⁸⁷¹ Cf. Weiber/Mühlhaus (2020), p. 209; Hair et al (2013), p. 121.

⁸⁷² Cf. Weiber/Mühlhaus (2020), p. 209; Andreev, Heart et al. (2009); Hair et al. (2013), p. 131.

⁸⁷³ Cf. Hair et al. (2013), p. 127.

⁸⁷⁴ If formative indicators have positive and negative weights, this must not be interpreted as higher or less relevance of the indicator but just that the indicators form different facets of the construct.

weights are significant (different from 0), the bootstrapping procedure is needed.⁸⁷⁵ Bootstrapping tests the model by applying it to about 5000 subsamples of the observations, which are randomly drawn from the original data set. The standard errors of the estimated outer weights in each subsample are then used to perform t-tests and the significance of each weight respectively.⁸⁷⁶

If the outer weight is not significant but the outer loading is higher than 0.5 or the outer loading is significant at all, the indicator is considered to have an absolute importance and relevance for the construct.⁸⁷⁷ The absolute importance “is the information an indicator provides without considering any other indicator.”⁸⁷⁸

Indicators that fulfill none of these criteria need to be deleted from the measurement model because they do not have any relevance or importance to explaining the construct.⁸⁷⁹ If the outer loading is not significant but below 0.5, the removal of the indicator needs to be considered carefully and with respect to the content validity.⁸⁸⁰

In terms of **construct validity**, the discussion of the relevance of discriminant and convergent validity is diverse even in SEM research. For nomological validity, there seems to be a consensus.

In order to test the nomological validity, the procedure is the same as that for reflective measurements: The relationships of the formative construct with the dependent constructs in the structural model need to be assessed.⁸⁸¹ Nomological validity is given if the relationships with the depending constructs in the structural are plausible and significant.⁸⁸² In addition, the coefficient of determination (R^2) is often used to test the validity of formative constructs.⁸⁸³

⁸⁷⁵ Cf. Hair et al. (2013), p. 127.

⁸⁷⁶ Cf. Hair et al. (2013), p. 127.

⁸⁷⁷ Cf. Hair et al. (2013), pp. 129, 131.

⁸⁷⁸ Hair et al. (2013), p. 129.

⁸⁷⁹ Cf. Hair et al. (2013), p. 131.

⁸⁸⁰ Cf. Hair et al. (2013), p. 127.

⁸⁸¹ Cf. Weiber/Mühlhaus (2010), p. 209.

⁸⁸² Cf. Weiber/Mühlhaus (2010), p. 209.

⁸⁸³ Cf. Weiber/Mühlhaus (2010), p. 209.

The discussion considering discriminant validity and convergent validity is about the relevance of the two types of validity. DIAMANTOPOULOS et al. (2001) state that neither convergent nor discriminant validity are even meaningful for formative constructs.⁸⁸⁴ In contrast, MACKENZIE ET AL. (2005) argue that **discriminant validity** can be tested for both the reflective and formative construct by testing “whether the constructs are less than perfectly correlated.”⁸⁸⁵ They recommend using the same procedure as for reflective constructs - i.e. calculating cross-loadings and the Fornell-Larcker criterion.

In order to assess **convergent validity** for formative constructs, HAIR et al (2013) recommend a redundancy analysis. Like the definition of convergent validity, their redundancy analysis calculates the extent to which an item correlates with other items of the same construct.⁸⁸⁶ However, the “same construct” in this analysis does not mean the remaining indicators but a different reflective measurement of the whole construct. “Specifically, one has to use the formatively measured constructs as an exogenous latent variable predicting an endogenous LV operationalized through one or more reflective indicators.”⁸⁸⁷ The strength of the path between the two constructs then indicates the validity of the set of formative indicators in “tapping the construct of interest.”⁸⁸⁸

This thesis supports the approaches of current research to establish ways to assess validity for formative construct and includes all of them in its assessment of formative constructs. However, one of these approaches cannot be tested based on the data set at hand: To test convergent validity with the redundancy approach is not possible, because no reflective constructs with the same meanings as the formative constructs have been specified in the research design phase, nor have they been part of the questionnaire afterwards.⁸⁸⁹

⁸⁸⁴ Cf. Diamantopoulos et al. (2001)

⁸⁸⁵ MacKenzie et al. (2005).

⁸⁸⁶ Cf. Hair et al. (2013), p. 121.

⁸⁸⁷ Hair et al. (2013), p. 121.

⁸⁸⁸ Hair et al. (2013), p. 121.

⁸⁸⁹ Cf. Hair et al. (2013), p. 122.

5. Empirical analysis and methods

All other quality tests can be performed and are calculated using IBM SPSS 21⁸⁹⁰ and SMART PLS 2.0⁸⁹¹ respectively. Table 23 presents an overview of the quality criteria for formative constructs as recommended by WEIBER & MÜHLHAUS (2010), HAIR ET AL. (2013) and MACKENZIE ET AL. (2005). The fields marked in gray indicate that this criterion cannot be used in this thesis.

Criteria	Requirement	Valid to evaluate...
Collinearity among indicators		
Variance Inflation factor (VIF)	≤ 10 ⁸⁹² ≤ 5 ⁸⁹³	Formative constructs
Indicator validity: Significance and relevance of indicators ⁸⁹⁴		
Relative importance or	Significant outer weights or	Formative constructs
Absolute importance	Outer loading > 0.5 or Outer loading significant	Formative constructs
Nomological validity ⁸⁹⁵		
R ²	$\geq 0,3$ ⁸⁹⁶	Formative constructs
Nomological validity:	significant ⁸⁹⁷ and plausible regression coefficients of construct with other constructs in the model	Formative constructs
Discriminant validity ⁸⁹⁸		
Cross-loadings of items	$<$ loading on own construct	Formative and reflective constructs
Fornell-Larcker criterion	$\sqrt{\text{AVE}} >$ correlation with other constructs	Formative and reflective constructs
Convergent validity ⁸⁹⁹		
Redundancy	> 0.8	Formative constructs

Table 23: Overview of quality criteria for the formative measurement model⁹⁰⁰

⁸⁹⁰ Calculation of collinearity analysis.

⁸⁹¹ Calculation of path significance, outer weights, outer loadings, and Fornell-Larcker criterion.

⁸⁹² Cf. Kim/Timm (2006), p.63.

⁸⁹³ Cf. Diamantopoulos/Riefler (2008), p.1193.

⁸⁹⁴ Recommended by Weiber/Mühlhaus (2010), Hair et al. (2013); Spector (1992).

⁸⁹⁵ Cf. Weiber/Mühlhaus (2010), p. 210.

⁸⁹⁶ Cf. Chin (1998b), p.325.

⁸⁹⁷ Cf. Diamantopoulos/Winklhofer (2001), p.273.

⁸⁹⁸ Cf. MacKenzie et al. (2005).

⁸⁹⁹ Cf. Hair et al. (2013), pp. 121 ff.

⁹⁰⁰ Adapted from Weiber/Mühlhaus (2010), p. 210.

5.3.4 Design of higher order constructs and hierarchical components

Some of the constructs in the system of hypotheses are quite complex in theory. Thus it is possible that they cannot be operationalized with one construct. In order to avoid a violation of the minimum sample size assumption of the PLS-SEM by using too many constructs, these types of constructs can be modeled as higher order constructs (HOCs).⁹⁰¹

Higher order constructs represent a higher level of abstraction of the multiple single constructs.⁹⁰² They combine several pieces of information of lower order construct (LOCs) into a single more general construct. This more general construct becomes part of the structural model whereas additional information can be found in the sub-dimensions (first-order latent variables).⁹⁰³

In addition to reduced model complexity, HOCs serve to handle highly correlated formative indicators as well as collinearity issues in the structural model, i.e. HOCs may solve discriminant validity problems.⁹⁰⁴

A condition for establishing HOCs is that theory supports splitting up the indicators and forming separate LOCs.⁹⁰⁵ The decision whether the relationship between LOCs and the HOC is formative or reflective depends on conceptual reasoning behind the goal of the analysis.⁹⁰⁶ Reflective relationships are used when the general and more global factor explains the correlations between the LOCs. In this measurement, the HOC represents the LOCs.⁹⁰⁷ Formative relationships between LOCs and HOC “reveal the relative contribution of the LOCs in explaining the HOC.”⁹⁰⁸ In this approach, the HOC fully mediates the relationship between the LOCs and their target construct in the

⁹⁰¹ Cf. Hair et al. (2013), p. 229.

⁹⁰² Cf. Hair et al. (2013), p. 229.

⁹⁰³ Cf. Hair et al. (2013), p. 229.

⁹⁰⁴ Cf. Hair et al. (2013), p. 230.

⁹⁰⁵ Cf. Hair et al. (2013), p. 230.

⁹⁰⁶ Cf. Hair et al. (2013), p. 231.

⁹⁰⁷ Cf. Hair et al. (2013), p. 235.

⁹⁰⁸ Hair et al. (2013), p. 232.

structural model.⁹⁰⁹ In case of formative relationships between LOCs and HOC, a two-stage approach needs to be used to form the HOC in a reflective relationship; a repeated indicator approach can be used, too, as long as all LOCs are measured by a similar number of indicators.⁹¹⁰

The **repeated indicators approach** measures the HOC with all the indicators of the LOCs by using the measurement approach (either formative or reflective) for the HOC as well as for the LOCs.⁹¹¹ This approach can be used based on two conditions. First, all the LOCs have to contain a similar number of indicators not to bias the relationships between LOCs and HOC.⁹¹² Second, the HOC has to fulfill the same (formative or reflective) quality criteria as every other construct in the model. The only exception is the discriminant validity between HOC and LOCs as well as between LOCs in a total reflective hierarchical component model (reflective LOCs and reflective relationships between HOC and LOCs).⁹¹³

The **two-stage approach** uses the repeated indicators approach in a first step to calculate the variables' scores of the LOCs. These scores are then used as manifest variables in the second step to measure the HOC.

In this approach, the HOC is embedded in a nomological net that allows other LVs to explain some of its variance, which might result in significant path relationships.⁹¹⁴ Therefore, it shall be used in the modeling of dependent variables. Using a repeated indicator approach for a dependent variable can help to explain all the variance of the dependent construct by the LOCs and rendering all other influencing constructs of the structural model insignificant.⁹¹⁵

⁹⁰⁹ Cf. Hair et al. (2013), p. 235.

⁹¹⁰ Cf. Hair et al. (2013), p. 238.

⁹¹¹ Cf. Hair et al. (2013), p. 230.

⁹¹² Cf. Becker et al. (2012); Hair et al. (2013).

⁹¹³ Cf. Hair et al. (2013), p. 231.

⁹¹⁴ Cf. Hair et al. (2013), p. 233.

⁹¹⁵ Cf. Hair et al. (2013), p. 233.

5.3.5 Conditions to test 0-hypotheses

Statistical hypotheses contain a 0-hypothesis and an alternative hypothesis. The 0-hypothesis proposes no effects, relationships, or changes whereas the alternative hypothesis proposes their existence. The research question is usually the subject of the alternative hypothesis, because one is interested in establishing effects. If the 0-hypotheses can be neglected based on an acceptable probability of mistake, the alternative hypothesis is considered confirmed.⁹¹⁶

However, such a confirmation is not definite because the sample size never reflects the whole population. Accordingly, the goal of hypotheses testing lies in reducing the probability of making a mistake by confirming or rejecting a hypothesis by mistake.⁹¹⁷

Two mistakes can occur: the alpha-mistake and the beta-mistake.

The alpha-mistake means confirming the alternative hypothesis while there is no relationship in reality (H0 is correct).⁹¹⁸ This mistake is limited by setting a minimum significance level (usually 1% or 5%), which must not be higher when deciding to confirm the alternative hypothesis (H1).

The beta-mistake means rejecting the alternative hypothesis (H1) while there is a relationship in reality. Beta-mistakes thus are made when deciding in favor of H0.⁹¹⁹

The beta-mistake thus defines the probability of rejecting a true H1 by mistake.

The difference between 1 and the percentage of the beta-mistake is called “test power.” Test power thus defines the probability of making the right decision: rejecting a false 0-hypothesis and confirming a correct H1. The higher the test power, the lower is the probability of making a beta-mistake.⁹²⁰

However, the test power depends on the significance level (alpha-mistake), the effect size of the relationship, and the sample size. Effect size is the strength of the effect

⁹¹⁶ Cf. Bortz/Döring (2006), p. 650.

⁹¹⁷ Cf. Biemann (2009), p.207.

⁹¹⁸ Cf. Bortz/Döring (2006), p. 498.

⁹¹⁹ Cf. Bortz/Döring (2006), p. 499.

⁹²⁰ Not considering the test power is a limitation of research addressed by e.g. Cohen (1990, 1992) and Buchner et al. (1996).

(p).⁹²¹ The four parameters are related to each other, thus each parameter can be calculated based on the values of the three others.⁹²²

In order to confirm a 0-hypothesis, a non-relationship has to be established. Basically H0 is always wrong because no correlation between empirical variables is actually zero.⁹²³ Thus some research argues that 0-hypotheses cannot be established (especially because they depend on the sample size).⁹²⁴

According to COHEN (1988), effect size cannot be zero but so small that it can be considered trivial. In conclusion, these trivial effect sizes are negligible. When phrasing a hypothesis that proposes a negligible relationship, a non-significant effect would indicate that the real effect is not likely to be higher than this minimum effect.⁹²⁵

Accordingly, H0 can be accepted, and it can be assumed that there are no important effects based on the beta-mistake probability.⁹²⁶ In other words, H0 can be supported if the beta-mistake level is low and the effect is found to be not significant.

Following COHEN (1990), a 0-hypothesis can only be supported if the sample has a size indicating the risk of making a beta-mistake is lower than or at least as high as the risk of making an alpha-mistake.⁹²⁷ According to LANE, CANNELLA, AND LUBATKIN (1998), to test these null hypotheses properly, statistical power analysis has to be used.⁹²⁸ Using power analysis, the sample size can be identified that is needed to identify a non-trivial effect based on a certain probability for alpha- and beta-mistakes and an effect size.⁹²⁹

The real effect sizes are not known to the researcher and can only be estimated based on profound experience⁹³⁰ in the field of research or by using huge sample sizes.⁹³¹ In

⁹²¹ Cf. also Cohen (1988) and Botz/Döring (2006).

⁹²² Cf. Cohen (1988), p. 14f.

⁹²³ Cf. Lane et al. (1998), p.568; Bortz/Döring (2006), p.635.

⁹²⁴ Cf. Aron et al. (2006); Klemmert (2004); Nickerson (2000); Harlow et al. (1997); Cohen (1994).

⁹²⁵ Cf. Bortz/Döring (2006), p. 651; Cohen (1988); p. 16.f.

⁹²⁶ Cf. Cohen (1990), p. 1309.

⁹²⁷ Cf. Cohen (1990), p. 1307ff; Lane et al. (1998), p.563; Hoetker/Mellewig (2009), p. 1035.

⁹²⁸ Cf. also Hoetker/Mellewig (2009).

⁹²⁹ Cf. Cohen (1988), p. 14f.

⁹³⁰ Cf. Cohen (1992), p. 156; Bortz et al. (2006), p.626; Erdfelder et al. (2004), p.150.

addition, research has not yet established a convention for the size of the beta-mistake.⁹³²

This thesis follows HOETKER/MELLEWIGT (2009) and LANE ET AL. (1998) by using a beta-mistake of 10% (test power of 90%) and an effect size of 0.3 to calculate the sufficient sample size to test 0-hypotheses:

A power analysis using G*power calculated that, based on a test power of 90% (alpha and beta mistake are 10%) and an effect size of 0.3, the sample size needs to be 88 to test 0-hypotheses. Since the actual sample size is 101, the test power in the analyses of this thesis reaches even 93.2% (*ceteris paribus* for all parameters).

This power analysis indicates that based on the actual sample size of 101, 90% of the non-significant effects in the model can be considered trivial.⁹³³ Therefore, it seems that a 0-hypothesis can be supported in this case. Nonetheless, it should be stated that there is a ten percent risk of making a type II error, which is conceivable as having occurred.⁹³⁴

The detailed results of the power analysis are reported in appendix N).

5.4 Construction of the measures

In order to operationalize the latent variables of the system of hypotheses whenever possible, survey items were adapted from existing scales in the literature to ensure proper reliability and validity of the constructs. However, this thesis' questionnaire uses German translations of the original English items. Therefore, the quality of all constructs is assessed in detail.

The quality of the constructs (their reliability and validity) was tested using established criteria and procedures as introduced in Chapter 5.3.3. Following WEIBER & MÜHLHAUS (2010), all reflective constructs in this thesis are first assessed and optimized based on the first generation criteria (using IBM SPSS Statistics 21). Only

⁹³¹ Cf. Cohen (1988), p. 17.

⁹³² Cf. Bortz (2005), p. 122.

⁹³³ Cf. Hoetker/Mellewig (2009), p. 1036f; Cohen (1992), p. 157f.

⁹³⁴ Cf. Hoetker/Mellewig (2009), p. 1036f; Cohen (1992), p. 157f.

constructs that pass these tests will be integrated into the SEM and then assessed by the second generation criteria (using SMART PLS 2.0).

An overview of the final constructs and their items is provided in appendix B).

5.4.1 Characteristics of knowledge

The characteristics of knowledge are measured based on three established, reflective constructs: tacitness, specificity, and complexity. All items were measured on a 5 point rating scale on the consultant side.

The consultant side was chosen for the measurement because as the sender of the knowledge, they have full disclosure about its nature. The customer might have only assessed the knowledge that was actually transferred to him but not the initial “task.” The entire block of items was introduced by asking the consultants to remember the project knowledge based on the contract deliverables and to assess the knowledge that had to be transferred to the customer based on the respective items:

“[BERATUNG] bietet sehr wissensintensive Dienstleistungen an. Dies bedeutet, dass unterschiedlichste Methoden, Fähigkeiten und Ressourcen notwendig sind, um die Ergebnisse, die [BERATUNG] ihren Kunden vertraglich zugesichert hat, zu erstellen und für ihn nutzbar zu machen. Die Ergebnisse dieses Projektes beinhalten daher auch Wissen, das nicht explizit im Vertrag ausgedrückt ist, aber notwendig ist, damit der Kunde die Ergebnisse versteht und damit arbeiten kann.

*Bitte ruf dir das Projekt anhand der in Anlage 1 aufgelisteten Ergebnisse nochmal in Erinnerung und beurteile anhand der folgenden Fragen das **gesamte Wissen** (Ergebnisse + notwendiges Wissen zu ihrer Erstellung/Verwendung), **das wir an den Kunden übertragen mussten.**“*

This thesis is interested in the transfer of project results and knowledge on processes and methods to generate such results. In order to make this subject of transfer clear to the respondent, blue highlights were placed in this introduction text as well as in the following items. This ensures a constant reminder of the subject and should prevent the respondent from interpreting the word knowledge, which is used in the items, in individual and thus diverse ways.

5.4.1.1. Tacitness

Tacitness was measured using two reflective items as designed by SIMONIN (1999b). The first item addresses the codifiability of the knowledge whereas the second item asks for the level of implicitness of the knowledge. Since implicit is a word which can be interpreted in different ways in German, it was defined explicitly in the questionnaire: Knowledge is part of preconscious awareness and hard to specify, such as for example intuition or experience. The study of SIMONIN analyzed the transferability of marketing know-how and skills and thus included the phrase “marketing skills and know-how“ in each item to describe the knowledge of interest. This thesis is interested in the transfer of project results and knowledge on processes and methods to generate such results. Thus, instead of marketing skills and know-how the German items contain descriptions of this kind of knowledge.

Table 24 shows the items used in German as well as the original ones and their respective reliabilities.

item name (SPSS variable)	Tacitness (German items and reliability)	Original items and reliability	Scale
	$\alpha=0,354$	SIMONIN (1999b) tacitness $\alpha=0,74$	Consultant questionnaire
U_KN_Tacitness_1_umc	Das gesamte an den Kunden zu übertragende Wissen ließ sich leicht verschriftlichen (z.B. Anleitungen).[R]	Partner's marketing skills and know-how easily codifiable- in writing, instructions.	1: gar nicht - 5: in sehr hohem Maße
U_KN_tacitness_2_umc	Das Wissen zur Erstellung dieser Ergebnisse ist eher explizit als implizit. [R]	Partner's marketing skills and knowhow are more explicit than tacit.	

Table 24: Tacitness items and reliability

Although SIMONIN (1999b) called his scale “tacitness,” the items are actually measuring the opposite. Their wording is designed to measure the extent of explicitness not tacitness, and thus the scale is reverse-coded. Consequently, the measures have been recoded prior to any analysis by subtracting each measured value from 6. The assessment of the first generation criteria revealed that this construct of tacitness based on the two items is not reliable - neither on the indicator nor on the construct level (Cf. red highlights in Table 25).

5. Empirical analysis and methods

Construct quality	Reliability test on indicator level	Corrected item-to-total-correlation	Communalities	(Rotated) factor loadings	Reliability test on construct level	KMO	Bartlett-test	Explained variance	One dimensionality	Cronbach's Alpha	Cronbach's Alpha for standardized items	Inter-Item-correlation (smallest in line)
Out off value		≥0,5	≥0,5	>0,4			≥0,5	0	>0,5	1 factor for each construct	≥0,6; ≥0,7; ≥0,8	≥0,3
Tacitness												
U_KN_Tacitness_1_umc		.223	.611	.782								0.223
U_KN_tacitness_2_umc		.223	.611	.782		0.5	0.025	61.13	1	0.354	0.364	0.223

Table 25: Overview of first generation criteria for tacitness

5.4.1.2. Specificity

Specificity of knowledge in the consultant-customer relationship means that the knowledge is dependent on the specific project context and has interdependence with it respectively.

The construct was measured based on three items invented by REED AND DEFILLIPPI (1990) and further developed by LUIGI M. DE LUCA & KWAKU ATUAHENE-GIMA (2007). The first item addresses the dependence of the used methods on the project task. The second item measures the dependence of the project knowledge on the business environment (e.g. industry or competence center). And the third item measures the individuality of the knowledge by asking if it was tailored to meet the specific conditions of the customer and project.

The original items (cf. table below) address the transfer subject of market knowledge. Like the design of the tacitness items, the German items of specificity replace these phrases by the respective subject of transfer of this study (cf. words marked in blue in the items). To make the subject of transfer clear to the respondent, the blue highlights were kept in the questionnaire and thereby connected to the definition of knowledge in the introduction text.

item name (SPSS variable)	Specificity (German items and reliability)	Original items and reliability	Scale
	$\alpha=0,497$	De Luca & Atuahene-Gima (2007) $\alpha=0,81$ (based on Reed and DeFillippi 1990)	Consultant questionnaire
U_KN_Specific_1_AP1	Die benötigten Methoden zur Erstellung der Ergebnisse sind nur für diese Art von Aufgabenstellung anwendbar.	Our knowledge of customers and competitors is quite specific to our kind of business.	1: gar nicht - 5: in sehr hohem Maße
U_KN_Specific_2_AP1	Es wird schwierig sein das Wissen auf ein anderes betriebliches Umfeld (z.B. Abteilung, Branche) zu übertragen.	It will be very difficult for an employee to transfer market knowledge acquired in our firm to other business environments	
U_KN_Specific_3_AP1	Das Wissen zur Erstellung der Ergebnisse dieses Projektes wurde extra für dieses Projekt entwickelt (z.B. neue Methoden, Vorgehensweisen...).	Our market knowledge and skills are tailored to meet the specific conditions of our business.	

Table 26: Specificity items and reliability

As represented by the reliability statistics of the first generation below, the construct cannot be considered reliable based on the used items: Cronbach's alpha for the German items only reached 0.497, and the corrected item to total correlations are all below 0.5.

Construct quality	Reliability test on indicator level	Corrected Item-to-total-correlation	Communalities	(Rotated) factor loadings	Reliability test on construct level	KMO	Bartlett-test	Explained variance	One dimensionality	Cronbach's Alpha	Cronbach's Alpha for standardized items	Inter-Item-correlation (smallest in line)
Cut off value		$\geq 0,5$	$\geq 0,5$	$> 0,4$		$\geq 0,5$	0	$> 0,5$	1 factor for each construct	$\geq 0,6; \geq 0,7; \geq 0,8$		$\geq 0,3$
Specificity												
U_KN_Specific_1_AP1		.251	.402	.412								0.133
U_KN_Specific_2_AP1		.439	.661	.529		0.556	0	51.286	1	0.497	0.519	0.307
U_KN_Specific_3_AP1		.284	.475	.448								0.133

Table 27: Overview of first generation criteria for specificity

The item-total statistic shows that Cronbach's alpha can be improved to 0.507 by deleting the first item. However, even this construct still would not fulfill the requirements of $\alpha > 0.7$.

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
U_KN_Specific_1_AP1	4,00	3,300	,251	,095	,507
U_KN_Specific_2_AP1	4,59	3,364	,439	,193	,235
U_KN_Specific_3_AP1	4,16	2,975	,284	,125	,461

Table 28: Item to total statistics for specificity items

5.4.1.3. Complexity

Complexity is measured using a single-item as introduced by SIMONIN (1999b). It stays close to the definition of complexity and asks to what extent the know-how transferred to the customer was the product of many interdependent techniques, routines, individuals, and resources.

SIMONIN’s subject of interest was “technology/process know-how.” Similar to the procedure regarding the constructs of tacitness and specificity, the term was replaced by the subject of transfer in this study.

item name (SPSS variable)	Complexity (German items and reliability)	Original items and reliability	Scale
	Single item scale	Simonin (1999b)	Consultant questionnaire
U_KN_complexity_AP1	Das an den Kunden zu übertragende Wissen ist ein Produkt aus vielen voneinander abhängigen Methoden, Prozeduren, Personen und Ressourcen.	The technology/process know-how that was transferred to the customer was the product of many interdependent techniques, routines, individuals, and resources.	1: gar nicht - 5: in sehr hohem Maße

Table 29: Complexity items and reliability

Single-items are considered as a reflective item of their construct and cannot be assessed on reliability or validity.⁹³⁵ Thus for complexity, no quality criteria are assessed.

⁹³⁵ Cf. Hair et al. (2013).

5.4.1.4. Knowledge factors

Since none of the original constructs of tacitness and specificity has a proper reliability (all $\alpha < 0.6$), all items for knowledge characteristics were analyzed by an EFA based on a varimax rotation in order to identify potential, different, underlying dimensions of knowledge types.

Varimax rotation identifies factors that are independent.⁹³⁶ Thus the results of this analysis will provide empirically distinct factors. The number of factors were chosen based on eigenvalues higher than 1. The results revealed two factors. As presented by the rotated component matrix below, the first factor summarizes all specificity items, and the second factor combines complexity and the two tacitness items.

	Component	
	1	2
U_KN_complexity_AP1		,705
U_KN_Specific_1_AP1	,587	,149
U_KN_Specific_2_AP1	,852	
U_KN_Specific_3_AP1	,630	
U_KN_Tacitness_1_umc	,389	,498
U_KN_tacitness_2_umc		,780

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

	Initial	Extraction
U_KN_complexity_AP1	1,000	,498
U_KN_Specific_1_AP1	1,000	,367
U_KN_Specific_2_AP1	1,000	,727
U_KN_Specific_3_AP1	1,000	,398
U_KN_Tacitness_1_umc	1,000	,399
U_KN_tacitness_2_umc	1,000	,609

Extraction Method: Principal Component Analysis.

Figure 36: EFA results for all knowledge items

The KMO is 0.523, and the Bartlett test was significant. However, the variance explained by these two factors is only 49.953%, all item communalities except for specificity 1 and tacitness 2 are below the recommended value of 0.5, and two items (specificity 1 and tacitness 1) have poor loadings (<0.4) on their respective factors.

In summary, the two factors do not properly reflect different knowledge types. Besides, a reliability test of a construct built with the items of the second factor (complexity + the two tacitness items) results in an alpha of 0.44. This still indicates a non-reliable construct.

⁹³⁶ Cf. Weiber/Mühlhaus (2010), p.108.

Considering the EFA results in more detail, some values indicate that the two factor model based on the eigenvalue analysis is not the only appropriate solution. First, because the scree plot has its elbow with three factors (cf. Figure 37). This indicates that the loss of information with two factors instead of three is very high. Second, because the eigenvalue of the potential third factor is 0.959, which is only a little less than 1. Since scree plots are as much a proper instrument to identifying the number of factors of a construct as eigenvalues⁹³⁷, this criterion is used to identify the final solution for this factor analysis. Thereby the theoretically separated constructs of complexity, tacitness, and specificity of knowledge can be established empirically.



Figure 37: Scree plot of EFA for all knowledge items

To compute the factor values for a three factor model, the EFA was run again but in the settings, a three factor solution was set as a fixed result. As represented by Figure 38, the first factor still contains all specificity items and thus represents the knowledge characteristic “specificity.” The second factor contains the complexity item and the second item of tacitness, whereas the third factor contains the first item of tacitness.

⁹³⁷ Cf. Backhaus et al. (2011), p 360.

Rotated Component Matrix^a

	Component		
	Specificity	Complexity	Tacitness
U_KN_complexity_AP1	,126	,822	
U_KN_Specific_1_AP1	,559		,220
U_KN_Specific_2_AP1	,760	-,173	,379
U_KN_Specific_3_AP1	,780	,156	-,315
U_KN_Tacitness_1_umc	,156	,150	,867
U_KN_tacitness_2_umc		,710	,318

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

Figure 38: Three factor solution for all knowledge items

The second item of tacitness asks for more explicit or implicit knowledge. Since this item loads on the same factor as complexity, the difference was not catchable for the respondents – i.e. complex knowledge is considered to be connected to implicit knowledge and the other way around.

The first item of tacitness asks for the ability to codify the knowledge of interest e.g. in documents or instructions. Thus the factor “Tacitness” has to be interpreted only based on the codifiability of the knowledge whereas the factor “Complexity” has to be interpreted as knowledge that depends on many combined processes, procedures, and resources including experience knowledge (implicit knowledge).

Except for the first specificity item, all items load properly (> 0.7) on one of the three factors. In addition, this item is now the only one with poor communality (0.367), and the variance explained by the three factors has increased to 65.9% (in contrast to 49% for two factors). Consequently, the three factor solution of knowledge types has a much better quality than the two factor solution and is thus used to represent different knowledge types in the empirical analysis.

Because this thesis relies on the separate constructs of complexity, tacitness, and specificity, additional steps were undertaken to gauge the possibility that higher complexity might induce higher tacitness or specificity, or vice versa. If this were the case, the three concepts would be endogenously determined, and as such, their parameter interpretations would be subject to errors.

The one-dimensionality analysis (EFA) indicated that the three constructs (factors) were measured by different items; an analysis of the correlation matrix (cf. Table 30) further indicates that cross-item-construct correlations are low and insignificant with one exception.

5. Empirical analysis and methods

	U_KN_complexity_AP1	U_KN_Specific_1_AP1	U_KN_Specific_2_AP1	U_KN_Specific_3_AP1	U_KN_Tacitness_1_umc	U_KN_tacitness_2_umc
Correlation	1,000	,130	-,013	,099	,128	,238
U_KN_complexity_AP1						
U_KN_Specific_1_AP1	,130	1,000	,307	,133	,139	,052
U_KN_Specific_2_AP1	-,013	,307	1,000	,353	,313	,005
U_KN_Specific_3_AP1	,099	,133	,353	1,000	,024	,058
U_KN_Tacitness_1_umc	,128	,139	,313	,024	1,000	,223
U_KN_tacitness_2_umc	,238	,052	,005	,058	,223	1,000
Sig. (1-tailed)						
U_KN_complexity_AP1		,098	,448	,161	,100	,008
U_KN_Specific_1_AP1	,098		,001	,092	,083	,302
U_KN_Specific_2_AP1	,448	,001		,000	,001	,480
U_KN_Specific_3_AP1	,161	,092	,000		,405	,283
U_KN_Tacitness_1_umc	,100	,083	,001	,405		,013
U_KN_tacitness_2_umc	,008	,302	,480	,283	,013	

a. Determinant = ,602

Table 30: Correlation of knowledge items

The second item of specificity correlates significantly with the first item of tacitness (non-codifiability). The second specificity item considers the difficulty to transfer the knowledge to other business environments. The correlation indicates that respondents relate the transferability to other contexts to the codifiability of the knowledge and vice versa. However, the codifiability is not correlated with the two other items of specificity.

These results provide confidence that specificity did not breed tacitness (non-codifiability), or vice versa, to an extent that would jeopardize the empirical analysis.⁹³⁸ Specificity, tacitness, and complexity are not only different and separate constructs at the conceptual level, they are so in empirical as well.

However, as shown in the first section of the item analysis, the reliability of the three constructs cannot be established with the used items.⁹³⁹ Therefore, **the three factor values will represent the three types of knowledge in the empirical analysis.**

When using factor scores, it has to be considered that the individual effects of the indicators become confounded because all item (indicator) loadings, regardless of their strength, are reflected by the factor.⁹⁴⁰ For the three knowledge type factors, it was made sure that this procedure does not have any consequences for the content validity⁹⁴¹ of the three knowledge types by carefully interpreting the factors of complexity and

⁹³⁸ Mesquita, Brush (2008), p. 796.

⁹³⁹ A potential construct of the second factor complexity that includes the two high loading items still revealed an insufficient alpha of 0.377. Thus this is neither a reliable construct.

⁹⁴⁰ Cf. Hair et al. (2013), p. 125.

⁹⁴¹ Cf. Hair et al. (2013), p. 125.

tacitness based on their item wording (cf. Table 31). Still, the factor loadings should be kept in mind when interpreting the results.

SPSS variable	Factor	Interpretation
FAC_Non_Codif	Tacitness	Non-codifiability of the knowledge
FAC_Complexity	Complexity	Knowledge that depends on many combined processes, procedures, and resources including experience knowledge (implicit knowledge)
FAC_Specificity	Specificity	Knowledge is dependent on the specific project context and has an interdependence with it

Table 31: Interpretation of knowledge type factors

As represented by Table 32 the factors are standardized, i.e. they have a standard deviation of 1 and a mean of 0. The range indicates that there is enough variance in each factor that can be assessed by the SEM.

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
FAC_Specificity	101	4,48657	-1,52530	2,96127	,0000000	,09950372	1,00000000	1,000
FAC_Complexity	101	5,51269	-2,80901	2,70367	,0000000	,09950372	1,00000000	1,000
FAC_Non_Codif	101	4,59722	-2,02994	2,56728	,0000000	,09950372	1,00000000	1,000
Valid N (listwise)	101							

Table 32: Descriptive statistics of the knowledge type factors

5.4.2 Individual level constructs (AMO)

Intensive analysis of the literature on individual performance identified reliable scales for all three individual performance constructs: motivation, ability, and opportunity. However the original scales assessed the constructs for the sender or the receiver perspective. Thus, for the purpose of buyer-oriented individual performance constructs, the items had to be transferred to the view of the buyer. All items have been reviewed by three academics for content validity and in this case also for correct transfer to the buyer's view. Close reflection of the original items was set as the overall goal here.

All three construct were assessed by the buyer itself – i.e. the buyer's AMO was assessed by the buyer. This might seem unusual but since the constructs should reflect the personal situation and feelings of the buyer's project team, an assessment by the respective partner does not capture the intention of the constructs.

5.4.2.1. Motivation to receive knowledge

Motivation is the force that directs individuals towards goals.⁹⁴² People have the motivation to perform when they have the willingness to perform a task.⁹⁴³ Thus motivation to receive knowledge is defined as the willingness (inner drive) to learn and integrate knowledge. To be motivated to do something, one needs the willingness and a direction of this intention. Without that direction, he or she would be motivated but without a clear goal what to do. Consequently, the construct of motivation to receive knowledge also needs to include both aspects.

The construct used in this thesis originates from SIEMSEN & BALASUBMARANIAN (2008). They measured “motivation to share” knowledge – the sender perspective – by using three items on a 7-point Likert scale. The construct had a good reliability of $\alpha=0.75$. The first item is reverse coded. The items cover the assessment of the intention, motivation, and willingness, and they define the direction of the motivation by using almost the same term (“knowledge with my coworker”) in all three items:

Motivation to share ($\alpha=0.75$) (Siemsen and Balasubmaranian (2008))	I had no intention to share this knowledge with my coworker (R)
	I was motivated to share what I know with my coworker
	I really wanted to share this knowledge with my coworker

Table 33: Original items of motivation

This “system” of specifying the items was kept when translating the items to German and when specifying the items for the buyer – the motivation to receive knowledge. The procedure resulted in a very good reliability⁹⁴⁴ for the German construct. Motivation to receive shows a Cronbach’s alpha of $\alpha=0.84$.⁹⁴⁵ In addition, all items present inter-item correlations higher than 0.3⁹⁴⁶ and passed all other criteria of the first generation (cf. Table 34).

⁹⁴² Cf. Gruen et al. (2007), p. 539.

⁹⁴³ Cf. Raiden et al. (2006), p. 884.

⁹⁴⁴ Cf. Rossiter(2002), p.310, who defined 0.8 as a value representing very good reliability.

⁹⁴⁵ Item 1 was re-coded prior to the reliability analysis as follows: 1->5; 2->4; 3->3; 4->2; 5->1.

⁹⁴⁶ Cf. Cutoff value defined by Robinson et al.(1991), p.13.

Construct quality	Reliability test on indicator level	Corrected Item-to-total-correlation (KITK)	Communalities	(Rotated) factor loadings	Reliability test on construct level	KMO	Bartlett-test	Explained variance	One dimensionality	Cronbach's Alpha	Cronbach's Alpha for standardized items	Inter-Item-correlation (smallest in line)
Cut off value		≥0,5	≥0,5	>0,4		≥0,5	0	>0,5	1 factor for each construct	≥0,6; ≥0,7; ≥0,8	≥0,3	
Motivation to integrate												
K_motivation_1_umcod		,609	,644	,802								0,525
K_Motivation_2		,727	,801	,895		,657	,000	77,236	1	,839	,851	0,525
K_Motivation_3		,808	,872	,934								0,628

Table 34: Overview of first generation criteria for motivation construct

The items were measured by asking the customer to what extent he agrees with the statements about the team's handling of the knowledge. All items are measured by a five-point rating scale ranging from 1: not at all to 5: to a very high extent. Table 35 presents the original items and introduction questions as used in the German questionnaire.

item name (SPSS variable)	Motivation to receive knowledge (a=0.84)	Scale
	Inwieweit stimmen Sie den folgenden Aussagen zum Umgang mit dem Projektwissen in Ihrem Team zu? Unter Wissen sind folgend die Ergebnisse des Projektes sowie die damals erlernten Prozesse, Methoden, Werkzeuge und Fähigkeiten zu verstehen.	Introduction question
K_motivation_1_umcod	Wir hatten nicht die Absicht, das Wissen zur Erstellung der Projektergebnisse zu verstehen und aufzunehmen, sondern wollten nur die Projektergebnisse nutzen.[R]	1: gar nicht - 5: in sehr hohem Maße
K_motivation_2	Wir waren motiviert, Wissen von der [Beratung] aufzunehmen und etwas zu lernen.	
K_motivation_3	Wir wollten, sowohl die Ergebnisse als auch das Wissen zu ihrer Erstellung verstehen und aufnehmen.	

Table 35: Overview of motivation items

To test the discriminant validity of the construct, all three items were subject to an exploratory factors analysis.⁹⁴⁷ It revealed one factor with an eigenvalue greater than 1, which explains 77.24 percent of the total variance. In addition, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) of 0.66 reached the sufficient value above 0.5, and the Bartlett test was significant. This proves that the construct represents discriminant validity. Thus in summary, the construct of motivation to receive knowledge can be considered reliable and valid.

As represented by Table 36, the mean of this construct is 11.73. As the maximum value is 15 (3* rating of 5), the sample represents a rather high motivation to receive

⁹⁴⁷ Cf. recommendations of Weiber/Mühlhaus (2010), p. 104.

knowledge. However the variance of 7.8 indicates that the motivation in the empirical sample differs enough to explain the role of motivation in the SEM.

	Mean	Variance	Std. Deviation	N of Items
Motivation to receive knowledge	11.7273	7.833	2.79875	3

Table 36: Descriptive statistics for the construct of motivation

5.4.2.2. Ability to receive knowledge

People have the ability to perform when they “are able to do the job because they possess the necessary knowledge and skills.”⁹⁴⁸ The ability to transfer knowledge thus was defined as the cognitive (mental) capabilities to receive and transfer knowledge. These capabilities are his or her knowledge and skills about and in the transfer and reception of knowledge.⁹⁴⁹ The construct to measure ability to receive knowledge used in this thesis originates from SIEMSEN & BALASUBMARANIAN (2008). They measured “ability to share” knowledge – the sender perspective – by using three items on a 7-point Likert scale. The construct had a good reliability of $\alpha=0.72$. The items ask for the ability to share knowledge directly (item 1) and cover two dimensions of capability by item 2 and item 3:

Ability to share ($\alpha=0.72$) (Siemsen and Balasubmaranian (2008))	I had the ability to transfer this knowledge to my coworker
	I had the means to share this knowledge with my coworker
	I was capable of sharing this knowledge with my coworker

Table 37: Original items of ability

Since the items do not contain any special type of knowledge that is the subject of the transfer, the German wording stayed close to the English original. Only the perspective was changed into the view of receiving knowledge. The analysis of the construct based on the first generation criteria (cf. Table 38) results in a good reliability of the ability to receive knowledge.

⁹⁴⁸ Raiden et al. (2006), p. 884.

⁹⁴⁹ Cf. Siemsen et al. (2008), p. 427.

Construct quality	Reliability test on indicator level	Corrected item-to-total correlation	Communalities	(Rotated) factor loadings	Reliability test on construct level	KMO	Bartlett-test	Explained variance	One dimensionality	Cronbach's Alpha	Cronbach's Alpha for standardized items	Inter-Item-correlation (smallest in line)
Out off value		≥0,8	≥0,5	>0,4		≥0,5	0	>0,5	1 factor for each construct	≥0,6; ≥0,7; ≥0,8		≥0,3
Ability to receive												
K_Ability_1		.874	.901	.949								0.756
K_Ability_2		.745	.774	.880		.709	.000	83.920	1.000	.904	.904	0.673
K_Ability_3		.810	.843	.918								0.673

Table 38: First generation quality statistics of ability constructs

Table 39 presents the items and introduction questions as used in the questionnaire. The items were introduced by asking the customer to assess the situation of his project team based on the item-statements. In line with the motivation items, they were measured on a five point rating scale ranging from 1: not at all to 5: to a very high extent.

item name (SPSS variable)	Ability to receive knowledge (a=0.904)	Scale
	Bitte beurteilen Sie die Situation Ihrer Projektmitarbeiter anhand folgender Aussagen. Unter <i>Wissen</i> sind folgend die Ergebnisse des Projektes sowie die damals erlernten Prozesse, Methoden, Werkzeuge und Fähigkeiten zu verstehen.	Introduction question
K_ability_1	Die Projektmitarbeiter hatten die nötigen Fähigkeiten, um das <i>Wissen</i> zu verstehen und aufzunehmen.	1: gar nicht - 5: in sehr hohem Maße
K_ability_2	Die Projektmitarbeiter hatten die nötigen Hilfsmittel, um das <i>Wissen</i> zu verstehen und aufzunehmen.	
K_ability_3	Die Projektmitarbeiter waren in der Lage, das das <i>Wissen</i> zu verstehen und aufzunehmen.	

Table 39: Items of the ability construct

To test the discriminant validity of the construct, all three items were subject to an exploratory factors analysis.⁹⁵⁰ This revealed one factor with an eigenvalue greater than 1, explaining 74.86 percent of the total variance. Their extracted communalities are all higher than 0.745, and the Bartlett test was significant. In addition, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) of 0.709 reached the sufficient value higher than 0.5. This proves that the items represent a valid construct. In summary, the ability to receive knowledge construct can be considered reliable and valid for a SEM.

As represented by Table 40 the mean of this construct is 10.88. As the maximum value is 15 (3 * rating of 5), the sample represents a rather high ability to receive knowledge. However, the variance of 5.8 indicates that the ability in the empirical sample differs enough to explain the role of ability in the SEM.

⁹⁵⁰ Cf. recommendations of Weiber/Mühlhaus (2010), p. 104.

	Mean	Variance	Std. Deviation	N of Items
Ability to receive knowledge	10.88	5.844	2.417	3

Table 40: Descriptive statistics for ability

5.4.2.3. Opportunity to receive knowledge

Opportunity is “the extent to which a situation is conducive to achieve a desired outcome.”⁹⁵¹ With reference to MACINNIS AND JAWORSKI (1989), situation factors that enhance or limit the achievement of a desired outcome are for example the time available, the attention paid, the number of distractions, the number of repetitions, or the availability of something.⁹⁵² In other words, people have the opportunity to perform when they have the necessary resources, avenues for expression, and work environment to perform the task.⁹⁵³

The construct used to measure opportunity to receive knowledge in this thesis originates from GRUEN ET AL. (2007).⁹⁵⁴ They measured “opportunity to network” – the sender perspective – by using four items. One of them was reverse-coded. The construct had a good reliability of $\alpha=0.80$. In contrast to the construct of opportunity designed by SIEMSEN et al. (2008), the items of GRUEN ET AL (2007) cover different dimensions of opportunity: the available time (items 1 and 4), the atmosphere (item 2), and disruptions (item 3):

Opportunity ($\alpha=0,80$) (Gruen et al. (2007))	The conference provided plenty of time for networking.
	The general atmosphere at the conference was conducive to building my professional network.
	There was so much going on at the conference that I found it hard to network. (R)
	I was well-informed about the activities at the conference that provided time for networking.

Table 41: Original items for the opportunity construct

⁹⁵¹ Gruen et al. (2007), p. 539.

⁹⁵² Cf. Mac Innis/Jaworski (1989), Gruen et al (2007).

⁹⁵³ Cf. Chang et al (2012), p. 928.

⁹⁵⁴ The construction of opportunity by Siemsen was rejected because it reduces opportunity to the dimension of time.

This “system” of specifying the items was kept when translating the items to German and when specifying the items for the buyer – the opportunity to receive knowledge. The reliability analysis for “opportunity to receive” revealed a sufficient Cronbach’s alpha of $\alpha=0.74$.

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
K_Opportunity_2	9,5714	5,361	,579	,369	,665
K_Opportunity_4	10,2347	4,862	,545	,371	,674
K_Opportunity_1	10,6531	4,889	,613	,376	,637
K_Opportunity_3_umcod	10,1633	4,860	,434	,221	,751

Table 42: Item to total statistics for opportunity items

However, the “Alpha if Item Deleted” statistic (cf. table above) showed that the reliability of the construct can be improved when deleting the third item. The final construct thus consists of items 1, 2, and 4 and presents a reliability of $\alpha=0.75$. All other criteria of the first generation have been fulfilled by the opportunity to receive knowledge (cf. Table 43).

Construct quality	Reliability test on indicator level	Corrected Item-to-total-correlation	Communalities	(Rotated) factor loadings	Reliability test on construct level	KMO	Bartlett-test	Explained variance	One dimensionality	Cronbach's Alpha	Cronbach's Alpha for standardized items	Inter-Item-correlation (smallest in line)
Quit off value		≥0,5	≥0,5	>0,4		≥0,5	0	>0,5	1 factor for each construct	≥0,6; ≥0,7; ≥0,8		≥0,3
Opportunity to receive												
K_Opportunity_1		.569	.655	.810								0.488
K_Opportunity_2		.599	.688	.829		0.693	0	67.129	1	0.75316558	0.7551136	0.525
K_Opportunity_4		.582	.671	.819								0.488

Table 43: First generation criteria for opportunity constructs

Table 44 presents the items and introduction questions as used in the German questionnaire. The gray, crossed-out fields indicate that the item was deleted within the reliability analysis. The items were introduced by asking the customer to assess the situation of the project team based on the item-statements. All items were measured on a five point rating scale reaching from 1: not at all to 5: to a very high extent:

5. Empirical analysis and methods

item name (SPSS variable)	Opportunity to receive knowledge($\alpha=0.75$)	Scale
	Bitte beurteilen Sie die Situation Ihrer Projektmitarbeiter anhand folgender Aussagen. Unter Wissen sind folgend die Ergebnisse des Projektes sowie die damals erlernten Prozesse, Methoden, Werkzeuge und Fähigkeiten zu verstehen.	Introduction question
K_opportunity_1	Das Projekt hat viel Zeit gelassen, das Wissen zu verstehen und aufzunehmen.	1: gar nicht - 5: in sehr hohem Maße
K_opportunity_2	Die Atmosphäre im Projekt war förderlich, um das Wissen zu verstehen und aufzunehmen.	
K_opportunity_3_umcod	Es passierten so viele andere Dinge im Projekt, dass es schwierig war, die Zeit zu finden das Wissen zu verstehen und aufzunehmen. (R)	
K_opportunity_4	Wir waren gut über die Zeiten im Projekt informiert, die dazu bestimmt waren das Wissen zu verstehen und zu erlernen.	

Table 44: Items for the opportunity construct

Construct validity of the opportunity construct was tested by analyzing the three items in an EFA. It revealed one factor with an eigenvalue greater than 1, explaining 69.3 percent of the total variance. The KMO (0.7) criterion was fulfilled and the Bartlett test significant, showing good correlation of the items of the identified factors. The rotated component matrix shows that all items clearly load (loading higher than 0.81) on the opportunity to receive construct. Their extracted communalities are all higher than 0.65. In summary, the construct of opportunity to receive knowledge can be considered reliable and valid.

As presented by Table 45, the mean of this construct is 10.11. As the maximum value is 15 (3 * rating of 5), the sample represents a rather high opportunity to receive knowledge. However, the variance of 5.08 indicates that the opportunity construct in the empirical sample differs enough to explain the role of opportunity in the SEM.

	Mean	Variance	Std. Deviation	N of Items
Opportunity to receive knowledge	10.11	5.079	2.254	3

Table 45: Descriptive statistics for opportunity

5.4.3 Governance mechanisms

The special interest of this thesis is what role different groups of governance mechanisms (formal versus relational) play in the knowledge transfer. Thus the governance constructs for the SEM have to represent a group value.

To generate this group value, first several single governance mechanisms are operationalized, and average⁹⁵⁵ construct values are calculated. Second, these construct values were subject to an EFA based on Principal Component Analysis with varimax rotation. This kind of EFA identifies orthogonal and thus independent factors, which represent distinct groups⁹⁵⁶ of governance mechanisms. The single factor values will then be used as indicators in the measurement model of the SEM.⁹⁵⁷

The first section of this chapter introduces the operationalization of the single formal governance mechanism constructs, the second section the operationalization of the relational governance mechanism constructs, and the third section presents the calculation of the governance group values.

To create a group value for relational governance mechanisms, three single mechanisms are operationalized: “Shared problem solving,” “Establishment of social ties,” and “Informal Socialization.” The group value of formal governance mechanisms was calculated based on two mechanisms: “Contract Intensity” and “Project Management Intensity.”

The relational mechanisms are chosen because they were found to be very important for knowledge transfer success in the empirical state of the art analysis (cf. Chapter 3.3.3). The formal governance mechanisms are chosen because they reflect the special governance situation of project teams in consultancy (cf. Chapter 5.1.).

⁹⁵⁵ Some construct have 5 point rating scales, others are dummy variables and coded by 0 or 1. Thus for all constructs, the average of the construct values is used to be able to compare the constructs with different scales in the EFA.

⁹⁵⁶ Cf. Weiber/Mühlhaus (2010), p. 108.

⁹⁵⁷ For more information about using factor values in SEMs the interested reader is directed to Canfeti & Basselier (2009) and Hair et al (2013).

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In order to reduce complexity in the measurement, WEIBER & MÜHLHAUS (2010) recommend the usage of single items.⁹⁵⁸ Thus the single formal and relational governance mechanisms were operationalized by single items that reflect the global content of the construct.⁹⁵⁹

For the constructs of “Shared Problem solving,” “Social ties,” and “Informal Socialization,” such global items could be identified. For the formal governance constructs, a formative index measurement was chosen, because the intensity of a construct asks for an addition-based concept that forms this intensity.

Since none of the construct values is meant to be part of the SEM but to reflect relational or formal governance, the quality criteria of a SEM standard do not need to and cannot be applied here.⁹⁶⁰ Thus the single items are only subject to content validity⁹⁶¹ assessments and the formative indexes are only subject to content validity and non-collinearity assessments respectively.

Type of GM	Formal governance mechanisms		Relational governance mechanisms		
	Operation-alized construct	Contract intensity	PM intensity	Shared problem solving	Social ties
Measurement	Formative index	Formative Index	Single item	Single item	Single item

Table 46: Overview of governance mechanisms and groups

⁹⁵⁸ Cf. Weiber/Mühlhaus (2010), p.92.

⁹⁵⁹ When using single items, the researcher should make sure that the item reflects the whole subject of interest. Thus “global” item means that the item covers the subject of interest completely. (Cf. Weiber/Mühlhaus (2010), p.92.)

⁹⁶⁰ To test for indicator validity and the construct validity of formative constructs as recommended by Hair et al. (2013), Weiber & Mühlhaus (2010), or MacKenzie et al. (2005). (cf. Chapter 4.4.3), the formative construct needs to be integrated into the nomological net of other reflective constructs – i.e. it identifies its validity only with the position in the SEM (cf. Weiber/Mühlhaus (2010), p. 204).

⁹⁶¹ The usage of single item scales is discussed controversially in research because of potential lacks in reliability and validity. However, current research identified that single item scales are not more or less reliable or valid than multi-item scales - cf. for example Boyd et al. (2005).

5.4.3.1. Formal governance: Contract intensity

The most formal way to govern a project is contractual mechanisms. “Contractual governance explicitly outlines the activities buyers and sellers should undertake [...]”⁹⁶². They contain the formal and explicit rights and responsibilities for the buyer and the seller.⁹⁶³ Thereby contracts create a mutually agreed upon range of acceptable behaviors, backed by the option of redress to the legal system in the event of disputes.⁹⁶⁴ In addition, they coordinate the carrying out of management practices.⁹⁶⁵

Although the majority of the projects are governed by standard contracts, a review of all contracts revealed that they still differ in their details in some paragraphs – i.e. the intensity of these paragraphs differs. These paragraphs changing in intensity are the paragraphs of “project organization,” “customer obligations,” and “definition of work packages.” Thus they were analyzed with respect to such differences in details that represent a different level of contract intensity. For the paragraph of project organization, the author could find explicit definitions of the single consultants that will be supplied (represented by a consultant profile with picture (23.8%) in contrast to only briefly described consultant categories (76.2%).

Consultant names are fixed in contract (V Personen sind festgeschrieben)				
	Frequency	Percent	Valid Percent	Cumulative Percent
No	77	76.2	76.2	76.2
Valid Yes	24	23.8	23.8	100.0
Total	101	100.0	100.0	

Table 47: Frequency of fixing consultant names to contract

Within the description of the work packages, the contracts differ in their description of customer tasks and obligations in each work package. Some contracts include an additional sub-section mentioning the customer’s tasks in this work package explicitly (25.8%) whereas other contracts do not mention them at all (74.2%).

⁹⁶² Wang et al. (2008), p. 117.

⁹⁶³ Cf. Wang et al (2008), p. 117.

⁹⁶⁴ Cf. Masten (1996); Hoetker/Mellewigt (2009).

⁹⁶⁵ Cf. Wang et al. (2008), p. 117.

5. Empirical analysis and methods

In 2010, a change in the standard contract institutionalized the customer's tasks and an additional paragraph "customer obligation" was added to each contract. To compare older and newer contracts in terms of customer obligation, a variable was computed that defines contracts with the new paragraph as intensive as well as contracts that defined the customer obligations in the work packages. The new variable "Definition of customer obligations and tasks" showed that 23.8 % of the contracts do not mention customer obligations at all, whereas 76.2% do mention them as either of the two options mentioned above.

Definition of customer obligations and tasks (V_irgendeine_Mitwirkung_def)

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid No	24	23.8	23.8	23.8
Valid Yes	77	76.2	76.2	100.0
Total	101	100.0	100.0	

Table 48: Frequency of defining customer obligations in the contract

The final construct "Contract intensity" is an intensity construct measured by an index that calculates the average value for the two variables mentioned above:

Contract intensity= MEAN (explicit definition of consultants + definition of customer obligations and tasks)

Accordingly, the only values "Contract intensity" can take are 0 (minimum), 0.5, or 1 (maximum). For the data sample of 101 projects, 19.8% are considered not to be contract-intensive – i.e. they do not specify consultant personnel or customer obligations. The same portion (19.8%) is identified for contracts which include both intensity aspects. Projects with this high contract intensity thus create high structural dependence. 60.4% of the contracts include either one or the other intensity measure.

GM CONTRACT INTENSITY

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid .00	20	19.8	19.8	19.8
Valid .50	61	60.4	60.4	80.2
Valid 1,00	20	19.8	19.8	100.0
Total	101	100.0	100.0	

Table 49: Descriptive statistics "Contract Intensity"

Since the calculation of this index construct includes additions of items like formative constructs, the single items must not correlate, because in case of multi correlation, the correlation would deform the index based on the value of the variable with the highest correlation.

To test for multi-collinearity, the two variables were regressed on the first item of knowledge ownership.⁹⁶⁶ The resulting VIF values for both items are below 5 (cf. Table 50). Thus collinearity is not a problem, and the index of “Contract Intensity” can be considered unbiased.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3,293	,194		17,015	,000		
	V_Personen_sind_festgeschrieben	-,260	,219	-,120	-1,189	,237	,991	1,009
	V_irgendeine_Mitwirkung_def	,060	,219	,028	,274	,785	,991	1,009

a. Dependent Variable: K_KNT_succs_Ownership_1

Table 50: Collinearity Check "Contract Intensity"

5.4.3.2. Formal governance: Intensity of formal project management

Ongoing activities required to monitor compliance with the terms of the contract and to fulfill the objectives specified in the initial contract are a second type of formal governance mechanisms.⁹⁶⁷ Examples for such mechanisms are standardized procedures, technical reports, cost accounting systems, and budget/planning systems.⁹⁶⁸ All of these examples have in common that their terms can be separated from the specific identities of the parties and that their scope is closely limited.⁹⁶⁹

In consultant-client relationships, the major means to coordinating the objectives of the contract are project management mechanisms. These define standard procedures that are to be followed to secure the successful completion of every project. These mechanisms cover the whole lifecycle of a project and can be considered standard rules of action (cf.

⁹⁶⁶ Following Hair et al. (2013) and Backhaus et al. (2013), the dependent variable is not relevant because only the correlation of the independent variables (items) is of interest.

⁹⁶⁷ Cf. Macneil (1978); Williamson (1979); Hoetker/Mellewig (2009)

⁹⁶⁸ Martinez/Jarillo (1989); Sitkin/Weingart (1995); Gulati (1995); Uzzi (1997); Das and Teng (1998).

⁹⁶⁹ Cf. Macneil (1978); Williamson (1979); Hoetker/Mellewig (2004)

Chapter 5.1) Thus they are not dependent on the identities of the parties but applicable for every project – i.e. they reflect the concept of structural dependence given by formal governance mechanisms.

The consultancy company in question uses PMI standards to manage their projects. Thus the extent to which a project team uses these standard procedures indicates the “Project Management (PM) Intensity” of a project.

To identify the specific wording of this company’s formal procedures, the quality management documentation of the consultant company was analyzed with regard to the dictated, formal project management tools and procedures. It revealed four clearly formal procedures that should be followed in every project: 1) definition of the project scope, 2) explicit documentation of the goal of the project including demands of the customer, 3) definition of a project plan including milestones, decisions, due dates and resources, and 4) definition of an organigram of the project team. The original wording of the check list is listed in Table 51.

Besides these four procedures, 14 others were identified (cf. Appendix F). However, these procedures do not fulfill the definition of formal governance but involve procedures that do not specify outcomes or include relational aspects. To avoid a blurring of the formal governance mechanism concept, these mechanisms were not included in the construct.

Item name (SPSS variable)	Items Project Management Intensity	Check box indicates usage (Haben wir benutzt)
U_Gov_PM_Anw_1	Ein Projekt-scope Statement wurde erstellt.	<input type="checkbox"/>
U_Gov_PM_Anw_2	Das Projektziel inklusive der Anforderungen des Unternehmens wurde dokumentiert.	<input type="checkbox"/>
U_Gov_PM_Anw_4	Das Projektvorgehen inklusive Meilensteine, Entscheidungen, Arbeitspakete, Termine und Ressourcen wurde in einem Projektplan definiert.	<input type="checkbox"/>
U_Gov_PM_Anw_5	Ein Projektorganigramm wurde erstellt.	<input type="checkbox"/>

Table 51: Items for "Project Management (PM) Intensity"

In interviews with project managers of the consultancy company, this list was discussed and perceived to be complete. Thus content validity is considered established⁹⁷⁰.

⁹⁷⁰ Cf. Hair et al. (2013), p. 43.

Since the procedures can only be used or not in a certain project, a rating scale is not an appropriate measurement type. Instead each item was presented with a check box, and the respondent (consultancy project leader) was asked if he or she used the project management means in the project:

*“Welche der folgenden Projektmanagement Werkzeuge wurden angewandt?
Wenn die Werkzeuge nicht erforderlich waren, lass die Kästchen bitte einfach frei.”⁹⁷¹*

Each marked check box was coded with 1 whereas empty check boxes were coded with 0. The construct “PM intensity” calculates the average value for all variables mentioned above:

$$\text{PM intensity} = (\text{U_Gov_PM_Anw_1} + \text{U_Gov_PM_Anw_2} + \text{U_Gov_PM_Anw_4} + \text{U_Gov_PM_Anw_5}) / 4.⁹⁷²$$

Accordingly, the construct represents the extent to which formal project management procedures were used – i.e. the extent to which the project was governed with structural dependence. The reported values are the percentage of formal project management usage and consequently take values between 0 and 100%.

For the current data set of 101 projects, 57.4% of the projects are managed by using 2 (50%) or less of the project management means. The minimum extreme of 0 was used by 21 projects and the maximum extreme of 4 (100%) was used by 17 projects.

PM_Intensity_formal					Statistics	
	Frequency	Percent	Valid Percent	Cumulative Percent	PM_Intensity_formal	
Valid	.00	21	20,8	20,8	N	Valid 101
	.25	11	10,9	31,7		Missing 0
	.50	26	25,7	57,4	Mean	,5173
	.75	26	25,7	83,2	Median	,5000
	1,00	17	16,8	100,0	Std. Deviation	,34325
Total		101	100,0		Range	1,00
					Minimum	,00
					Maximum	1,00

Table 52: Descriptive statistics "PM Intensity"

⁹⁷¹ Original introduction question in the German questionnaire.

⁹⁷² Calculated with IBM SPSS 21.

5. Empirical analysis and methods

Based on a regression on the first item of knowledge integration, the collinearity of the four items was assessed. The results as presented below show that no item has a VIF that exceeds the critical value of 5. The maximum reaches 1.7. Thus collinearity is not a problem for the construct of “PM Intensity”.

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3,212	,188		17,127	,000		
	U_Gov_PM_Anw_1	-,039	,233	-,019	-,169	,866	,768	1,303
	U_Gov_PM_Anw_2	-,104	,271	-,051	-,384	,702	,573	1,746
	U_Gov_PM_Anw_4	,373	,255	,180	1,463	,147	,660	1,515
	U_Gov_PM_Anw_5	-,380	,215	-,191	-1,770	,080	,854	1,170

a. Dependent Variable: K_KNT_succs_learning_1

Table 53: Collinearity check PM Intensity

5.4.3.3. Relational governance: Shared problem solving

In contrast to formal governance mechanisms, the scope of relational mechanisms is more open, they create no formal alternatives in the event of unresolved conflict, and the identity of the involved persons is critical.⁹⁷³ Relational mechanisms are based largely on trust and social identification, thus their outcome relies on the interaction of individuals and cannot be pre-specified in advance.⁹⁷⁴

A frequently used relational governance mechanism is “shared problem solving.” Shared problem solving is the joint resolution of problems or decisions during the project.⁹⁷⁵ Through joint decision making, the two parties can learn the decision structure of the other party and gain familiarity with the underlying knowledge.⁹⁷⁶

To operationalize “shared problem solving” with a global item that covers joint decisions in any situation of potential problems, one item out of four from BSTIELER AND HEMMERT (2010) was used.⁹⁷⁷ The original item states that all changes

⁹⁷³ Cf. Martinez and Jarillo (1989); Dyer and Singh (1998); Hoetker/Mellewig (2009).

⁹⁷⁴ Cf. Hoetker/Mellewig (2009), p.1028.

⁹⁷⁵ Cf. Bstieler, Hemmert (2010), p. 492.

⁹⁷⁶ Cf. Bstieler, Hemmert (2010), p. 487.

⁹⁷⁷ For complexity reasons, the measurement of all governance mechanisms was focused on single item measures.

regarding any project agreements have been decided together with the customer. The consultant was asked to what extent he agreed with this statement on a 5 point rating scale ranging from 1: not at all to 5: to a very high extent.

Item name (spss variable)	Shared problem solving (single item)	Bstieler, Hemmert (2010) – 1 out of 4 items for "shared problem solving"	Scale
U_shared_Prob_solv_2	Alle Änderungen bezüglich der Projektvereinbarung haben wir mit dem Kunden gemeinsam vereinbart.	Adjustments to project specific agreements were mutually agreed upon	1: gar nicht - 5: in sehr hohem Maße

Table 54: Item of shared problem solving

In line with the calculation of the other governance mechanisms, the mean of the measured values is used to represent the average intensity of shared problem solving ($GM_SPS_5 = U_shared_Prob_solv_2 / 5$).

The reported values thus represent an intensity of shared problem solving. In the dataset of 101 projects, the mean intensity of shared problem solving was 84%. 21 projects are characterized by rather less cooperation in solving problems. However, none of the projects stated that they did not involve the customer at all. In 79 projects, the team to some degree (4 or 5 assessment of the item) included the customer in solving project problems.

GM_SPS_5					Statistics	
	Frequency	Percent	Valid Percent	Cumulative Percent	GM_SPS_5	
Valid	,40	4	4,0	4,0	N	Valid 100
	,60	17	16,8	21,0		Missing 1
	,80	32	31,7	53,0	Mean	,8440
	1,00	47	46,5	100,0	Median	,8000
Total	100	99,0	100,0		Std. Deviation	,17426
Missing	System	1	1,0		Range	,60
Total	101	100,0			Minimum	,40
					Maximum	1,00

Table 55: Descriptive statistics "Shared Problem Solving"

5.4.3.4. Relational governance: Social ties

A classic relational governance mechanism that was frequently found to be conducive for knowledge transfer is the establishment of social ties.⁹⁷⁸ Social ties are personal relationships between the two organizations or single members of the organizations.⁹⁷⁹ The strength of this interpersonal connection is reflected by the degree of emotional attachment to each other.⁹⁸⁰ In line with REAGANS, MCEVILY (2003), the mechanism was operationalized by a global item that asked the consultant how close he/she was with the client. It was measured on a 4 point rating scale: 1: distant; 2: not very close; 3: close; 4: extraordinary close.

Item name (spss variable)	Social ties (single item)	Reagans, McEvily (2003) – 1 out of 2 items ⁹⁸¹ for social ties	Scale
U_social_ties_1	Wie nah standet ihr euch mit den einzelnen Personen des Kunden-Teams?	How close have you been with each person of the customer project team?	1: distanziert 2: nicht sehr nah 3: nah- 4. Außergewöhnlich nah

Table 56: Item of social ties

To make this scale comparable to the other 5 point rating scales, the measured values were divided by the highest number of 4 (GM_ST_mean=U_social_ties_1/4). The reported values thus represent an intensity of established ties. In the dataset of 101 projects, the mean intensity of social ties was 69%. 30 projects are characterized by rather distant, non-close relationships, whereas in 71 projects, the team established rather close relationships and had high emotional attachments.

⁹⁷⁸ Cf. Easterby-Smith et al. (2008); Hansen/Lovas (2004); Bell/Zaheer (2007); Reagans, McEvily (2003); Easterby-Smith et al. (2008), p. 680

⁹⁷⁹ Cf. Reagans, McEvily (2003).

⁹⁸⁰ Cf. Szulanski (1996); Uzzi (1997); Hansen (1999); Reagans, McEvily (2003).

⁹⁸¹ In addition they ask for communication frequency.

Item name (spss variable)	Informal Socialization (single item)	Lawson, Petersen et al. (2011)- 1 out of 3 items ⁹⁸⁷	Scale
U_inf.soci alisation_3	Wir haben gemeinsame Veranstaltungen mit dem Kunden organisiert. (Teamabende, Sport, etc.)	Social events	1: gar nicht - 5: in sehr hohem Maße

Table 58: Item of social ties

In line with the other governance mechanisms, the means of the measured values were used to represent the average intensity of informal socialization (GM_Inf.Social._5=U_inf.socialisation_3/5). In the data set of 101 projects, two values were missing. For the remaining 99 projects, the descriptive statistics show that the informal socialization mechanism is used only by 25.3% of the projects to a high or very high extent. 43.4% of the projects did not use this mechanism at all in governing the project. Consequently, the mean intensity of informal socialization is 46 %.

GM_Inf.Social._5					Statistics		
	Frequency	Percent	Valid Percent	Cumulative Percent	GM_Inf.Social._5		
Valid					N	Valid	99
,20	43	42,6	43,4	43,4		Missing	2
,40	13	12,9	13,1	56,6	Mean		,4626
,60	18	17,8	18,2	74,7	Median		,4000
,80	19	18,8	19,2	93,9	Std. Deviation		,27202
1,00	6	5,9	6,1	100,0	Range		,80
Total	99	98,0	100,0		Minimum		,20
Missing System	2	2,0			Maximum		1,00
Total	101	100,0					

Table 59: Descriptive statistics "Informal socialization"

5.4.3.6. Governance Groups

In order to ensure that the governance mechanisms operationalized above sort into their theorized group of either formal or relational mechanisms, all constructs were subjected to a principal components factor analysis.

Using varimax rotation, a two-factor solution was extracted for the independent variables. The factor solution conformed closely to the formal or relational governance constructs that each item was supposed to measure: All items loaded on the expected factors, and all factor loadings were above 0.7, with no cross-loadings greater than 0.14.

⁹⁸⁷ The remaining items are: "Communication guidelines" and "Awareness of supplier issues."

These clear loadings make interpretation easy: The factor relational governance is represented by the mechanisms of shared problem solving, informal socialization, and social ties whereas the factor of formal governance is represented by contract intensity and project management intensity.

Rotated Component Matrix^a

	Component	
	Relational GMs	Formal GMs
GM_SPS_5	,719	,117
GM_Inf.Social._5	,770	,140
GM_ST_mean	,845	-,119
GM_CONTRACT_INTENSI TY		,792
PM_Intensity_formal		,760

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Table 60: Rotated component matrix to identify governance groups

The two factors explain 61.2 % of the total variance, all communalities were higher than 0.53 for the independent variables and did not vary over a wide range. The Bartlett Test was significant, and the KMO (0.601) is over the recommended value of 0.5. Consequently, the analysis indicates that the mechanisms represent independent measures of the underlying constructs of formal and relational governance that can be interpreted clearly based on the items of the single mechanisms:

Factor	Content/Interpretation
Relational Governance	<ul style="list-style-type: none"> Establishment of close relationships between consultant and customer (Wie nah standet ihr euch mit den einzelnen Personen des Kunden-Teams?) Joint social events with the customer (Wir haben gemeinsame Veranstaltungen mit dem Kunden organisiert (Teamabende, Sport, Essen, Vorträge, etc.).) Shared problem solving in terms of any changes in the project (Alle Änderungen bezüglich des Projekts haben wir mit dem Kunden gemeinsam vereinbart.)
Formal governance	<ul style="list-style-type: none"> Consultant names are fixed in contract Customer obligations are fixed in contract High Intensity of standardized project management tools.

Table 61: Interpretation of governance group factors

The factor values of these constructs will represent the value of formal and relational governance in the SEM.⁹⁸⁸

Within the data set of 101 projects, 3 of these factor values are missing. Thus the values are calculated based on 98 projects.

The factor values are standardized values: Their mean is 0, and the standard deviation is 1. The values of relational governance range from -2.7 to 2.1, and the values from formal governance range from -2.2 to 2.1. This represents a comparable range of 4.7 and 4.3 for relational and formal governance respectively.

Statistics relational governance			Statistics formal governance		
F_GM_rel			F_GM_form		
N	Valid	98	N	Valid	98
	Missing	3		Missing	3
Mean		,0000000	Mean		,0000000
Median		,1261700	Median		-,0507877
Std. Deviation		1,00000000	Std. Deviation		1,00000000
Range		4,77557	Range		4,25373
Minimum		-2,70388	Minimum		-2,17456
Maximum		2,07169	Maximum		2,07917

Table 62: Descriptive statistics of relational and formal governance

5.4.4 Dependent variable: Success of knowledge transfer

Success of knowledge transfer in this thesis is defined as the change of the knowledge base of the buyer. With reference to the knowledge transfer process, the change of the knowledge base is the completion of the fourth stage of the knowledge transfer process. However, this result can be achieved only by completing the prior knowledge transfer stages.

Consequently, knowledge transfer success consists of several parts: the successful reception of the knowledge (stage 2), gaining sufficient results with the knowledge

⁹⁸⁸ Since few indicators increase the PLS bias, the author tried to model a construct for formal and relational governance based on the single items. However, these constructs did not show sufficient reliability.

(stage 3), and finally a change of the knowledge base of the recipient organization or its actors (stage 4) (cf. Chapter 2).⁹⁸⁹

“Most prior studies have investigated knowledge transfer as a unidimensional construct. A common theme across the included studies is to investigate the extent or the degree of knowledge transfer.”⁹⁹⁰ These approaches measure knowledge transfer success just as a result of stage 3 or 4 respectively.

A multi-dimensional construct, which reflects a complete success of knowledge transfer, means operationalizing a construct that contains the single results of the knowledge transfer process. Therefore, this thesis draws from different established perspectives on knowledge transfer success, which operationalized the single parts of the knowledge transfer success, and is going to design a higher order construct of knowledge transfer success.

The single perspectives to explain the results of the stages are the project management perspective for the success of stage 2 and the institutional theory perspective of ownership and organizational internalization for stages 3 and 4.

In order to model the higher order construct (HOC) of knowledge transfer success, first these single lower order constructs (LOCs) need to be operationalized. In a second step, the HOC can be set up and assessed for reliability and validity. The next three sub-chapters describe the operationalization of the lower order constructs and their reliability based on the criteria of the first generation. The fourth chapter describes the modeling of the HOC and the assessment of the quality criteria of the second generation for all constructs (HOC and LOCs).

5.4.4.1. Project success

The project management literature defines a successful transfer as one that is on time, on budget, and produces a satisfied recipient.⁹⁹¹ The operationalization of this success

⁹⁸⁹ Stage 1 (complete set-up) is left out of the operationalization because all the projects needed to complete that phase to be included in the sample. In other words, there was no variance that could be analyzed in this regard.

⁹⁹⁰ Van Wijk et al. (2008), p. 846.

⁹⁹¹ Pinto&Mantel (1990); Szulanski (1996), Cummings&Teng (2003), p.41f.

factor was created by PINTO AND MANTEL (1990), who called it the “technical success of a project.” The scale was also used by RANDOLPH AND POSNER (1988) and later by SZULANSKI (1996), who measured "outcome-based stickiness" with it. This intention reflects the result of the second stage of knowledge transfer process perfectly, because the second stage of the knowledge transfer process aims for the initial transfer and a receiver that obtains the outcome of the project – the knowledge.

The scale of project success includes eight items, representing the three success factors satisfaction (quality), time, and budget.

Three items measure the **quality** of the project. One item measures the adjustment in the customer’s expectations after gaining experience with the knowledge. The possible answers for this question are 5: dramatically upward, 4: slightly upward, 3: no change, 2: slightly downward, 1: dramatically downward. Two items measure whether the customer was satisfied with the quality of the knowledge and with the quality of the transfer. For these two items, the possible answers are 5: very satisfied, 4: somewhat satisfied, 3: neither satisfied nor dissatisfied, 2: somewhat dissatisfied, 1: very dissatisfied.

Success in **time** is measured as the deviation from the initial plan in reaching key milestones—the start of the transfer, the first day the knowledge became operational at the customer and achievement of satisfactory performance. For these three items, the five possible answers are 1: faster by more than 30%, 2: faster between 6 to 29%, 3: as expected, 4: delayed between 6 to 29%, 5: delayed more than 30%.

Two items measured the success in terms of **costs**. They ask for the deviation of the actual cost from the expected cost on the consultant side and the customer side. For these two items, the five possible answers are 1: much (> 30 %) more than expected, 2: slightly more (>6% and < 30 %) than expected, 3: as expected; 4: slightly (>-6% and <-30%) less than expected; 5: much less (<-30%) than expected.

This block of items is introduced by asking the respective respondent to remember the results of the project and to assess them in terms of quality, time, and quality: “*Gemäß Ihrem Vertrag mit der [BERATUNG] haben Sie in diesem Projekt Ergebnisse gemäß Anlage 1 erhalten. Bitte rufen Sie sich diese Ergebnisse nochmals in Erinnerung und*

*beurteilen Sie folgend das Projekt unter Qualitäts-, Zeit-, und Kostengesichtspunkten.*⁹⁹²

In order to test the reliability of the constructs of project success, all items have been the subject of an EFA with varimax rotation. However, the communalities show that the condition to perform such an analysis (extraction >0.5) cannot be met by the third item of quality and the first item of time. This is also confirmed by weak factor loading (<0.4) on each of the identified factors for the former item (cf. Figure 39).

Communalities			Rotated Component Matrix ^a			
	Initial	Extraction	Component			
			1	2	3	
K_KNT_succs_Quali_1	1,000	,813		,882	,190	
K_KNT_succs_Quali_2	1,000	,815		,900		
K_KNT_succs_Quali_3	1,000	,272				
K_KNT_succs_Budget	1,000	,500	,313	-,214	,358	
K_KNT_succs_Zeit_1	1,000	,335		,286	,640	
K_KNT_succs_Zeit_2	1,000	,820	,288	,134	,483	
K_KNT_succs_Zeit_3	1,000	,842	,903			
U_KNT_succs_Budget_AP1	1,000	,663	,902		,161	
					,812	

Extraction Method: Principal Component Analysis.

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 4 iterations.

Figure 39: Reliability tests of original project success items

Following the recommendations of HAIR ET AL. (2013), the two items were deleted, and the EFA was calculated again. For this second analysis, all conditions were passed: With a KMO of 0.557, the minimum of 0.5 is passed, all communalities are above 0.5, and all factor loading are higher than 0.4.

In contrast to the findings of SZULANSKI (1996), who used all items as one single construct, the EFA identified a three-dimensional construct as theorized by PINTO & MANTEL (1990).⁹⁹³ Indicated by Figure 40, the three factors contain two items of quality, time, and budget respectively.

For each factor, the items were subject to an EFA of their own. The EFAs showed that all factors are one-dimensional – i.e. only one component was identified. Thus the items used to build the three construct are summarized as presented by Table 63.

⁹⁹² Original introduction question in the German questionnaire.

⁹⁹³ Cf. Stock & Tatikonda (2000); Meredith and Mantel (1995).

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Rotated Component Matrix^a

	Component		
	Time	Quality	Budget
K_KNT_succs_Quali_1		,893	,194
K_KNT_succs_Quali_2		,910	
K_KNT_succs_Budget	,150	,284	,696
K_KNT_succs_Zeit_2	,925		
K_KNT_succs_Zeit_3	,917		,119
U_KNT_succs_Budget_AP1			,872

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Figure 40: EFA for project success variables

Item name (SPSS variable)	German items and reliability	Original items and reliability	Scale
	3 factors of project success: quality ($\alpha=0.792$), time ($\alpha=0.815$), budget ($\alpha=0.443$)	Stickiness-outcome-based measure ($\alpha = 0.8$, Items = 8)	Customer questionnaire
Factor "Project success- quality" ($\alpha=0.792$)			
K_KNT_succs_Quali_1	Wir waren mit der Qualität der Ergebnisse... [1-5].	We have been satisfied with the quality of the know-how.[Q]	1: sehr unzufrieden 2: unzufrieden 3: weder zufrieden noch unzufrieden 4: zufrieden 5: sehr zufrieden
K_KNT_succs_Quali_2	Wir waren mit der der Art und Weise der Ergebnisvermittlung [1-5].	We have been satisfied with the quality of the transfer process. [Q]	1: stark gesunken 2: leicht gesunken 3: unverändert 4: leicht gestiegen 5: stark gestiegen
K_KNT_succs_Quali_3	Nachdem wir die Ergebnisse eine Zeit lang genutzt hatten, ist unsere Zufriedenheit... [1-5].	Once the recipient gained experience with the know how, how did that change their satisfaction? [Q]	
Factor „Project success- time“ ($\alpha=0.815$)			
K_KNT_succs_Zeit_1	Es gab Abweichungen zum geplanten Start des Projektes. Wir waren... [1-5].	How far was there any deviation to the planned start date of the transfer project?(T)	1: viel langsamer als erwartet (+30% und mehr) 2: etwas langsamer als erwartet (+29% bis +6%) 3: wie erwartet (+5% bis -5%) 4: etwas schneller als erwartet (-6% bis -29%) 5: viel schneller als erwartet (-30% und weniger)
K_KNT_succs_Zeit_2	Die Ergebnisse des Projektes konnten ... [1-5] genutzt werden.	How far was there any deviation to the planned first use of the know-how?(T)	
K_KNT_succs_Zeit_3	Wir erreichten zufriedenstellende Resultate mit den Ergebnissen des Projektes... [1-5].	How far was there any deviation to the planned achievement of satisfactory results? (T)	
Factor „Project success- budget“ ($\alpha=0.443$)			
K_KNT_succs_Budget	Die Kosten des Projektes (z.B. Arbeits-aufwand, Reisen, Material, etc...) waren... [1-5].	How far was there any deviation to the planned an actual costs of the transfer? (B) (measured at customer)	1: viel mehr als erwartet (+30% und mehr) 2: etwas mehr als erwartet (+29% bis +6%) 3: wie erwartet (+5% bis -5%) 4: etwas weniger als erwartet (-6% bis -29%) 5: viel weniger als erwartet (-30% und weniger)
U_KNT_succs_Budget_AP1	Wir waren mit der Qualität der Ergebnisse... [1-5].	How far was there any deviation to the planned an actual costs of the transfer? (B) (Measured at consultant)	

Table 63: Items for the constructs of project success⁹⁹⁴

⁹⁹⁴ Crossed out items are deleted in the final construct due to reliability issues.

In order to test whether the identified factors are reliable constructs of their own, the reliability tests of the first generation are checked. This means analyzing if the factor constructs have a Cronbach’s alpha higher than 0.7, an inter-item correlation higher than 0.5, and a corrected-item-to-total correlation higher than 0.5 (Cf. Chapter 5.3.3).

The construct “project success-quality” passed all tests of the first generation with $\alpha=0.729$. The construct of project-success-time has a very good alpha of 0.815 and passed all other reliability test of the first generation as well. The construct of project success-budget has only a Cronbach’s alpha of 0.44 and insufficient corrected item-to-total correlations as well as insufficient inter-item correlations of 0.289.

Construct quality	Reliability test on indicator level	Corrected Item-to-total-correlation (KITK)	Communalities	(Rotated) factor loadings	Reliability test on construct level	KMO	Bartlett-test	Explained variance	One dimensionality	Cronbach's Alpha	Cronbach's Alpha for standardized items	Inter-Item-correlation (smallest in line)
Cut off value		≥0,5	≥0,5	>0,4		≥0,5	0	>0,5	1 factor for each construct	≥0,6; ≥0,7; ≥0,8		≥0,3
Project success factors						0,557	0	78,48	3 factors			
Factor quality												
	K_KNT_succs_Quali_1	,660	0,83	,911		0,5	0	83,003	1 factor	,792	,795	0,66
	K_KNT_succs_Quali_2	,660	0,83	,911								0,66
	K_KNT_succs_Quali_3											
Factor time												
	K_KNT_succs_Zeit_1					0,5	0	84,398	1 factor	,815	,815	0,688
	K_KNT_succs_Zeit_2	0,688	,844	,919								0,688
	K_KNT_succs_Zeit_3	0,688	,844	,919								0,688
Factor budget												
	K_KNT_succs_Budget	,289	0,644	0,803		0,5	0,004	64,444	1 factor	,443	,448	0,289
	U_KNT_succs_Budget_AP1	,289	0,644	0,803								0,289

Table 64: Overview of first generation criteria for project success constructs

In summary, the constructs of quality and time can be considered as reliable measurements in terms of the first generation quality criteria whereas the reliability of the budget construct cannot be established with these two items. The latter indicates that the budget construct cannot be used in the SEM.

The maximum value of the constructs is 10 (2 * rating of 5). Table 65 provides the descriptive statistics for all three constructs. Considering the mean of the constructs, the sample represents a rather high level of quality and a medium level of needed time and budget. A variance of 0.6 for the budget confirms that the construct shouldn’t be used in the SEM, because there is not much variance to explain at all. In contrast, the variances of quality (2.3) and time (2.2) indicate that the values in the empirical sample differ sufficiently to have variance that can be explained.

	Mean	Variance	Std. Deviation	N of Items
Project success-quality	8.31	2.277	1.509	2
Project success-time	5.03	2.152	1.467	2
Project success-budget	5.69	.620	.787	2

Table 65: Descriptive statistics for the constructs of project success

5.4.4.2. Ownership

The accomplishment of the third stage of knowledge transfer success demands sufficient results with the knowledge. This result reflects the concept of psychological ownership as introduced by the institutional theory. Institutional theory defines psychological ownership as the discretion over the knowledge, intensity of the association with the knowledge, and the investment of energy, time, effort, and attention in the knowledge.⁹⁹⁵

The development of the measurement of ownership is rooted in PIERCE ET AL. (1991, 1992, 2001). They started by defining psychological ownership as “that state in which individuals feel as though the target of ownership (material or immaterial in nature) or a piece of it is ‘theirs’ (i.e., ‘It is MINE!’).”⁹⁹⁶ Thus, the target becomes part of the owner's identity “when property is grounded psychologically”⁹⁹⁷ – i.e. “the individual finds himself or herself present in it (Kline & France, 1899), and it within the individual.”⁹⁹⁸ They concluded that the core of ownership is the feeling of possessiveness.⁹⁹⁹

Based on this work, CUMMINGs & TENG (2003) presented a scale of ownership as part of their construct of knowledge transfer success. This scale is used in this thesis. Thus six items are used to capture different aspects of the personal possession of the knowledge. Two items measure the feeling for the knowledge, one reverse-coded item measures the control one wants to have over the knowledge, two items measure the interaction intensity with the knowledge and the effort invested in obtaining it, and the last item measures the discretion about how the knowledge was transferred and how it is used. All items are measured on a five point rating scale. The block of items as

⁹⁹⁵ Cf. Cummings & Teng (2003), p.42.

⁹⁹⁶ Pierce et al (2001), p. 299.

⁹⁹⁷ Pierce et al (2001), p. 299.

⁹⁹⁸ Pierce et al (2001), p. 299.

⁹⁹⁹ Cf. Pierce et al (2001), p. 299.

presented below is introduced by asking how the respondent feels about the received knowledge these days: “*Welche Einstellung haben Sie heute zu dem Wissen, dass Sie im Projekt erlangt haben?*”¹⁰⁰⁰

Item name (SPSS variable)	Knowledge Ownership (German items and reliability)	Original items and reliability	Scale
	$\alpha=0.808$	Cummings/Teng (2003) ¹⁰⁰¹	Customer questionnaire
K_KNT_succs_Ownership_1	Wir haben uns das Wissen angeeignet und es aufgenommen.	They feel a very high degree of personal ownership of the know-how.	1: gar nicht - 5: in sehr hohem Maße
K_KNT_succs_Ownership_2	Wir fühlen uns dafür verantwortlich wie das erlangte Wissen weiterverwendet wird.	They feel a sense of responsibility for how the know-how gets used.	
K_KNT_succs_Ownership_3_u mced	Wir möchten nicht, dass UNITY über das erlangte Wissen mehr weiß als wir.[R]	They resent the continued control that the source has over how to use the know-how (R)	
K_KNT_succs_Ownership_4	Wir hatten ausreichend Umgang mit dem erlangten Wissen und sind heute damit vertraut.	They have had sufficient interaction with the know-how to develop an intimate understanding of it.	
K_KNT_succs_Ownership_5	Wir haben Zeit, Ideen, Fähigkeiten und Energie in den Aufbau dieses Wissens investiert.	They have significantly invested their time, ideas, skills and physical, psychological, and intellectual energies in the know-how and the related transfer process.	
K_KNT_succs_Ownership_6	Wir hatten großen Handlungs- und Entscheidungsspielraum im Projekt und bezüglich der Verwendung des Wissens.	They have been able to exercise a great deal of discretion about how this know-how was transferred and how it is used.	

Table 66: Items for knowledge ownership¹⁰⁰²

The Cronbach’s alpha for the construct based on 6 items is 0.716, which is considered good. The EFA for all items of the ownership construct showed that it is not one-dimensional, but has two components. The second component consists of only one item, which is the third, reverse-coded item. In addition, the item-to-total statistics show that this item has poor correlations with all other items (0.04) and that the Cronbach’s alpha

¹⁰⁰⁰ Original introduction question in the German questionnaire.

¹⁰⁰¹ Since the items were integrated into the whole construct of KNT success, no reliability is available.

¹⁰⁰² Crossed out items are deleted due to reliability issues.

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can be improved to 0.812 when this item is deleted (cf. Figure 40). Consequently, the construct is modeled on the remaining 5 items.¹⁰⁰³

Rotated Component Matrix ^a			Item-to-total statistics			
	Component			Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
	1	2				
K_KNT_succs_Ownership_1	,782		K_KNT_succs_Ownership_1	,560	,475	,646
K_KNT_succs_Ownership_2	,760		K_KNT_succs_Ownership_2	,587	,376	,635
K_KNT_succs_Ownership_3	,138	,921	K_KNT_succs_Ownership_3	,044	,085	,812
K_KNT_succs_Ownership_4	,859		K_KNT_succs_Ownership_4	,697	,571	,604
K_KNT_succs_Ownership_5	,806	,133	K_KNT_succs_Ownership_5	,649	,458	,613
K_KNT_succs_Ownership_6	,552	-,484	K_KNT_succs_Ownership_6	,338	,267	,709

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Figure 41: Reliability tests for knowledge ownership based on 6 items

The operationalization of “Knowledge Ownership” based on five items is identified as one-dimensional by EFA and has sufficient inter-item correlations except for the correlation between items 1 and 6 (0.248). All other correlations are clearly higher than the cut off value of 0.3. In addition to inter-item correlation problems, the item-to-total correlation statistics showed insufficient correlations of the 6th item, indicating that the Cronbach’s alpha can be improved to 0.82 when deleting this item (cf. Figure 41).

¹⁰⁰³ According to Weiber/Mühlhaus (2010), Hair et al. (2013), if an indicator is removed in reflective constructs, the correlation of the remaining ones with the latent variable and the correlation between the remaining indicators do not change. So, if we maintain a sufficient number of indicators the obtained measure still sufficiently represents the original different facets of the latent construct.

Inter-Item Correlation Matrix

	K_KNT_succs_Ownership_1	K_KNT_succs_Ownership_2	K_KNT_succs_Ownership_4	K_KNT_succs_Ownership_5	K_KNT_succs_Ownership_6
K_KNT_succs_Ownership_1	1,000	,522	,597	,525	,258
K_KNT_succs_Ownership_2	,522	1,000	,481	,485	,349
K_KNT_succs_Ownership_4	,597	,481	1,000	,600	,434
K_KNT_succs_Ownership_5	,525	,485	,600	1,000	,347
K_KNT_succs_Ownership_6	,258	,349	,434	,347	1,000

Item-Total Statistics

	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
K_KNT_succs_Ownership_1	,619	,452	,764
K_KNT_succs_Ownership_2	,594	,366	,771
K_KNT_succs_Ownership_4	,704	,518	,738
K_KNT_succs_Ownership_5	,640	,435	,756
K_KNT_succs_Ownership_6	,430	,223	,821

Figure 42: Reliability tests for knowledge ownership based on 5 items.

The resulting construct based on 4 items and with a Cronbach's alpha of 0.821 passed all reliability tests of the first generation (cf. Table 67). Thus this construct will be used as a LOC to model knowledge transfer success.

Construct quality	Reliability test on indicator level	Corrected Item-to-total-correlation (KITK)	Communalities	(Rotated) factor loadings	Reliability test on construct level	KMO	Bartlett-test	Explained variance	One dimensionality	Cronbach's Alpha	Cronbach's Alpha for standardized items	Inter-Item-correlation (smallest in line)
Cut off value		≥0,5	≥0,5	>0,4		≥0,5	0	>0,5	1 factor for each construct	≥0,6; ≥0,7; ≥0,8		≥0,3
KN Ownership												
K_KNT_succs_Ownership_1		,663	,676	,822								>0,525
K_KNT_succs_Ownership_2		,586	,579	,761								>0,481
K_KNT_succs_Ownership_3												
K_KNT_succs_Ownership_4		0,681	,697	,835		0,796	0	65,2	1	0,821	0,822	>0,481
K_KNT_succs_Ownership_5		,646	,656	,810								>0,485
K_KNT_succs_Ownership_6												

Table 67: Overview of first generation criteria for knowledge ownership construct

As presented by Table 68, the mean of this construct is 13.95. As the maximum value is 20 (4 * rating of 5), the sample represents a rather medium level of knowledge ownership. In addition, the variance of 9.7 indicates that the values in the empirical sample differ sufficiently to show explainable variance in knowledge ownership.

	Mean	Variance	Std. Deviation	N of Items
Knowledge ownership	13,95	9,708	3,116	4

Table 68: Descriptive statistics for the construct of knowledge ownership

5.4.4.3. Knowledge Integration

The final stage of knowledge transfer is the knowledge internalization in the buyer's organization – i.e. the change of the buyer's knowledge base. From an institutional perspective, organizations have integrated knowledge, when they have learned to use the knowledge on their own and achieved autarky from the initial knowledge sender. "Only when a recipient internalizes knowledge can it be sufficiently understood and adapted by the recipient to allow for its effective re-creation and, ultimately, its use."¹⁰⁰⁴

The operationalization of this last stage of knowledge transfer was taken from SIMONIN (1999b). He developed the construct "knowledge transfer" based on three items, perfectly reflecting this institutional view of knowledge integration into the receiving company. The first item asks for the learning of the process know-how, the second item asks directly if the receiving company has become more independent from the supplier's know-how, and the third item checks if the new knowledge was used in other projects of the company. All items are measured on a five point rating scale. The block of items as presented in Table 69 is introduced by asking the respondent to what extent the organization has established the knowledge to generate and use the results of the project: *"Die [BERATUNG] erbringt wissensintensive Dienstleistungen. Dies bedeutet, dass unterschiedlichste Methoden, Fähigkeiten und Ressourcen notwendig sind, um die Ergebnisse, die [BERATUNG] Ihnen vertraglich zugesichert hat, zu erstellen und für sie nutzbar zu machen.*

Inwieweit haben Sie dieses Wissen (Prozesse, Methoden, Werkzeuge und Fähigkeiten) zur Erstellung und Nutzung der vertraglich vereinbarten Ergebnisse in diesem Projekt aufgebaut?"¹⁰⁰⁵

¹⁰⁰⁴ Cummings&Teng (2003), p.42.

¹⁰⁰⁵ Original introduction question in the German questionnaire.

item name (SPSS variable)	Knowledge Integration (German items and reliability)	Original items and reliability	Scale
	$\alpha=0.620$	"Knowledge transfer" Simonin (1999b, 2004) ($\alpha = 0.07$; $\alpha > 0,82^{1006}$)	Customer questionnaire
K_KNT_succs_earning_1	Wir haben viel über das Wissen zur Erstellung und Nutzung der Ergebnisse von der UNITY gelernt.	Your company has learned a great deal about the technology/process know-how held by your partner	1: gar nicht - 5: in sehr hohem Maße
K_KNT_succs_earning_2	Wir haben die anfängliche Abhängigkeit von der UNITY zur Erstellung dieser Ergebnisse reduziert.	Your company has greatly reduced its initial technological reliance or dependence upon the partner since the beginning of the alliance.	
K_KNT_succs_earning_3	Das UNITY-Wissen zur Erstellung und Nutzung dieser Ergebnisse wurde von uns aufgenommen und in weiteren Projekten in unserem Unternehmen eigenständig eingesetzt.	The technology/process know-how held by your partner has been assimilated by your company and has contributed to other projects developed by your company.	

Table 69: Items for knowledge integration

The construct shows a reliability of $\alpha= 0.62$ which is not very high but sufficient.¹⁰⁰⁷ Actually, compared to the initial alpha value of SIMONIN (1999b) which was 0.07, this value is rather high. The inter-item correlations reach a sufficient value of 0.331 or higher. Thus the reliability on the construct level is established. However, the corrected-item-to-total correlations do not reach the minimum of 0.5 indicating that the three items do not share a common core.¹⁰⁰⁸

Item-Total Statistics	
	Cronbach's Alpha if Item Deleted
K_KNT_succs_learning_1	,484
K_KNT_succs_learning_2	,582
K_KNT_succs_learning_3	,495

Table 70: Reliability test for knowledge integration

¹⁰⁰⁶ SIMONIN (2004) only documented the minimum reliability of all his measures. Therefore the exact value for alpha cannot be reported here.

¹⁰⁰⁷ Cf. Robinson et al (1991), p. 13.

¹⁰⁰⁸ Cf. Nunnally (1978), p. 274.

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Since the item-total statistics in Table 70 indicate that deleting an item will not improve the Cronbach's alpha, the operationalization of the construct cannot be further improved.

In summary, the construct of "Knowledge Integration" is considered reliable on the construct level but not on the indicator level. The test of the second generation thus will provide the final decision about the usability of this construct. The tests of the second generation are reported based on the SEM. Thus the construct is integrated into the initial HOC of knowledge transfer success.

Construct quality	Reliability test on indicator level	Corrected Item-to-total-correlation (KITK)	Communalities	(Rotated) factor loadings	Reliability test on construct level	KMO	Bartlett-test	Explained variance	One dimensionality	Cronbach's Alpha	Cronbach's Alpha for standardized items	Inter-Item-correlation (smallest in line)
Cut off value		≥0,5	≥0,5	>0,4		≥0,5	0	>0,5	1 factor for each construct		≥0,6; ≥0,7; ≥0,8	≥0,3
KN Integration												
K_KNT_succs_learning_1		0,461	,610	,781								
K_KNT_succs_learning_2		0,385	,504	,710		0,638						
K_KNT_succs_learning_3		0,448	,599	,774			C	57,091	1	0,620	0,623	>,331

Table 71: Overview of first generation criteria for knowledge integration construct

As presented by Table 72, the mean of the knowledge integration construct is 8.87. As the maximum value is 15 (3 * rating of 5), the sample represents a rather medium level of knowledge integration. The variance of 5.7 indicates that the values in the empirical sample differ sufficiently to have explainable variance in knowledge integration.

	Mean	Variance	Std. Deviation	N of Items
Knowledge integration	8.87	5.730	2.394	3

Table 72: Descriptive statistics for the construct of knowledge integration

5.4.4.4. Higher order construct of knowledge transfer success

To form the HOC of knowledge transfer success, the two-stage approach was used, because using a repeated indicator approach for a dependent variable would explain all the variance of the dependent construct through the LOCs and rendering all other influencing constructs of the structural model insignificant.¹⁰⁰⁹

The first step of the two-stage approach uses the repeated indicators approach to calculate the variables' scores of the LOC. These scores are used as manifest variables

¹⁰⁰⁹ Cf. Hair et al. (2013), p. 233.

in the second step to measure the HOC. In this approach, the HOC is embedded in a nomological net that allows other LVs to explain some of its variance, which might result in significant path relationships.¹⁰¹⁰

The modeling of a HOC of knowledge transfer success started by interpreting the single constructs of project success (time, quality, and budget¹⁰¹¹) and the constructs of knowledge ownership and knowledge integration as LOCs. Thus knowledge transfer success is modeled as a HOC that has five LOCs.

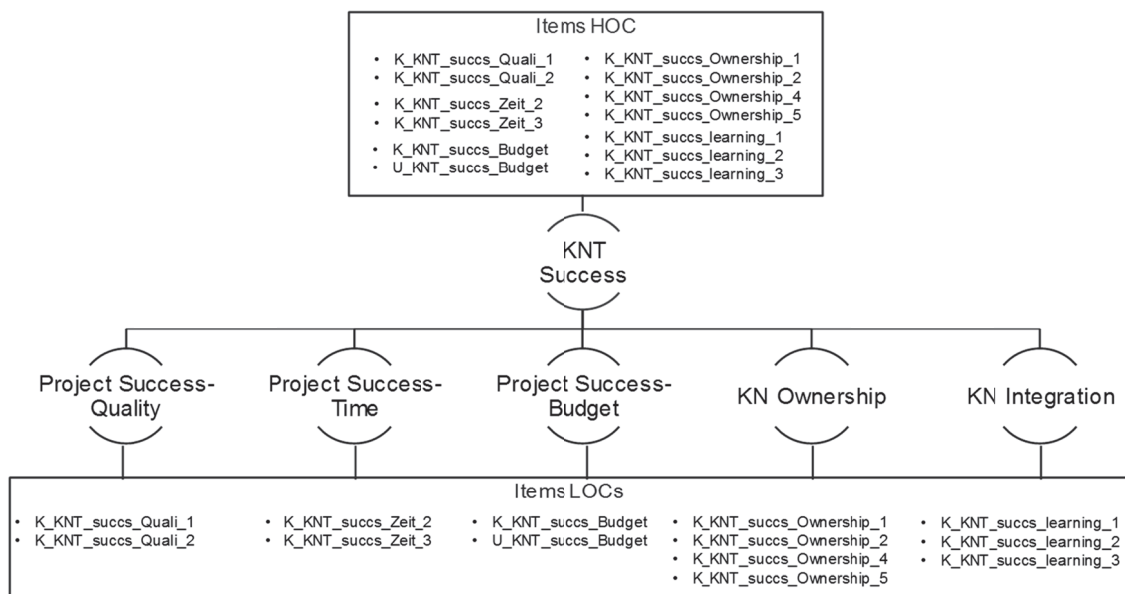


Figure 43: Higher order construct of knowledge transfer success

Based on the diagnostic questionnaire for formative opposed to reflective measurements by JARVIS, MACKENZIE AND PODSAKOFF (2003) (cf. Appendix C), the HOC of knowledge transfer success is modeled as a formative construct.

For example: “knowledge ownership” does not need to increase when “budget” changes, and “KN integration” might decrease, but this is fully independent from the result of “KN ownership.” Thus the dimensions are not consequences of knowledge

¹⁰¹⁰ Cf. Hair et al. (2013), p. 233.

¹⁰¹¹ Although the reliability of the budget construct was identified to be insufficient, it was included to test again for the reliability within the nomological net.

transfer success but need to be considered as causes that form the HOC “KNT success” – i.e. the structural model of the HOC has to be modeled as formative.

First however, the HOC and LOCs’ measurement model has to be assessed. Since the LOCs themselves are reflective constructs, they need to pass all the quality criteria of reflective constructs in a PLS-SEM model. The HOC is measured based on the repeated indicators approach and thus has the same measurement type as the LOCs.¹⁰¹² Consequently, the HOC has to pass the reflective criteria, too.

Stage 1:

The PLS analysis of the measurement model shows insufficient outer loadings (<0.4) for the customer-based measured item of “Project Success-Budget” for this LOC and for the HOC. For the HOC, all other items of the project success constructs have insufficient outer loadings as well. Following HAIR ET AL. (2013), all items with a value less than 0.4 were deleted from the model, to ensure convergent validity of the single constructs.¹⁰¹³ The respective values (items) are highlighted red in the overview of the outer loadings reported in appendix H).

The PLS analysis of the reduced model revealed that the AVE of the supposed HOC “KNT Success” is lower than 0.5, which still indicates a construct without convergent validity.

To improve the AVE, the indicators with the lowest outer loadings on knowledge transfer success (only those with loadings between 0.4 and 0.69) were considered for removal.¹⁰¹⁴ After deleting the second indicator of knowledge integration, the AVE of knowledge transfer success reached convergent validity (AVE = 0.5116). In addition, the report (cf. Table 73) indicates that all other constructs have sufficient AVEs and composite reliability, too. Thus for all constructs of the HOC, internal consistency and convergent reliability are established.

¹⁰¹² Cf. Hair et al. (2013).

¹⁰¹³ Cf. Hair et al. (2013), p.103.

¹⁰¹⁴ Cf. Hair et al. (2013), p.103.

	AVE >0.5	Composite Reliability: 0.7-0.95				
KN Integration	0.5662	0.7944				
KN Ownership	0.6518	0.882				
KNT Success	0.5116	0.8602				
Project Success Quality	0.8243	0.9036				
Project Success Time	0.8438	0.9153				
Project Success-Budget	1	1				
Fornell-Larcker						
	KN Integration	KN Ownership	KNT Success	Project Success Quality	Project Success Time	Project Success-Budget
KN Integration	0.752462624					
KN Ownership	0.4693	0.8073				
KNT Success	0.6797	0.9624	0.7153			
Project Success Quality	-0.0014	-0.0013	0.0141	0.907909687		
Project Success Time	0.0239	0.2008	0.1767	0.0705	0.91858587	
Project Success-Budget	0.1374	-0.0316	0.0216	0.1426	0.1281	1 item scale

Table 73: Second generation criteria report of the „KNT Success“ HOC

The last criterion of the second generation is discriminant validity, indicating that a construct is truly distinct from another construct.¹⁰¹⁵ The PLS report above shows that discriminant validity can be established for “KN Integration” and the three constructs of project success but not for “KN Ownership” nor for the HOC of “KNT Success.” The square root of these constructs’ AVEs is lower than the correlations with the respective other construct (cf. red highlighted values in Table 73) and thus the Fornell-Larcker criterion is not fulfilled.

This means that knowledge transfer success shares more variance with knowledge ownership than with its own construct, and that knowledge ownership shares more variance¹⁰¹⁶ with knowledge transfer success than with its own construct as well. In any interpretation of the HOC as a dependent variable, this implies that knowledge ownership is explained more than knowledge transfer success. Interpretation is thus very difficult and can easily lead to confusion because of the “wrong” name of the HOC “KNT success.”

¹⁰¹⁵ Cf. Hair et al. (2013), p. 104.

¹⁰¹⁶ Cf. Hair et al. (2013), p. 105.

Knowledge transfer success is the dependent variable in the model. Thus this construct should be very reliable and valid for clearly interpreting all findings. Since the HOC of knowledge transfer success failed to pass the required quality criteria of discriminant validity, the HOC cannot be interpreted clearly. In addition, all indicators of project success had to be deleted from the HOC measurement because of convergent validity issues. This indicates that the items of the initial HOC do not share much variance, and that therefore knowledge transfer success is not a higher order construct of the five components. Rather, the components are independent success factors describing different types of success. Thus they need to be considered in separate models. Consequently, the HOC approach is rejected as a proper solution to model knowledge transfer success in the SEM. Instead separate models will be set up, that have knowledge ownership, knowledge integration, time of the transfer, and quality of the transfer as the respective dependent variable.¹⁰¹⁷

5.4.5 Distribution of the final SEM constructs

The previous chapters identified and/or constructed the items and measures that will be used as indicators in the measurement model of the SEM in the next step. In order to enhance the understanding of these indicators, their distribution is analyzed by using the Kolmogorov-Smirnov test, the Shapiro Wilk test, skewness, and kurtosis.

According to MOOI & SARSTEDT (2011), the former two tests assess normality by comparing the data to a normal distribution with the same mean and standard deviation as the sample. Skewness assesses the extent to which a distribution is symmetrical, and kurtosis analyzes whether the distribution is too peaked.¹⁰¹⁸ The former tests assess the 0-hypothesis of normally distributed data whereas the latter provide information on the degree of normality.¹⁰¹⁹ Total normality is assumed if both values (kurtosis and skewness) are 0.¹⁰²⁰ The more the values differ from zero, the less normal is the

¹⁰¹⁷ The budget of the transfer cannot be used because it was identified as a non-reliable construct.

¹⁰¹⁸ Cf. Hair et al. (2013), p. 54.

¹⁰¹⁹ Cf. Hair et al. (2013), p. 54.

¹⁰²⁰ Cf. Hair et al. (2013), p. 54.

distribution of the data. Distributions that exceed values higher than 1 or lower than -1 are non-normal.¹⁰²¹

As reported by Table 74, the analysis of the four normal distribution tests revealed that most of the constructs are not distributed normally. In fact, only the governance factors and the factor of knowledge complexity passed all tests and are thus considered normally distributed.

Tests of Normality									
Variables	Kolmogorov-			Shapiro-Wilk			Skewness	Kurtosis	Conclusion
	Statistic	df	Sig.	Statistic	df	Sig.			
F_GM_rel	.071	98	.200*	.989	98	.568	-.263	-.283	ND
F_GM_form	.061	98	.200*	.981	98	.164	.153	-.465	ND
FAC_Specificity	.123	101	.001	.934	101	.000	.924	.476	
FAC_Complexity	.059	101	.200*	.994	101	.949	-.082	-.110	ND
FAC_Non_Codif	.082	101	.087	.979	101	.103	.334	-.578	
K_motivation_1_umcod	.235	101	.000	.817	101	.000	-.925	-.084	
K_Motivation_2	.251	101	.000	.853	101	.000	-.780	.542	
K_Motivation_3	.248	99	.000	.844	99	.000	-.901	.386	
K_Ability_1	.311	100	.000	.847	100	.000	-.755	.466	
K_Ability_2	.314	100	.000	.833	100	.000	-.884	.928	
K_Ability_3	.309	100	.000	.848	100	.000	-.620	.260	
K_Opportunity_1	.214	100	.000	.898	100	.000	.223	-.219	
K_Opportunity_2	.298	100	.000	.821	100	.000	-.989	1.749	
K_Opportunity_4	.211	100	.000	.898	100	.000	-.324	-.199	
K_KNT_succs_learning_1	.218	101	.000	.896	101	.000	-.313	-.335	
K_KNT_succs_learning_2	.239	101	.000	.899	101	.000	-.173	-.250	
K_KNT_succs_learning_3	.171	100	.000	.904	100	.000	.119	-.875	
K_KNT_succs_Ownership_1	.227	101	.000	.890	101	.000	-.202	-.533	
K_KNT_succs_Ownership_2	.281	101	.000	.852	101	.000	-.873	.792	
K_KNT_succs_Ownership_4	.261	101	.000	.877	101	.000	-.458	-.301	
K_KNT_succs_Ownership_5	.270	101	.000	.878	101	.000	-.587	-.150	

Table 74: Test for normal distribution for all indicators used in the PLS SEM¹⁰²²

These results underline the choice for PLS-SEM as the analytic method, because not only are the single items non-normally distributed but also the constructs that will serve as indicators in the SEM.

¹⁰²¹ Cf. Hair et al. (2013), p. 54.

¹⁰²² The tests have been performed using SPSS 21.

5.4.6 Controls

In addition to the variables that are part of the theoretical system of hypotheses, some controls are measured. These control variables will be used to check for obvious explanations of knowledge transfer success and heterogeneity.

5.4.6.1. Contract type

The contract type defines the governance form of the buyer-supplier relationship. It can be a reason for the success or failure of knowledge transfer success because the organizational context was found to matter in strategic alliance research.^{1023, 1024} The contract type was identified by analyzing the original contracts and thus represents a measure from a different source than the questionnaire.

The contracts were analyzed with regard to their delivery and payment obligations – either services or crafts. Contracts that provide services are classified as “contract for service,” whereas contracts that provide crafts are classified as “contracts for work.” In cases the contract type was not clear, the sales department was consulted, and the classification was decided by the responsible sales manager.

The classification resulted in the nominal variable “contract type” (U_Govchoice). The descriptive statistics below show that the consultancy company predominantly works with contracts for service (85%).

U_Govchoice				
	Frequency	Percent	Valid Percent	Cumulative Percent
contract for work	15	14.9	14.9	14.9
Valid contract for service	86	85.1	85.1	100.0
Total	101	100.0	100.0	

Table 75: Descriptive statistics for governance choice

¹⁰²³ Cf. Inkpen, Tsang (2005); Van Wijk et al. (2008)

¹⁰²⁴ For example Li/Li (2005) found that “the effect of trust and shared vision may be contingent upon different contexts. It appears to be that in managing knowledge transfer, trust is a more influential factor in inter-organizational relationships, while shared vision, in contrast, is more influential in intra-organizational relationships.” (Li/Li (2005), p.93).

5.4.6.2. Organizational knowledge type

The type of organizational knowledge puts additional emphasis onto the impact of knowledge on knowledge transfer success. As defined in Chapter 2, process and outcome knowledge are distinct types of organizational knowledge. The outcome knowledge is the know-what whereas the process knowledge is the know-how.¹⁰²⁵

Whether the subject of the transfer was rather the outcome or process knowledge was measured on a 5 point rating scale. Value 1 was defined as the task to deliver a solution to the customer (outcome knowledge), whereas value five was defined as teaching the customer something he needs to do (process knowledge).

The construct was measured on the consultant side like all other knowledge characteristics.

item name (SPSS variable)	Organizational knowledge type	Scale
U_Process_KN_AP1	Welchen Fokus hat unsere Aufgabe?	1.: Wir müssen eine Lösung liefern (mit der, der Kunde arbeiten kann). - 5 Wir müssen dem Kunden beibringen, WIE etwas zu tun ist

The descriptive statistics below show that with a mean of 2.96, the projects are characterized by process and outcome knowledge on a comparable level.

U_Process_KN_AP1					Statistics		
	Frequency	Percent	Valid Percent	Cumulative Percent	U_Process_KN_AP1		
outcome knowledge	14	13,9	13,9	13,9	N	Valid	101
2	27	26,7	26,7	40,6		Missing	0
3	20	19,8	19,8	60,4	Mean		2,96
4	29	28,7	28,7	89,1	Median		3,00
process knowledge	11	10,9	10,9	100,0	Std. Deviation		1,248
Total	101	100,0	100,0		Range		4
					Minimum		1
					Maximum		5

Table 76: Descriptive statistics for organizational knowledge type

¹⁰²⁵ Cf. Turner, Makhija (2006).

5.4.6.3. Company age

The age of the customer company is tested because it is a frequent control variable in knowledge transfer research models.¹⁰²⁶ Older companies are more likely to have experience in knowledge transfer with consultants and thus might have developed logics and strategies to receive knowledge from an external partner.¹⁰²⁷ On the contrary, aging organizations might become inert and possess a limited ability to learn and adapt to changing circumstances.¹⁰²⁸ In other words, cognitive and relational patterns of younger firms are supposed to be modified more easily.¹⁰²⁹ Accordingly, age is controlled for.

The age of the customer company was measured by asking the project manager of the customer team for the year of its foundation. Thus the scale is a metric measure of the year.

Item name (SPSS variable)	Customer company age	Scale
U_Process_K N_AP1	Wann wurde ihr Unternehmen gegründet (Jahr)?	Year

The descriptive statistics below show that the oldest company was founded in 1418 and the youngest in the year before this analysis was conducted. However, the average age of the customer companies is 73 years.

Statistics

K Gründungsjahr

N	Valid	99
	Missing	2
Mean		1940.37
Median		1963.00
Mode		1863
Range		594
Minimum		1418
Maximum		2012

Table 77: Descriptive statistics for company age

¹⁰²⁶ Cf. Van Wijk et al. (2008), Young et al. (2003).

¹⁰²⁷ Cf. Aldrich and Auster (1986); Prahalad and Bettis (1986).

¹⁰²⁸ Cf. Cyert and March (1963); Van Wijk et al. (2008).

¹⁰²⁹ Cf. Frost et al. (2002); Van Wijk et al. (2008).

6 EMPIRICAL RESULTS

The construction of the measures showed that there is no valid higher order construct of knowledge transfer success. Therefore separate models for the single success dimensions of knowledge integration (KNI), knowledge ownership (KNO), time, and quality have to be set up. The dimension of budget was not reliable wherefore this dimension cannot be tested empirically. The system of hypotheses has to be tested for each of the dimensions of knowledge transfer success as displayed in Figure 44. Consequently, four PLS-based SEMs have to be set up and evaluated.

The empirical tests are conducted by using PLS 2.0. All original values of the items were standardized before the initial set up of the PLS models.¹⁰³⁰

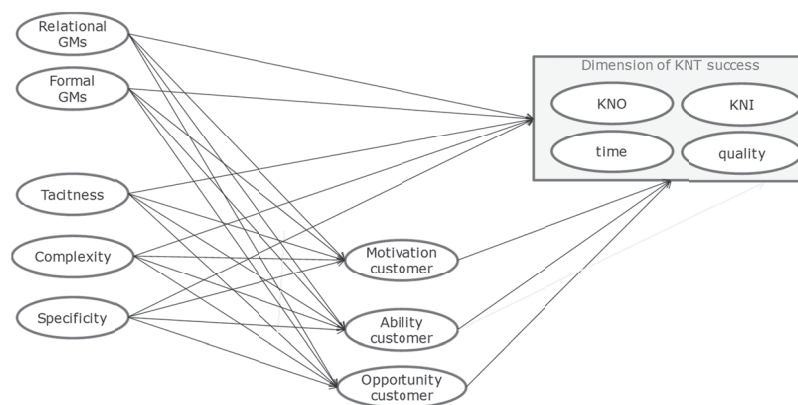


Figure 44: Structural AMO model for different dimensions of KNT success

6.1 Evaluating the models for knowledge transfer success

For each PLS model, the measurement model as well as the structural model have to pass the quality tests in order to be interpreted.¹⁰³¹ In advance, the explanatory power of the models is analyzed to identify whether all dependent variables can be explained sufficiently by the model.

According to CHIN (1988b), the dependent variable needs to be explained to more than 19%¹⁰³² by the independent variables of a model to draw conclusions from a model. The

¹⁰³⁰ Based on recommendations of Hair et al. (2013).

¹⁰³¹ See Chapter 4.3.

¹⁰³² Cf. Chin (1998b), p. 232.

6. Empirical results

coefficient of determination (adjusted R^2) as a criterion that explains the variance of a variable thus has to be higher than 0.19 to have at least a weak explanatory power, higher than 0.33 to have a moderate explanatory power, and higher than 0.66 to have a substantial explanatory power of the model for the respective dependent variable.¹⁰³³

The explanatory power of the model is moderate for the dependent variable of knowledge ownership (KNO) and knowledge integration (KNI) but not sufficient for the time and quality of knowledge transfer (cf. Table 78). The model does not explain enough variance of the success regarding the time or quality of a knowledge transfer. Thus these two dependent variables must not be interpreted any further, and the hypotheses must not be tested on the later models.

Dependent variable	Adjusted R^2	Q^2
Knowledge Integration (KNI)	0.35	0.22
Knowledge Ownership (KNO)	0.47	0.33
Time of knowledge transfer	0.004	--
Quality of knowledge transfer	0.03	--

Table 78: Explanatory power and predictive relevance of the AMO model

In addition to the adjusted R^2 criterion, the model was also tested for its predictive relevance for the two testable dependent variables. The prediction relevance represented by the Stone Geisser criterion (Q^2) measures the accurate prediction of data points of the indicators of the construct.¹⁰³⁴ Q^2 thus identifies how well the path model can predict the originally observed values.¹⁰³⁵ As indicated by values higher than 0¹⁰³⁶, the model has predictive relevance for explaining KNI as well as KNO (cf. Table 78).¹⁰³⁷

Consequently, the system of hypotheses can be tested for the success dimension of KNO and KNI (cf. Figure 45). The model for both SEMs has to be evaluated based on the quality criteria of the measurement model and structural model respectively.

¹⁰³³ Cf. Chin (1998b), p. 232.

¹⁰³⁴ Cf. Hair et al. (2013), p.186.

¹⁰³⁵ Cf. Hair et al. (2013), p. 186.

¹⁰³⁶ Cf. Hair et al. (2013), p. 186.

¹⁰³⁷ Q^2 was calculated using the PLS blindfolding procedure: For the dependent variables, the cross-validated redundancy measures were obtained using an omission distance of 7 so as not to create an integer of the sample size of 101. Cf. recommendations of Hair et al. (2013).

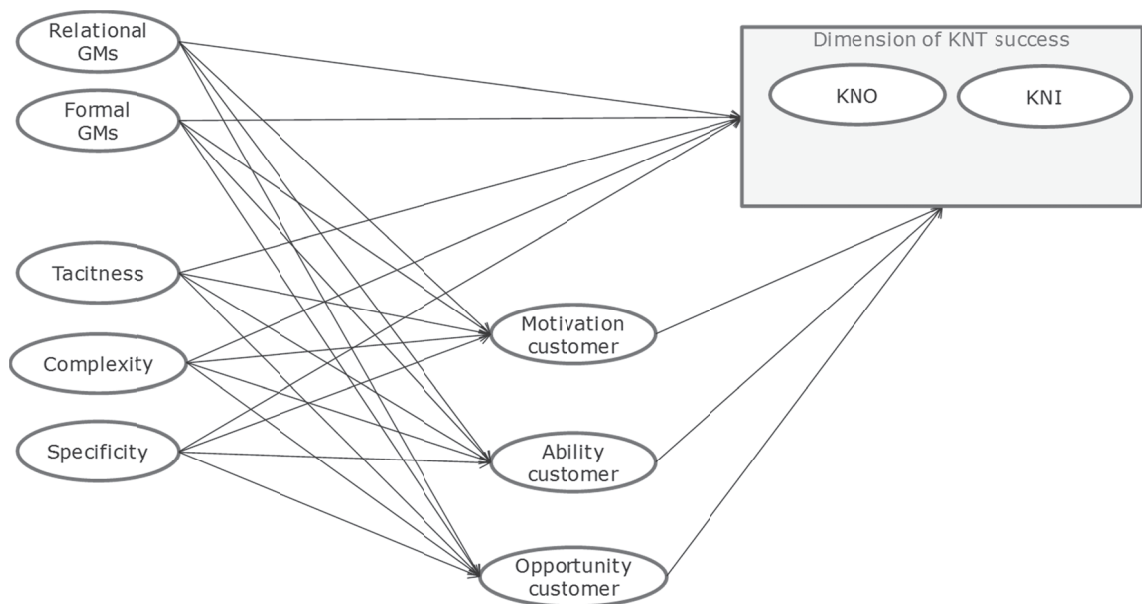


Figure 45: Final SEM models for empirical test

The system of hypotheses focuses on the final step of KNI and considers the prior phases as a precondition. The hypotheses apply, strictly spoken, only to the KNI model but do not have to be applicable to KNO right away. However, the comparison of the results might provide additional insights regarding the impact of governance in the knowledge transfer process. Therefore all proposed effects will be tested for both models, but it should be noted explicitly that the single success dimension of KNO was not hypothesized.

6.1.1 Evaluation of measurement models

The measurement model quality is assessed based on the criteria defined in Chapter 5.3.3. Table 79 and Table 80 provide an overview of all variables of the models and their values for the single criteria.

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Construct quality		Micro Model Ownership				
Construct quality	Indicator reliability (Outer loadings of indicators)	AVE	Composite Reliability	Fomell-Larcker criterion	Cross loadings	
Cut off value	≥0,4; >0,7	≥0,5	≥0,5	√AVE > correlation with other constructs	highest on own construct	
KN Ownership		0.652	0.882	yes	yes	
K_KNT_succs_Ownership_1	0.827					
K_KNT_succs_Ownership_2	0.760					
K_KNT_succs_Ownership_4	0.824					
K_KNT_succs_Ownership_5	0.817					
Complexity	single item:factor value		single item:factor value	yes	yes	
Specificity	single item:factor value		single item:factor value	yes	yes	
Tacitness	single item:factor value		single item:factor value	yes	yes	
Relational governance	single item:factor value		single item:factor value	yes	yes	
Formal governance	single item:factor value		single item:factor value	yes	yes	
Motivation to receive		0.765	0.907	yes	yes	
K_motivation_1_umcod	0.798					
K_Motivation_2	0.888					
K_Motivation_3	0.932					
Ability to receive		0.838	0.940	yes	yes	
K_Ability_1	0.939					
K_Ability_2	0.880					
K_Ability_3	0.927					
Opportunity to receive		0.662	0.854	yes	yes	
K_Opportunity_1	0.747					
K_Opportunity_2	0.857					
K_Opportunity_4	0.832					

Table 79: Measurement model quality for the micro model of knowledge ownership

Construct quality	Micro Model KN Integration					
	Indicator reliability (Outer loadings of indicators)	AVE	Composite Reliability	Fornell-Larcker criterion	Cross loadings	
Cut off value	≥0,4; >0,7	≥0,5	≥0,5	√AVE > correlation with other constructs	highest on own construct	
KN Integration		0.564	0.794	yes	yes	
K_KNT_succs_learning_1	0.848					
K_KNT_succs_learning_2	0.688					
K_KNT_succs_learning_3	0.708					
Complexity	single item:factor value		single item:factor value	yes	yes	
Specificity	single item:factor value		single item:factor value	yes	yes	
Tacitness	single item:factor value		single item:factor value	yes	yes	
Relational governance	single item:factor value		single item:factor value	yes	yes	
Formal governance	single item:factor value		single item:factor value	yes	yes	
Motivation to receive		0.765	0.907	yes	yes	
K_motivation_1_umcod	0.797					
K_Motivation_2	0.888					
K_Motivation_3	0.933					
Ability to receive		0.838	0.940	yes	yes	
K_Ability_1	0.937					
K_Ability_2	0.885					
K_Ability_3	0.924					
Opportunity to receive		0.664	0.856	yes	yes	
K_Opportunity_1	0.747					
K_Opportunity_2	0.857					
K_Opportunity_4	0.831					

Table 80: Measurement model quality for the micro model of knowledge integration

Regarding single item measurements, the criteria are not applicable.¹⁰³⁸ Therefore, the factor values used to measure the three characteristics of knowledge and the governance types are not the subject of the analysis. KNO, KNI, and the constructs of motivation, ability, and opportunity need to be evaluated in detail.

All constructs have outer loadings above the threshold value of 0.7. Thus indicator reliability is established.¹⁰³⁹ In order to establish convergent validity, the AVE was assessed. All constructs passed the threshold of 0.5 and consequently are considered valid.¹⁰⁴⁰

¹⁰³⁸ Cf. Weiber/Mühlhaus (2010), p.92.

¹⁰³⁹ Cf. Hair et al. (2013), p. 186.

¹⁰⁴⁰ Cf. Hair et al. (2013), p. 186.

The constructs' internal consistency was evaluated by assessing the composite reliability as provided by the SmartPLS overview report.¹⁰⁴¹ The threshold of 0.5 was reached by all constructs in the models.

Finally, the Fornell-Larcker criterion and the cross-loadings allow checking for discriminant validity. To fulfill the Fornell-Larcker criterion, the square root of the AVE of each construct should be higher than the construct's highest correlation with any other construct in the model.¹⁰⁴² For all constructs, discriminant validity is established. The detailed results of these tests are reported in appendix J).

In summary, the measurement models of the two SEMs passed all quality tests. Thus the calculation and interpretation of the structural models can follow.

6.1.2 Evaluation of structural models

The assessment of the structural models builds on the results from the standard model estimation (PLS algorithm), the bootstrapping routine, and the blindfolding procedure.

The PLS algorithm stopped after 5 iterations for the KNO model and after 6 iterations for the KNI model. This number is smaller than the maximum number of iteration (300) as prescribed in the algorithm setting. Thus the stop criterion was fulfilled, and the model is valid for further predictive evaluation.¹⁰⁴³

To test the models for collinearity issues, all latent variables of the model are regressed on the respective dependent variable using SPSS Statistics 21. The latent variables' scores were extracted from the PLS software and imported into SPSS after the PLS algorithm completed its run.¹⁰⁴⁴ The collinearity analysis of the linear regression in SPSS identified that the highest VIF value was caused by "ability" and "motivation" (1.4) in the KNO model and by "ability"(1.4) in the KNI model. These values are not

¹⁰⁴¹ Cf. Hair et al. (2013), p. 186.

¹⁰⁴² Cf. Hair et al. (2013), p. 186.

¹⁰⁴³ Cf. Hair et al. (2013).

¹⁰⁴⁴ Cf. Hair et al. (2013), p. 188.

critical because only VIF values above 5 are considered to represent collinearity problems.¹⁰⁴⁵ Thus the models can be considered free of collinearity problems. In addition to the regression on the final dependent variables KNO and KNI, the single regression models for ability, motivation, and opportunity were subject to collinearity analysis, too.¹⁰⁴⁶ No collinearity issues were identified. The detailed results of the separate collinearity analyses are reported in appendix K).

For both independent variables, the adjusted coefficient of determination (adj. R^2) indicated a medium explanatory power of the model (cf. Table 78). The adjusted R^2 values for the remaining endogenous variables in the model (ability, motivation, opportunity) are meaningless. All values are below 0.19, indicating that the model must not be used to explain the AMO levels but only the subject of interest: the KNI and KNO (cf. Table 81).

The Q^2 values¹⁰⁴⁷ of the three AMO constructs are larger than zero. This indicates that in both models, all three AMO constructs have predictive relevance for the dependent variable of KNI and KNO respectively.

	KNO model			KNI model		
	R^2	Adj. R^2	Q^2	R^2	Adj. R^2	Q^2
Ability to integrate	0.0637	0.014	0.0582	0.0637	0.014	0.0592
Motivation to integrate	0.1498	0.105	0.1239	0.1504	0.098	0.1005
Opportunity to integrate	0.1111	0.064	0.0342	0.1127	0.066	0.0743

Table 81: Overview of adjusted coefficient of determination for the AMO constructs

In order to assess whether the relationships in the models are significant, the bootstrapping procedure was used. The PLS algorithm was set to use mean replacement for missing values, the no sign changing option to generate conservative significance results, 100 cases, and 5000 samples in the bootstrapping settings.

¹⁰⁴⁵ Cf. Hair et al. (2013), p. 186.

¹⁰⁴⁶ Cf. Hair et al. (2013), p. 188.

¹⁰⁴⁷ Q^2 was calculated using the PLS blindfolding procedure: For each of the AMO variables, the cross-validated redundancy measures were obtained using an omission distance of 7 not to create an integer of the sample size of 101. Cf. recommendations of Hair et al. (2013).

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The significance of the single relationships in the model is reported based on t-values. T-values above 1.65, above 1.96 and above 2.57 identify a significance of 10%, 5%, and 1%, respectively.¹⁰⁴⁸

In addition to the t-values and the significance level, the effect strength (f^2) and the effect relevance (q^2) are also reported to complete the overview of the structural model evaluation criteria. These values provide additional information to interpret the explanatory power and the robustness of the identified effects. There are different quality dimension of these values: f^2 and q^2 values above 0.02, 0.15, and 0.35 are considered low, medium, and relevant, respectively.¹⁰⁴⁹ Values below 0.02 suggest effects that are too weak to be considered relevant from a practical point of view, even when the corresponding path coefficient values are statistically significant; such a situation may occur with large sample sizes.¹⁰⁵⁰

Table 82 provides an overview of all standardized path coefficients, their t-values, significance levels, their explanatory power, and their prediction relevance.

The color in the single cells indicates the quality of the value:

yellow: small significance (10%)/small explanatory power (0.02),

light green: medium significance (5%)/medium explanatory power (0.15),

dark green: high significance (1%)/high explanatory power (0.35).

¹⁰⁴⁸ Cf. Hair et al.. (2013), p. 134.

¹⁰⁴⁹ Cf. Cohen (1988), Hair et al. (2013).

¹⁰⁵⁰ Ned Kock (2012) in introduction to WARP PLS software online:

http://warppls.blogspot.de/2012_01_01_archive.html.

Overview of micro model single path effects		KNT Success dimensions							
		Ownership (Adj .R ² : 0,47)				Integration (Adj .R ² : 0,33)			
		p	t	f ²	q ²	p	t	f ²	q ²
Micro Models									
Cut off value / quality dimensions		>0.2 better 0.3	>1,65 (10%) >1,96 (5%) >2,57 (1%)	>0,02 >0,15 >0,35	>0,02 >0,15 >0,35	>0.2 better 0.3	>1,65 (10%) >1,96 (5%) >2,57 (1%)	>0,02 >0,15 >0,35	>0,02 >0,15 >0,35
MAO Effects	Motivation to receive -> KNT "Success"	0.3885	4.4978	0.22	0.10	0.3311	3.1573	0.13	0.05
	Opportunity to receive -> KNT "Success"	0.3707	3.7463	0.17	0.07	0.2902	2.5774	0.09	0.03
	Ability to receive -> KNT "Success"	0.022	0.2518	0	-0.01	-0.21	2.3662	0.06	0.03
Governance Effects	Relational GMS -> KNT "Success"	0.0732	0.7899	0.01	0.04	0.0655	0.6673	0	0.06
	Formal GMS -> KNT "Success"	0.0224	0.2957	0	0.03	-0.1095	1.3114	0.02	0.06
	Relational GMS -> Ability to receive	0.175	1.869	0.03	0.01	0.1748	1.7864	0.03	0.01
	Relational GMS -> Motivation to receive	0.2229	2.2599	0.05	0.06	0.2229	2.2686	0.05	0.02
	Relational GMS -> Opportunity to receive	0.226	2.1186	0.05	-0.01	0.2259	2.0694	0.05	0.03
	Formal GMS -> Ability to receive	-0.0268	0.289	0	0	-0.026	0.2735	0	0
	Formal GMS -> Motivation to receive	0.0196	0.1766	0	0.01	0.0203	0.1837	0	-0.02
	Formal GMS -> Opportunity to receive	-0.0528	0.4713	0	0.02	-0.0556	0.513	0	0
Knowledge Effects	Tacitness -> KNT "Success"	0.1278	1.6401	0.02	0.05	-0.0877	0.895	0.01	0.06
	Specificity ->KNT "Success"	-0.0755	1.1715	0.01	0.04	-0.1781	2.0034	0.05	0.07
	Complexity -> KNT "Success"	0.1982	2.7575	0.07	0.07	0.2245	2.4845	0.07	0.09
	Tacitness -> Ability to receive	-0.0939	0.9479	0.01	0	-0.0947	0.9515	0.01	0
	Tacitness -> Motivation to receive	-0.2687	2.5969	0.08	0.08	-0.2694	2.6353	0.08	0.04
	Tacitness -> Opportunity to receive	-0.1797	1.7697	0.03	-0.02	-0.1878	1.8877	0.04	0.02
	Complexity -> Ability to receive	0.0589	0.5815	0	0	0.059	0.5815	0	0
	Complexity -> Motivation to receive	0.0235	0.222	0	0.03	0.0247	0.2298	0	-0.01
	Complexity -> Opportunity to receive	0.051	0.4606	0	-0.04	0.0381	0.3344	0	0.01
	Specificity -> Ability to receive	-0.0961	0.8948	0.01	0	-0.0957	0.8964	0.01	0
	Specificity -> Motivation to receive	0.0357	0.3362	0	0.01	0.0356	0.3361	0	0.04
	Specificity -> Opportunity to receive	0.0012	0.0132	0	0.02	0.0098	0.1099	0	0.02

Table 82: Overview of micro model: significant path coefficients and effect sizes

The results of the model assessment indicate that in the **knowledge ownership model** (left column), eight relationships are significant: Four relationships are significant on a 1% level, two on a 5% level, and another two on a 10% level.

All the relationships reported above are direct ones. Thus the following connections in the model are established:

Motivation, opportunity, and complexity affect KNO positively and directly. Relational governance mechanisms increase all three AMO variables. Tacitness decreases the motivation to receive knowledge and the opportunity to receive knowledge.

The strongest positive effect is created by motivation and the strongest negative effect by tacitness. Direct, negative effects on KNO could not be found.

6. Empirical results

Figure 46 visualizes the significant relationships in the structural model of KNO. All non-significant relationships are left out.

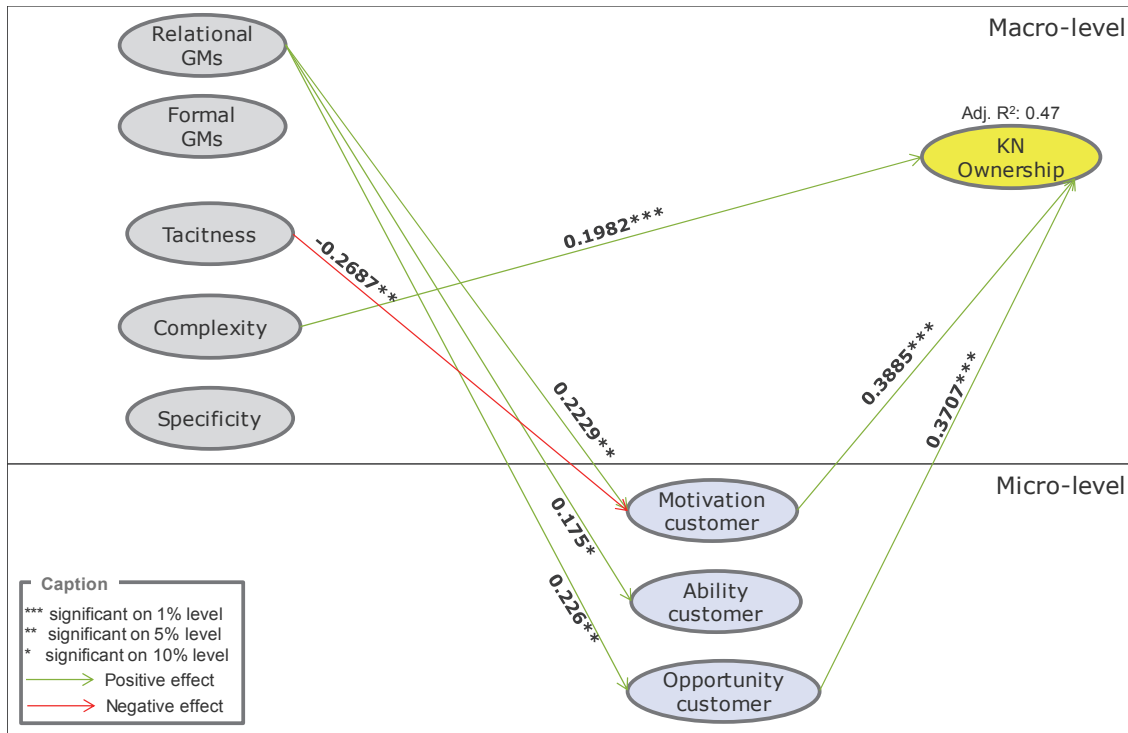


Figure 46: Significant direct relationships in the KNO model

In the **knowledge integration model** (right column of Table 82), ten relationships are significant: Three relationships are significant on a 1% level, five on a 5% level, and two on a 10% level.

The connections that are established empirically are:

Motivation, opportunity, complexity affect KNO positively and directly. Ability and specificity decrease knowledge integration. Relational governance mechanisms increase all three AMO variables. Tacitness decreases the motivation to receive knowledge and the opportunity to receive knowledge.

Motivation has the strongest, positive effect and tacitness the strongest, negative effect in the model. Unlike the KNO model, there is a direct, negative effect on the dependent variable in the KNI model: Specificity decreases KNI directly.

Figure 47 visualizes these significant relationships in the structural model. All non-significant relationships are left out.

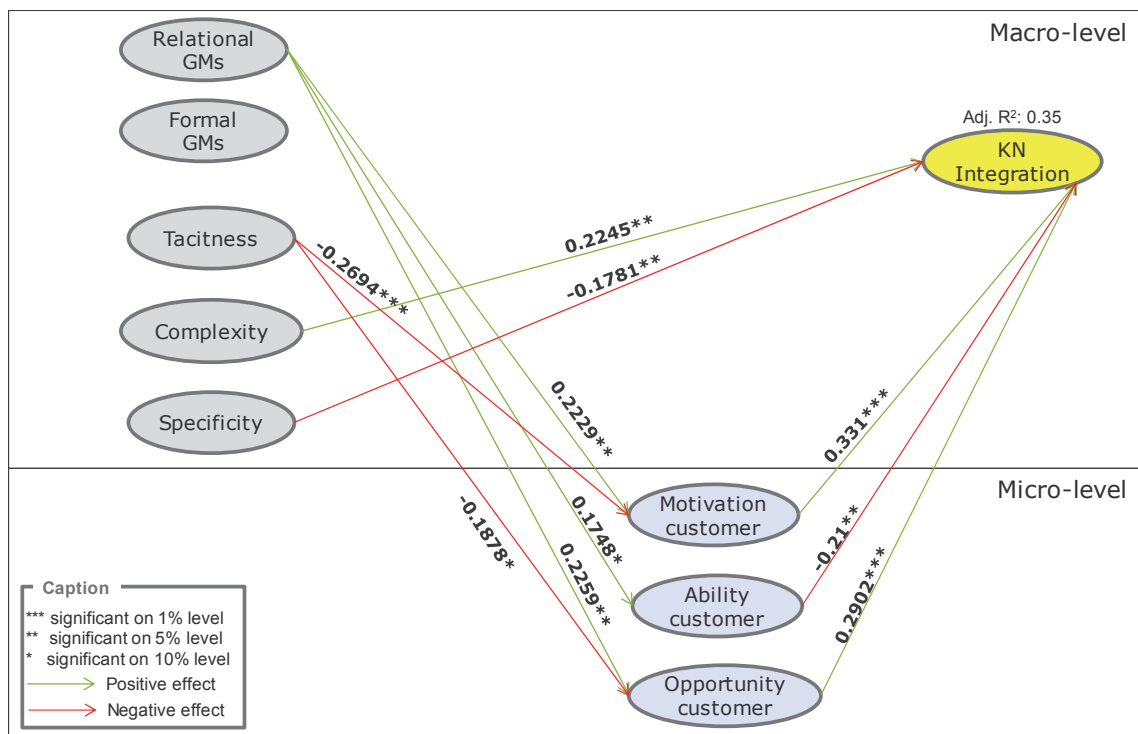


Figure 47: Significant direct relationships in the KNI model

In summary, the synopsis of the quality criteria for the measurement model and for the structural model shows that the models for KNO and KNI are acceptable. The variables all have high reliabilities and are valid. Although in the structural models, many relationships are not significant and the endogenous constructs of AMO have very low R^2 values, the dependent constructs show good R^2 , and thus the models are acceptable.¹⁰⁵¹

The main differences between the two models are the additional negative effects of specificity and ability on KNI. KNO is not affected by these variables. In addition, in the KNI model, opportunity is affected negatively by tacitness.

The differences in the models have implications for the support and rejection of the single hypotheses that need to be tested. In the following, the different types of hypotheses are tested for both models: First all hypotheses that define direct effects are assessed, second all hypotheses that define mediation effects, third those defining moderation effects, and finally those defining total effects.

¹⁰⁵¹ Cf. Weiber/Mühlhaus (2010), p. 264.

6.2 *Testing direct effects*

Direct effects of one construct on another are described by hypotheses H1a-c and H2-6: the direct effects of AMO, governance mechanisms, and knowledge characteristics on knowledge transfer success.

To test these hypotheses, the single path coefficients of the models are analyzed. The path coefficient has to be significant in its predicted effect to confirm the hypothesis.

Motivation and opportunity both have positive effects on KNI and KNO on a 1% significance level as predicted by hypotheses 1a and 1c (Table 82). In contrast to H1b, the effect of ability is not significant in the KNO model and negative on a 5% significance level in the KNI model. Therefore, H1b, which proposed a significant positive effect of ability on knowledge transfer success, needs to be rejected.

The comparison of the path coefficient shows that motivation increases knowledge transfer success more than opportunity and that the effect size is larger for motivation than for opportunity. Both constructs are more important for the explanation of KNO, because the effect as well as the predictive relevance of motivation and opportunity are higher in the KNO model.

The positive effects of relational and formal governance mechanisms as proposed by H2 and H3 are neither supported by the model of KNO nor by the model of KNI. Thus H2 and H3 are rejected. However, these constructs have low predictive relevance for both dependent variables, as indicated by positive q^2 values.

The effect of tacitness on knowledge transfer success is not significant. Neither KNI nor KNO are affected by the level of the tacitness of knowledge. Thus H4 is rejected.

The effect of complexity on knowledge transfer is significant in both models, in the KNO model on a 1% level and in the KNI model on a 5% level. The empirical effect is positive instead of negative as proposed by H5. Thus H5 has to be rejected. The effect of complexity is stronger in the KNI model than in the KNO model.

The negative effect of **specificity** on knowledge transfer success (H6) is only supported in the KNI model. The effect is significant on a 5% level, and based on the reported q^2 and f^2 values, the effect size and prediction relevance can be described as low.

In summary, the results indicate that the effects of knowledge characteristics are stronger in the KNI model whereas the effect of the motivation and opportunity are stronger in the KNO model. Ability takes a special role insofar as it impacts only KNI negatively.

For the explanation of direct success drivers of knowledge transfer success, the results indicate that motivation is the major success driver, followed by opportunity.

In contrast, a major challenge for knowledge transfer success can only be identified for the dimension of KNI. The ability of the customer and knowledge specificity hinder the integration of knowledge.

Table 83 summarizes the empirical results for the hypotheses that rely on direct effects.

Part of model	No	Hypothesis	Support by KNO Model	Support by KNI Model	
AMO	direct	H1a	The higher the motivation of the customer to receive the knowledge the higher the KNT success.	yes	yes
		H1b	The higher the ability of the customer to receive the knowledge the higher the KNT success.	No	No
		H1c	The higher the opportunity of the customer to receive the knowledge the higher the KNT success.	yes	yes
Effects of governance mechanisms	direct	H2	The more relational governance is used the higher is the KNT success.	No	No
		H3	The more formal governance is used the higher is the KNT success.	No	No
Effects of knowledge types	direct	H4	The more tacit the knowledge the lower is the success of KNT.	No	No
		H5	The more complex the knowledge the lower is the success of KNT.	No	No
		H6	The more specific the knowledge the lower is the KNT success.	No	Yes

Table 83: Summary of supported hypotheses for direct effects

Comparing the support of the hypotheses for the two dimensions of knowledge transfer success, the results for hypothesis 6 (specificity) have to be discussed and interpreted separately for the two dimensions of knowledge transfer success whereas the remaining hypotheses have the same results for both models (KNI and KNO).

6.3 Testing mediation effects

Hypotheses H2a-c to H6a-c describe the mediation roles of the three AMO constructs for the effects of governance and knowledge characteristics on knowledge transfer success, respectively.

“Mediators reveal the true relationship between a predictor [e.g. relational governance] and a performance construct [e.g. knowledge transfer success].”¹⁰⁵² That is, they absorb a part of the relationship between the two constructs via an indirect effect.¹⁰⁵³ The indirect effect is the relationship between the predictor construct (P) and the mediator construct (M) and between the mediator construct (M) and the performance construct (Pf).¹⁰⁵⁴ If this indirect effect (P->M->Pf) is significant, it fully or partly absorbs the direct relationship between P and Pf or can even change its direction (suppressor effect).¹⁰⁵⁵

*“In general, a given variable may be said to function as a mediator to the extent that it accounts for the relation between the predictor and the criterion. Mediators explain how external physical events take on internal psychological significance.”*¹⁰⁵⁶

In the PLS path model, mediation effects are indirect effects – i.e. they are a sequence of multiple direct effects (arrows). The intervening construct is the mediator that clarifies or explains the relationship between the two other constructs, i.e. the predictor and the performance variable.¹⁰⁵⁷

In order to test the mediation hypotheses, this thesis follows the procedure recommended by HAIR ET AL. (2013). They define three conditions¹⁰⁵⁸ to prove a significant mediation effect¹⁰⁵⁹:

¹⁰⁵² Hair et al. (2013), p. 238.

¹⁰⁵³ Cf. Hair et al. (2013), p. 238.

¹⁰⁵⁴ Cf. Hair et al. (2013), p. 238.

¹⁰⁵⁵ Cf. Hair et al. (2013), p. 238; Baron/Kenney (1986), p. 1176.

¹⁰⁵⁶ Baron/Kenney (1986), p. 1176.

¹⁰⁵⁷ Cf. Hair et al. (2013), p. 36.

¹⁰⁵⁸ This procedure is in line with former recommendations of Baron & Kenny (1986) and Shaver (2005).

- 1) The predictor has to have a significant direct effect on the performance variable (P->PF), when the mediator is excluded from the model (not necessary condition¹⁰⁶⁰)
- 2) There has to be a significant effect of
 - 2.1) the predictor on the mediator (P -> M) and
 - 2.2.) the mediator on performance variable (M-> Pf)
- 3) The interaction effect of the predictor and mediator on the performance variable (P*M->Pf) has to be significant.

6.3.1 Significance of direct effects

According to Zhao et al. (2010), the significance of the direct effect in a model that excludes the potential mediator construct is not a necessary condition. Therefore, this condition will not be used to reject a mediation effect in this thesis. Still, this kind of situation makes the mediator analysis clearer to interpret, because the direct effect in the reduced model can be compared to that in the full model.¹⁰⁶¹

To test the significance of the direct effects, the traditional macro level relationships between governance and knowledge on knowledge transfer success are modeled in a so called “macro model”. This macro model contains only simple direct effects without the potential mediators. It contains only the variables of governance (H2, 3) and knowledge types (H4-6) and tests their direct relationships with the success variables (cf. Figure 48).

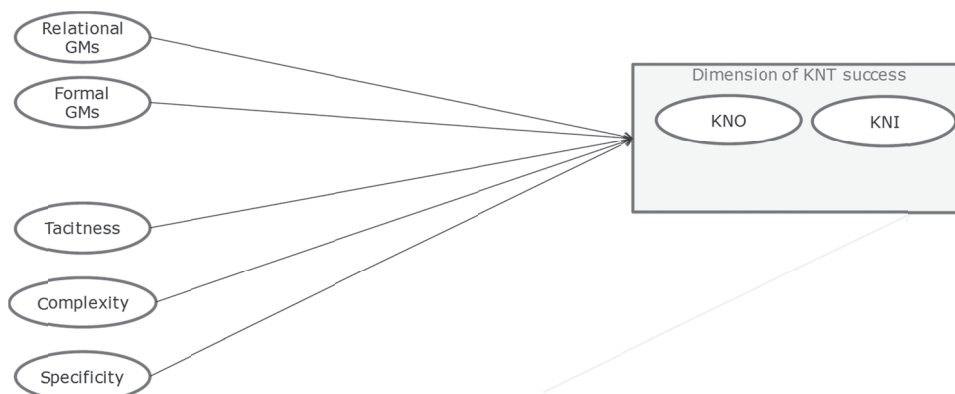


Figure 48: Structural “macro model” for different dimensions of KNT success

¹⁰⁵⁹ Cf. the method section 4 for further details on mediation analysis.

¹⁰⁶⁰ Cf. Zaho et al. (2010).

¹⁰⁶¹ Cf. Hair et al. (2013), p. 223.

6. Empirical results

The macro models for KNI and KNO passed all quality criteria of the measurement model evaluation as well as those of the structural model evaluation except for the adjusted coefficient of determination (adj. R^2). The adjusted R^2 is 0.11 for KNO and 0.16 for KNI.

On the one hand, this indicates that the missing AMO constructs explain a crucial part of the variance in KNO and KNI, and on the other hand, this implies that the macro model does not explain a sufficient part of the variance of the dependent constructs (adj. R^2 needs to be higher than 0.19). The detailed results of the model assessments are reported in appendix 0.

The subject of interest for the analysis of the first condition of the mediation analysis is the significance of path coefficients. As presented by the highlighted cells in Table 84, for knowledge ownership, only relational governance and complexity have significant effects, whereas for knowledge integration only the effects of tacitness and complexity are significant.

Macro Model	KNT Success dimensions			
	Ownership		Integration	
	p	t	p	t
Cut off value/quality dimensions	>0.2 better 0.3	>1.65 (10%) >1.96 (5%) >2.57 (1%)	>0.2 better 0.3	>1.65 (10%) >1.96 (5%) >2.57 (1%)
Formal GMs -> KNT success	0.015	0.1294	-0.121	1.1294
Relational GMs -> KNT success	0.2569	2.3373	0.1628	1.5406
Complexity -> KNT success	0.2264	2.1944	0.2335	2.4390
Specificity -> KNT success	-0.0674	0.7581	-0.1502	1.4699
Tacitness -> KNT success	-0.0436	0.3951	-0.2175	2.1137

Table 84: Overview of significant path coefficients in the macro models

Consequently, the effects of complexity in the macro model and the micro model can be compared for both models (H5a-c) whereas a comparison of effects of relational governance mechanisms (H2a-c) is only possible for the KNO model and for effects of tacitness (H4a-c) only for the KNI model.

6.3.2 Significant effect of predictor on mediator and significant effect of mediator on performance variable

The effects of the predictor constructs on the mediator construct (P->M) and of the moderator on the performance variable (M-> PF) are direct effects, thus they are analyzed based on the micro model results (cf. Table 82). In the following, each proposed mediation for knowledge and governance effects respectively is checked for the fulfillment of the two conditions. Condition 2.1 will refer to the P->M relationship, and condition 2.2 will refer to the M-> PF relationship.

6.3.2.1. Knowledge

All effects of **complexity and specificity** on the AMO constructs are insignificant in both models (Table 82). Consequently, condition 2.1 of the mediation analyses (P->M) is not fulfilled, and neither a mediation of the complexity effect nor a mediation of the specificity effect is possible.¹⁰⁶² These results support H5a-c and H6b, c that proposed a negligible mediation effect of AMO for the effect of complexity and specificity. In contrast, H6a, which proposed a mediation effect of motivation for the effect of specificity, has to be rejected.

Analyzing the SEM results for the effects of **tacitness**, Table 82 indicates that the effects of tacitness on motivation and on opportunity are significant but not the effect on ability (in both models). Consequently, condition 2.1 is not fulfilled for the mediation of the effect of tacitness on knowledge transfer success by ability. Thus H4b, which proposed a negligible effect, is supported for both knowledge transfer success dimensions.

Condition 2.2 asks for significant effects of the moderator on the performance variable. H4a suggests mediation by motivation and H4c mediation by opportunity. As both constructs showed significant effects on KNI and KNO, condition 2.2. is fulfilled and the evaluation of condition 3 can proceed.

¹⁰⁶² As defined in the method section (Chapter 5.4.5), the sample size of 101 observations is large enough to interpret non-significant effects as a support of the 0-hypothesis with only a 10% chance that this decision is wrong.

6.3.2.2. Governance

All effects of relational governance mechanisms on the AMO constructs are significant (Table 82). Therefore, the mediation condition 2.1 is fulfilled: The predictor relational governance mechanism has a significant effect on the moderator constructs of motivation, ability, and opportunity.

Condition 2.2 asks for significant effects of the moderator on the performance variable. As only motivation and opportunity showed significant effects on KNO but not ability, a mediation for the effect of relational governance mechanisms on KNO by ability cannot be established empirically in the KNO model. Thus H2b is rejected for the knowledge transfer success dimension of KNO. H2a and H2c fulfill the mediation condition 2, and thus the evaluation of condition 3 can proceed.

In the KNI model, all AMO constructs show significant effects on KNI. Thus condition 2 is fulfilled, and the evaluation of condition 3 for all three mediation variables can proceed for the KNI model.

In summary, the evaluation of the second condition showed that H4a, H4c as well as H2a and H2c passed the analyses in both models and can be further evaluated for the last condition which demands a significance of the interaction effect of the predictor and the moderator on the performance variable of knowledge transfer success. H2b was already rejected for the KNO model but can still be further analyzed for condition 3 regarding the KNI model.

6.3.3 Significant interaction effect of predictor and mediator on performance variable

In order to test the significance of the interaction term of the predictor and moderator variables, this thesis follows the recommendations of PREACHER/HAYES (2008) and bootstrapped the sampling distribution of the interaction term.¹⁰⁶³

¹⁰⁶³ Bootstrapping is important to fulfill the PLS assumption of non-correlation of the error terms. Correlation of errors would create significant mediation effects due to the correlation of errors but not to the variables. When t-values are calculated based on bootstrapping, the sampling distribution of an indirect effect is estimated by sampling N units with replacement from the original sample of N units.

To obtain the bootstrapping results for an interaction term (a product of two path coefficients), the results of the 5000 sub-samples of the bootstrapping routine were copied to an Excel spreadsheet. For each of the 5000 sub-samples, the product of the respective path coefficients generating the indirect effect was computed. Afterwards, the standard deviation for the interaction term was computed by using the Excel function STDEV.

The standard deviation equals the standard error in bootstrapping.¹⁰⁶⁴ Thus the empirical t-value of the indirect effect is calculated by dividing the original value (multiplication of path coefficient) by the bootstrapping standard error. If the interaction term is significant, the final condition of the mediation analysis is fulfilled.¹⁰⁶⁵

In order to identify how much of the direct effect is absorbed by the mediator, the VAF (variance accounted for) is calculated. It determines the size of the indirect effect in relation to the total effect ($VAF = \text{indirect effect (P*M)} / \text{total effect ((P*M)+(P->Pf))}$).

In other words, the VAF explains the “extent to which the variance of the dependent variable is directly explained by the independent variable and how much of the target construct’s variance is explained by the indirect relationship via the mediator variable.”¹⁰⁶⁶

VAF values between 20% and 80% indicate a partial mediation. Values below 20% need to be interpreted as almost no mediation whereas values above 80% represent full mediation.¹⁰⁶⁷ A situation where the sign of the direct relationship changes from the original model to the extended model is called a suppressor effect - the mediator results in a change of the sign.

Thus the correlation of original error terms can be rejected. For an introduction to different methods to test mediation effects see Preacher et al. (2007). For more detailed information about the sources and effects of correlated error terms see Shaver (2005).

¹⁰⁶⁴ Cf. Hair et al. (2013), p. 226.

¹⁰⁶⁵ The procedure described above follows the recommendations by Hair et al. (2013), pp. 226ff.

¹⁰⁶⁶ Hair et al. (2013), p. 225.

¹⁰⁶⁷ Cf. Hair et al (2013), p. 224.

6.3.3.1. Knowledge

First, the potential mediation of **knowledge** effects is analyzed for the fulfillment of the third condition.

The results of the analysis for the third condition (cf. Table 85) in the **KNI model** show that the interaction term of tacitness and motivation ($-0.089 = 0.331 * -0.269$) is significant on a 10% level whereas the interaction term of tacitness and opportunity ($-0.054 = -0.188 * 0.29$) is not significant. Consequently, condition 3 is only fulfilled for the mediation of the tacitness effect by motivation.

	Direct effect tacitness-> KNI	tacitness*Mot	tacitness*Opp
Macro model	-0.2175**	--	--
Micro model	-0.088	-0.089	-0.054
	Total Effect	-0.231	
	VAF	0.385	0.236
	STDEV (Sample)	0.050	0.042
	T-value for indirect effect	-1.781	-1.297

Table 85: Significance of mediation effects for tacitness in the KNI model

The analyses of the VAFs indicate that 38.5% of the relationship between tacitness and KNI is explained by the motivation mediator. Since the VAF is larger than 20% but smaller than 80% this situation can be characterized as partial mediation.¹⁰⁶⁸ A full mediation needs a VAF higher than 80%.¹⁰⁶⁹

In the macro model, the direct effect of tacitness on KNI was 0.2175 (5% significance level). Since the inclusion of the mediator “motivation” did not change the direction of the direct effect, the indirect effect represents a positive mediation effect and not a suppressor effect. Thus H4a is supported for the success dimension of KNI.

As condition 3 is not fulfilled for the interaction terms of tacitness and opportunity, the mediation effect cannot be established empirically. This result supports H4c for the KNI model because it proposed a negligible mediation effect for opportunity.

The assessment of the interaction terms of tacitness with motivation and with opportunity for the **KNO model** equals the results for the KNI model: Only the interaction term with motivation is significant (5% level) in the KNO model (cf. Table

¹⁰⁶⁸ Cf. Hair et al (2013), p. 224.

¹⁰⁶⁹ Cf. Hair et al (2013), p. 224.

88). Thus condition 3 is only fulfilled for the interaction with motivation and not for the interaction with opportunity.

	Direct effect Tacitness -> KNO	Tacitness* Mot	Tacitness * Opp
Macro model	-0.0436 (n.s.)	--	--
	0.128 (n.s.)	-0.104	-0.067
	Total Effect	-0.043	
	VAF	2.416	1.542
	STDEV (Sample)	0.047	0.043
Micro model	T-value for indirect effect	-2.220	-1.552

Table 86: Significance of mediation effects for tacitness in the KNO model

The VAF of the interaction term is 2.416. Since this value is higher than 0.8, this indicates a full mediation of the direct effect.¹⁰⁷⁰ In other words, the direct effect of tacitness on KNO is completely explained via the relationship with motivation. When comparing the single path coefficient of the direct effect in the micro model (0.128) to the negative effects of the interaction terms, an interpretation of the direct effect, though, would actually lead to false conclusions of the direction of the relationship between tacitness and KNO.

In summary, condition 3 is fulfilled for the interaction term of tacitness and motivation in both models, and thus the mediation effect as proposed by H4a is supported by both models. In contrast, condition 3 is not fulfilled for the interaction term of tacitness and opportunity in both models. This result supports H4c for both models because it proposed a negligible mediation effect for opportunity.

6.3.3.2. Governance

Second, the potential mediation of governance effects is analyzed for the fulfillment of the third condition:

Table 87 reports the results for the interaction terms of relational governance with the AMO constructs in the **KNI model**. They indicate that condition 3 is only fulfilled for the interaction of relational governance and motivation. Consequently, H2a is supported whereas H2b and H2c have to be rejected for the KNI model.

¹⁰⁷⁰ Cf. Hair et al (2013), p. 224.

6. Empirical results

	Direct effect rel GM-> KNI	rel GM*Mot	rel GM*ability	rel GM*Opp
Macro model	0.1628 (n.s.)	--	--	--
	0.0655 (n.s.)	0.074	-0.039	0.066
	Total Effect	0.165		
	VAF	0.446	-0.239	0.396
	STDEV (Sample)	0.044	0.030	0.041
Micro model	T-value for indirect effect	1.678	-1.336	1.587

Table 87: Significance of mediation effects for relational governance in the KNI model

The VAF of 0.446 indicates that the relationship with motivation explains 45% of the direct effect of relational governance on knowledge integration. This means that a partial mediation is in place. Since the direct effect in the macro model is not significant, the direct and indirect effects cannot be compared.¹⁰⁷¹

In the **KNO model**, only the assessment of the interaction terms of relational governance mechanisms with motivation and with opportunity have to be assessed because ability does not show a significant effect on KNO (condition 2.2.).

	Direct effect Rel GM-> KNO	Rel GM*Mot	RelGM*Opp
Macro model	0.2569**	--	--
	0.0732**	0.087	0.084
	Total Effect	0.244	
	VAF	0.356	0.344
	STDEV (Sample)	0.046	0.046
Micro model	T-value for indirect effect	1.895	1.817

Table 88: Significance of mediation effects for relational governance in the KNO model

Table 88 shows that both interaction terms are significant (10% level) in the KNO model. Consequently condition 3 is fulfilled, and both mediation effects are empirically established in the KNO model. This supports H2a and H2c for the KNO model.

The additional analyses of the VAF indicate that 35.6% of the relationship between relational governance mechanisms and KNO is explained by the motivation mediator, and 34.4% are explained by the opportunity mediator. Since the single and the joint VAF (70%) are larger than 20% but smaller than 80%, this situation can be characterized as partial mediation.¹⁰⁷²

¹⁰⁷¹ Cf. Hair et al. (2013), p. 223.

¹⁰⁷² Cf. Hair et al (2013), p. 224.

In the macro model, the direct effect of relational governance mechanism on KNO was 0.2569 (5% significance level). Since the inclusion of the mediators “motivation” and “opportunity” did not change the direction of the direct effect, the indirect effect represents a positive mediation effect and not a suppressor effect.

In summary, the mediation of the effect of relational governance on knowledge transfer success has to be considered differentially for the KNO and the KNI model: H2a is supported for both models. Thus motivation explains parts of the relationship between relational governance and knowledge ownership as well as knowledge integration.

H2b is rejected for both models. Thus ability does not explain the effect of relational governance on knowledge transfer success.

H2c is supported for the KNO model but not for the KNI model. Thus opportunity explains part of the effect of relational governance on knowledge ownership but not on knowledge integration.

Table 89 and Table 90 summarize the results of the step by step mediation analysis and thereby indicate why each of the mediation effects is empirically established or not.

6. Empirical results

Part of model	No	Hypothesis	Requirement 2.1) P->M	Requirement 2.2) M->Pf	Requirement 3) P*M->Pf	Support of hypothesis in KNO model	
Effects of governance mechanisms	Indirect	H2a	The positive effect of relational governance on KNT success is mediated by the motivation of the customer to receive the knowledge.	Yes	Yes	Yes	Yes
		H2b	The positive effect of relational governance on KNT success is mediated by the ability of the customer to receive the knowledge.	Yes	No	--	No
		H2c	The positive effect of relational governance on KNT success is mediated by the opportunity of the customer to receive the knowledge.	Yes	Yes	Yes	Yes
		H3a	The positive effect of formal governance on KNT success is mediated by the motivation of the customer to receive the knowledge.	No	--	--	No
		H3b	The effect of formal governance on KNT success is negligibly mediated by the ability of the customer to receive the knowledge.	No	No	--	Yes
		H3c	The effect of formal governance on KNT success is negligibly mediated by the opportunity of the customer to receive the knowledge.	No	--	--	Yes
Effects of knowledge types	Indirect	H4a	The negative effect of tacitness on KNT success is mediated by the motivation of the customer to receive the knowledge.	Yes	Yes	Yes	Yes
		H4b	The effect of tacitness on KNT success is negligibly mediated by the ability of the customer to receive the knowledge.	No	No	--	Yes
		H4c	The effect of tacitness on KNT success is negligibly mediated by the opportunity of the customer to receive the knowledge.	Yes	Yes	No	Yes
		H5a	The effect of complexity on KNT success is negligibly mediated by the motivation of the customer to receive the knowledge.	No	--	--	Yes
		H5b	The effect of complexity on KNT success is negligibly mediated by the ability of the customer to receive the knowledge.	No	--	--	Yes
		H5c	The effect of complexity on KNT success is negligibly mediated by the opportunity of the customer to receive the knowledge.	No	--	--	Yes
		H6a	The effect of specificity on KNT success is mediated by the motivation of the customer to receive the knowledge.	No	--	--	No
		H6b	The effect of specificity on KNT success is negligibly mediated by the ability of the customer to receive the knowledge.	No	--	--	Yes
		H6c	The effect of specificity on KNT success is negligibly mediated by the opportunity of the customer to receive the knowledge.	No	--	--	Yes

Table 89: Summary of the mediation analysis in the KNO model¹⁰⁷³

Part of model	No	Hypothesis	Requirement 2.1) P->M	Requirement 2.2) M->Pf	Requirement 3) P*M->Pf	Support of hypothesis in KNI model	
Effects of governance mechanisms	Indirect	H2a	The positive effect of relational governance on KNT success is mediated by the motivation of the customer to receive the knowledge.	Yes	Yes	Yes	Yes
		H2b	The positive effect of relational governance on KNT success is mediated by the ability of the customer to receive the knowledge.	Yes	Yes	No	No
		H2c	The positive effect of relational governance on KNT success is mediated by the opportunity of the customer to receive the knowledge.	Yes	Yes	No	No
		H3a	The positive effect of formal governance on KNT success is mediated by the motivation of the customer to receive the knowledge.	No	--	--	No
		H3b	The effect of formal governance on KNT success is negligibly mediated by the ability of the customer to receive the knowledge.	No	--	--	Yes
		H3c	The effect of formal governance on KNT success is negligibly mediated by the opportunity of the customer to receive the knowledge.	No	--	--	Yes
Effects of knowledge types	Indirect	H4a	The negative effect of tacitness on KNT success is mediated by the motivation of the customer to receive the knowledge.	Yes	Yes	Yes	Yes
		H4b	The effect of tacitness on KNT success is negligibly mediated by the ability of the customer to receive the knowledge.	No	--	--	Yes
		H4c	The effect of tacitness on KNT success is negligibly mediated by the opportunity of the customer to receive the knowledge.	Yes	Yes	No	Yes
		H5a	The effect of complexity on KNT success is negligibly mediated by the motivation of the customer to receive the knowledge.	No	--	--	Yes
		H5b	The effect of complexity on KNT success is negligibly mediated by the ability of the customer to receive the knowledge.	No	--	--	Yes
		H5c	The effect of complexity on KNT success is negligibly mediated by the opportunity of the customer to receive the knowledge.	No	--	--	Yes
		H6a	The effect of specificity on KNT success is mediated by the motivation of the customer to receive the knowledge.	No	--	--	No
		H6b	The effect of specificity on KNT success is negligibly mediated by the ability of the customer to receive the knowledge.	No	--	--	Yes
		H6c	The effect of specificity on KNT success is negligibly mediated by the opportunity of the customer to receive the knowledge.	No	--	--	Yes

Table 90: Summary of the mediation analysis in the KNI model¹⁰⁷⁴

¹⁰⁷³ Areas marked in gray indicate a 0-hypothesis.

¹⁰⁷⁴ Areas marked in gray indicate a 0-hypothesis.

The final decisions for the support of the mediation hypotheses in the KNI and KNO models are compared in Table 91. It shows that the results for hypotheses 2a, 2c, 4a, and 4c have to be discussed and interpreted separately for the two dimensions of knowledge transfer success whereas the remaining hypotheses show the same results for both models.

Part of model	No	Hypothesis	Support of hypothesis in KNO model	Support of hypothesis in KNI model	
Effects of governance mechanisms	Indirect	H2a	The positive effect of relational governance on KNT success is mediated by the motivation of the customer to receive the knowledge.	Yes	Yes
		H2b	The positive effect of relational governance on KNT success is mediated by the ability of the customer to receive the knowledge.	No	No
		H2c	The positive effect of relational governance on KNT success is mediated by the opportunity of the customer to receive the knowledge.	Yes	No
		H3a	The positive effect of formal governance on KNT success is mediated by the motivation of the customer to receive the knowledge.	No	No
		H3b	The effect of formal governance on KNT success is negligibly mediated by the ability of the customer to receive the knowledge.	Yes	Yes
		H3c	The effect of formal governance on KNT success is negligibly mediated by the opportunity of the customer to receive the knowledge.	Yes	Yes
Effects of knowledge types	Indirect	H4a	The negative effect of tacitness on KNT success is mediated by the motivation of the customer to receive the knowledge.	Yes	Yes
		H4b	The effect of tacitness on KNT success is negligibly mediated by the ability of the customer to receive the knowledge.	Yes	Yes
		H4c	The effect of tacitness on KNT success is negligibly mediated by the opportunity of the customer to receive the knowledge.	Yes	Yes
		H5a	The effect of complexity on KNT success is negligibly mediated by the motivation of the customer to receive the knowledge.	Yes	Yes
		H5b	The effect of complexity on KNT success is negligibly mediated by the ability of the customer to receive the knowledge.	Yes	Yes
		H5c	The effect of complexity on KNT success is negligibly mediated by the opportunity of the customer to receive the knowledge.	Yes	Yes
		H6a	The effect of specificity on KNT success is mediated by the motivation of the customer to receive the knowledge.	No	No
		H6b	The effect of specificity on KNT success is negligibly mediated by the ability of the customer to receive the knowledge.	Yes	Yes
		H6c	The effect of specificity on KNT success is negligibly mediated by the opportunity of the customer to receive the knowledge.	Yes	Yes

Table 91: Summary of the supported hypotheses for mediation effects¹⁰⁷⁵

¹⁰⁷⁵ Areas marked in gray indicate a 0-hypothesis.

6.4 Testing moderation effects

Hypotheses H7-9 describe moderating effects of relational and formal governance on the relationship between knowledge types and knowledge transfer success.¹⁰⁷⁶

A moderator changes the strength or even the direction of a relationship between a predictor variable and a dependent variable.¹⁰⁷⁷ Accordingly, the moderator is not dependent on the predictor variable like the mediator.¹⁰⁷⁸

Thus for moderation, it is sufficient to interpret the interaction term, whereas interpreting the main effect parameter is irrelevant.¹⁰⁷⁹ *“This is because the main effect parameter represents only the mean effect over the variance range of the moderator factor, whereas the moderator parameter represents the change, from the mean, of the effect of the moderator variable.”*¹⁰⁸⁰

Consequently, hypotheses H7-9 are tested by assessing the size and significance of the respective moderator interaction terms. For hypotheses testing in PLS, it is best to use the indicator approach when modeling interaction terms for moderators.¹⁰⁸¹ This means that interaction terms are created by multiplying each indicator of the predictor with each indicator of the moderator. All interaction terms rely on standardized data.^{1082, 1083}

The resulting interaction terms serve as the indicators for the moderator construct that was added to the structural models of KNI and KNO respectively.

The sample size of the analysis is 101. Therefore a maximum of 10 constructs is allowed to be modeled to influence the knowledge transfer success construct.¹⁰⁸⁴

¹⁰⁷⁶ Moderating effects can be continuous or categorical. Continuous moderators result from variables, which are metrically measured, whereas categorical effects result from categorical variables. Since all variables in the SEM are metric, this thesis analyzes continuous moderator effects. (Cf. Hair et al. (2013), p. 37).

¹⁰⁷⁷ Cf. Hair et al. (2013), p. 37.

¹⁰⁷⁸ Cf. Hair et al. (2013), p. 37.

¹⁰⁷⁹ Cf. Baron and Kenny (1986), p. 1174. Still, the main effect must be included in the model.

¹⁰⁸⁰ Mesquita, Brush (2008), p.799

¹⁰⁸¹ The item values are standardized before multiplication cf. Hair et al. (2013), p. 265.

¹⁰⁸² Recommendation of Hair et al. (2013), p. 265.

¹⁰⁸³ Interaction terms that rely on mean-centered data have also been tested in the models but did not reveal different results.

¹⁰⁸⁴ Cf. sample size rule (Chapter 5.4.2).

Modeling all six interaction effects for the moderator hypotheses in one SEM would violate this sample size rule. Therefore, each potential moderator effect was tested by itself. For example, when testing H7.1, the interaction term of relational governance and tacitness was added to the model, and when testing H7.2., a new model was set up that included only the interaction term of tacitness and formal governance.

Table 92 shows the results for the single interaction terms that are the subject of the hypotheses H7-9.

Hypothesis	Interaction term (predictor * moderator)	Ownership (Adj .R ² : 0,47)				Integration (Adj .R ² : 0,33)			
		p	t	R ² of KNO	Adj. R ² of KNO	p	t	R ² of KNI	Adj. R ² of KNO
		>0.2 better 0.3	>1,65 (10%) >1,96 (5%) >2,57 (1%)			>0.2 better 0.3	>1,65 (10%) >1,96 (5%) >2,57 (1%)		
H7.1)	Tacitness* Rel GM	0.051	0.720	0.51	0.46	-0.001	0.010	0.388	0.33
H7.2)	Tacitness* Form GM	0.043	0.408	0.51	0.46	0.017	0.125	0.388	0.33
H8.1)	Specificity * Rel GM	0.096	0.021	0.52	0.47	0.111	0.849	0.397	0.34
H8.2)	Specificity* Form GM	0.084	0.059	0.52	0.47	0.087	0.469	0.393	0.33
H9.1)	Complexity* Rel GM	-0.04	0.137	0.51	0.46	0.029	0.142	0.388	0.33
H9.2)	Complexity* Form GM	-0.04	0.157	0.51	0.46	0.024	0,136 6	0.388	0.33

Table 92: Results for the moderator analyses

None of the interaction terms shows significant effects on the knowledge transfer success dimensions of KNI and KNO. In addition, none of the interaction terms increased the explained variance (adj. R²) of the respective dependent construct, except for specificity and relational governance mechanisms. Thus H7 and H8 are rejected whereas H9, which proposed negligible moderation effects, is supported (Table 93).

Part of model	No	Hypothesis	Support by KNO Model	Support by KNI Model
Simultaneous effects of governance and knowledge	H7	The negative effect of tacitness on KNT success is weakened by 1) relational governance and 2) formal governance.	No	No
	H8	The positive effect of specificity on KNT success is strengthened by 1) relational governance and 2) formal governance.	No	No
	H9	The negative effect of complexity on KNT success is negligibly weakened by 1) relational governance and 2) formal governance.	Yes	Yes

Table 93: Summary of the supported hypotheses for moderation effects¹⁰⁸⁵

¹⁰⁸⁵ Areas marked in gray indicate a 0-hypothesis.

6. Empirical results

In the previous chapter (6.3), it was reported that many of the proposed mediation relationships for knowledge effects are not significant. Therefore, additional empirical analyses have been conducted to identify if AMO might instead act as moderators for the effects of different knowledge characteristics.¹⁰⁸⁶

The results show that none of the AMO constructs have a moderator function (cf. appendix M). In other words, the effects of knowledge on KNI as well as on KNO do not change under different AMO conditions.

6.5 Testing total effects

H10 proposed that the total effect of relational governance on knowledge transfer success is higher than the total effect of formal governance. The total effect is the overall impact of a variable “via one or more mediating constructs.”¹⁰⁸⁷ They are the sum of the direct and indirect effects of a variable.¹⁰⁸⁸ PLS2.0 reports these total effects automatically as presented in Table 94.

	Total effect	Ownership		Integration	
		P	t-values	p	t-values
	Cut off value/quality dimensions	>0.2 better 0.3	>1.65 (10%)	>0.2 better 0.3	>1.65 (10%)
>1.96 (5%)			>1.96 (5%)		
>2,57 (1%)			>2,57 (1%)		
Governance effects	Relational GMs ->KNT "Success"	0.2474	2.3519	0.1654	1.5942
	Formal GMs -> KNT "Success"	0.0099	0.0887	-0.1131	1.1314
Knowledge effects	Tacitness -> KNT "Success"	-0.0452	0.4231	-0.21	2.1264
	Complexity -> KNT "Success"	0.2276	2.2819	0.2304	2.417
	Specificity -> KNT "Success"	-0.0633	0.7489	-0.1419	1.4848

Table 94: Overview of the total effects in the micro models

The total effect of relational governance is significant in the KNO model but not in the KNI model. The total effect of formal governance is not significant at all.

In conclusion, H10 can be supported for the KNO model. For the KNI model, no conclusions can be drawn since both effects are insignificant.

¹⁰⁸⁶ Cf. Baron and Kenny (1986) and Mesquita et al. (2008): SEM provides information regarding the fit of a proposed model but cannot determine if that model is the “correct” one.

¹⁰⁸⁷ Hair et al. (2013), p. 174.

¹⁰⁸⁸ Cf. Hair et al. (2013), p. 174.

6.6 Summary of the tests of hypotheses

The following table provides an overview of all hypotheses and their empirical support or rejection respectively to provide a clearly arranged basis for the identification of the findings and discussion.

Part of model	No	Hypothesis	Support by KNO Model	Support by KNI Model		
AMO	direct	H1a	The higher the motivation of the customer to receive the knowledge the higher the KNT success.	yes	yes	
		H1b	The higher the ability of the customer to receive the knowledge the higher the KNT success.	No	No	
		H1c	The higher the opportunity of the customer to receive the knowledge the higher the KNT success.	yes	yes	
Effects of knowledge types	direct	H2	The more relational governance is used the higher is the KNT success.	No	No	
		H3	The more formal governance is used the higher is the KNT success.	No	No	
		H4	The more tacit the knowledge the lower is the success of KNT.	No	No	
		H5	The more complex the knowledge the lower is the success of KNT.	No	No	
		H6	The more specific the knowledge the lower is the KNT success.	No	Yes	
Effects of governance mechanisms	Indirect	H2a	The positive effect of relational governance on KNT success is mediated by the motivation of the customer to receive the knowledge.	Yes	Yes	
		H2b	The positive effect of relational governance on KNT success is mediated by the ability of the customer to receive the knowledge.	No	No	
		H2c	The positive effect of relational governance on KNT success is mediated by the opportunity of the customer to receive the knowledge.	Yes	No	
		H3a	The positive effect of formal governance on KNT success is mediated by the motivation of the customer to receive the knowledge.	No	No	
		H3b	The effect of formal governance on KNT success is negligibly mediated by the ability of the customer to receive the knowledge.	Yes	Yes	
		H3c	The effect of formal governance on KNT success is negligibly mediated by the opportunity of the customer to receive the knowledge.	Yes	Yes	
		H4a	The negative effect of tacitness on KNT success is mediated by the motivation of the customer to receive the knowledge.	Yes	Yes	
		H4b	The effect of tacitness on KNT success is negligibly mediated by the ability of the customer to receive the knowledge.	Yes	Yes	
		H4c	The effect of tacitness on KNT success is negligibly mediated by the opportunity of the customer to receive the knowledge.	Yes	Yes	
Effects of knowledge types	Indirect	H5a	The effect of complexity on KNT success is negligibly mediated by the motivation of the customer to receive the knowledge.	Yes	Yes	
		H5b	The effect of complexity on KNT success is negligibly mediated by the ability of the customer to receive the knowledge.	Yes	Yes	
		H5c	The effect of complexity on KNT success is negligibly mediated by the opportunity of the customer to receive the knowledge.	Yes	Yes	
		H6a	The effect of specificity on KNT success is mediated by the motivation of the customer to receive the knowledge.	No	No	
		H6b	The effect of specificity on KNT success is negligibly mediated by the ability of the customer to receive the knowledge.	Yes	Yes	
		H6c	The effect of specificity on KNT success is negligibly mediated by the opportunity of the customer to receive the knowledge.	Yes	Yes	
Simultaneous effects of governance and knowledge	Indirect	H7	The negative effect of tacitness on KNT success is weakened by 1) relational governance and 2) formal governance.	No	No	
		H8	The positive effect of specificity on KNT success is strengthened by 1) relational governance and 2) formal governance.	No	No	
		H9	The negative effect of complexity on KNT success is negligibly weakened by 1) relational governance and 2) formal governance.	Yes	Yes	
		H10	The impact of relational governance on KNT success is higher than the impact of formal governance on KNT success.	Yes	--	

Table 95: Overview of support and rejection for all hypotheses

6.7 *Controlling heterogeneity*

Heterogeneity can be a threat to validity in PLS-SEM results, because in many instances, the relationship between the variables of the model is affected by systematic influences from other variables. That is, path coefficients differ significantly across two or more groups. The moderator analysis as presented in section 6.4 is one means to identify heterogeneity for sources that are theory-based. For sources that are known to potentially cause heterogeneity but that are not part of the theoretical model, usually multi-group analysis is used to compare path coefficients between two or more groups of data.¹⁰⁸⁹ However, the complexity of the SEM in this thesis does not allow the sample of 101 to be split into multiple (not even two) groups. Splitting the sample would imply calculating a model with 8 endogenous constructs on the knowledge transfer success variable: This would violate the rule of thumb for the minimum sample size, which is 10 times the number of endogenous constructs. Therefore, a multi-group analysis is not applicable for this type of model.

Still, potential heterogeneity should be tested to identify potential systematic influences. Therefore, tests based on a comparison of means for potential sources of heterogeneity have been conducted to control for their influence on the dependent variables of knowledge integration and knowledge ownership.

In order to perform the test based on the comparison of means, the two dependent variables are first computed as the sum of their items.¹⁰⁹⁰

$$\mathbf{KN\ Integration} = K_KNT_succs_learning_1 + K_KNT_succs_learning_2 + \\ K_KNT_succs_learning_3$$

$$\mathbf{KN\ Ownership} = K_KNT_succs_Ownership_1 + K_KNT_succs_Ownership_2 \\ + K_KNT_succs_Ownership_4 + \\ K_KNT_succs_Ownership_5$$

Second, the distribution of these variables is tested to identify the appropriate test type. A Kolmogorov-Smirnoff test for normal distribution indicated that only knowledge

¹⁰⁸⁹ Cf. Hair et al. (2013), p. 244.

¹⁰⁹⁰ The items equal the indicators of the SEM constructs. The resulting constructs are reliable and valid as introduced in the construction of the measurements chapter.

integration is normally distributed (cf. Table 96). For normally distributed constructs, a t-test for differences of means can be conducted when testing for potential heterogeneity. For the non-normally distributed construct of KNO, the Mann-Whitney-U test (a non-parametric test) needs to be used.¹⁰⁹¹

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of COMPUTE KN_Integration=K_KNT_succs_learning_1 + K_KNT_succs_learning_2 + K_KNT_succs_learning_3 is normal with mean 8,870 and standard deviation 2,39.	One-Sample Kolmogorov-Smirnov Test	,254	Retain the null hypothesis.
2	The distribution of COMPUTE KN_Ownership=K_KNT_succs_Ownership_1 + K_KNT_succs_Ownership_2 + K_KNT_succs_Ownership_4 + K_KNT_succs_Ownership_5 is normal with mean 13,950 and standard deviation 3,12.	One-Sample Kolmogorov-Smirnov Test	,033	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is ,05.

Table 96: Kolmogorov-Smirnoff test for dependent, computed variables

Potential sources of heterogeneity that are controlled for are the company age, the contract type, and the type of organizational knowledge that was the subject of the transfer.¹⁰⁹²

¹⁰⁹¹ Cf. Rasch et al. (2006).

¹⁰⁹² For the construction of the measures see Chapter 4.5.6).

6. Empirical results

6.7.1 Influence of company age

The tests for mean differences (cf. tables below) indicate that older companies are significantly more successful in integrating knowledge than younger companies. Younger companies' success in KNI is 7.9 in average whereas older companies' average success is 9.1.

In contrast, company age is not a significant source of heterogeneity when analyzing KNO.

Group Statistics

	K_Gründungsjahr	N	Mean	Std. Deviation	Std. Error Mean
KN_Integration	>= 2000	16	7,9375	2,11246	,52812
	< 2000	82	9,0610	2,37969	,26279

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
KN_Integration	Equal variances assumed	,149	,701	-1,757	96	,082	-1,12348	,63952	-2,39291	,14595
	Equal variances not assumed			-1,905	23,086	,069	-1,12348	,58989	-2,34350	,09655

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of COMPUTE KN_Ownership=K_KNT_succs_Ownership_1 + K_KNT_succs_Ownership_2 + K_KNT_succs_Ownership_4 + K_KNT_succs_Ownership_5 is the same across categories of Companies junger than founded in 2000.	Independent-Samples Mann-Whitney U Test	,615	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is ,05.

Table 97: Tests for differences in KNT success due to company age

Consequently, the prominent control variable “company age” can only partly be supported as important for the explanation of knowledge transfer success. This result underlines the importance of differentiating and defining the dimensions of the knowledge transfer success (the phase of knowledge transfer) as explained in knowledge transfer research.

6.7.2 Influence of contract type

The types of contract used in the buyer-supplier relationships are either contracts for work or contracts for service.¹⁰⁹³ Neither comparison of means between different types of contract, based on either the t-test or the Mann-Whitney-U test, shows significant differences in the dimensions of knowledge transfer success (cf. Table 98). This finding is in line with CUMMINGS/TENG (2003). They conclude that “the separation of research on knowledge transfer by governance mode may have less importance in reality than in convention or in research ease, as organizational distance was not found to be a statistically significant.”¹⁰⁹⁴

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
KN_Integration	Equal variances assumed	1,337	,250	-1,297	98	,198	-,86667	,66811	-2,19250	,45917
	Equal variances not assumed			-1,107	17,285	,283	-,86667	,78295	-2,51648	,78314

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of COMPUTE KN_Ownership=K_KNT_succs_Ownership_1 + K_KNT_succs_Ownership_2 + K_KNT_succs_Ownership_4 + K_KNT_succs_Ownership_5 is the same across categories of type of contract.	Independent-Samples Mann-Whitney U Test	,305	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is ,05.

Table 98: Tests for differences in KNT success due to different contract types

¹⁰⁹³ Cf. Chapter 5.1.2 for further details

¹⁰⁹⁴ Cummings/Teng (2003), p. 59.

6.7.3 Influence of organizational knowledge type

The type of organizational knowledge is either process knowledge or outcome knowledge (cf. Chapter 1). The original item measured the type of organizational knowledge on a 5 point rating scale. To form a group that reflects outcome knowledge, all cases with values from 1-3 are used. The group that reflects process knowledge contains all cases with values from 4-5.

The two median tests as reported below indicate no difference in both knowledge transfer success variables due to the different types of organizational knowledge.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
KN_Integration	Equal variances assumed	.504	.480	1,229	98	.222	.84551	.68812	-.52004	2,21107
	Equal variances not assumed			1,112	16,372	.282	.84551	.76061	-.76393	2,45496

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of COMPUTE KN_Ownership=K_KNT_succes_Ownership_1 + K_KNT_succes_Ownership_2 + K_KNT_succes_Ownership_4 + K_KNT_succes_Ownership_5 is the same across categories of outcome knowledge is group1.	Independent-Samples Mann-Whitney U Test	.380	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Table 99: Tests for differences in KNT success due to the different types of organizational knowledge

In conclusion, neither the different types of contracts nor the different types of organizational knowledge result in significantly different levels of KNT success, but older companies are more successful in knowledge integration than younger companies.

7 FINDINGS

Success in knowledge transfer is defined as the completion of the four phases of the knowledge transfer process, resulting in the change of the knowledge base of the receiver.¹⁰⁹⁵ Therefore, the dependent variable of knowledge transfer success was designed as a higher order construct (HOC) by using lower order constructs reflecting the different results of the phases of knowledge transfer. The construction of the measurements showed that such a HOC cannot be established empirically.¹⁰⁹⁶ KNO reflects the results of phase three, whereas KNI reflects the results of phase four. They had to be tested separately in order to support the system of hypotheses. The hypotheses focus on the result of the whole knowledge transfer processes. Therefore, they apply to KNI but not necessarily to KNO. The empirical results show that the model explains more of the variance of KNO than of KNI. 16 hypotheses could be validated for KNO and 15 for KNI. The support and rejection of two hypotheses differ for KNO and KNI. As a result, the impact and role of the independent constructs of governance and knowledge are also different.

Divergent roles of governance and knowledge imply a different answer to the research questions for each phase of the knowledge transfer. They also imply that the theoretical underpinning of the hypotheses do not match the empirical results in equal measure. Therefore, the following chapters derive the findings for successful governance of knowledge characteristics and discuss them compared to the theoretical model. In order to answer the research questions, each model is discussed separately, before the answer for the holistic governance of knowledge transfer is derived.

¹⁰⁹⁵ This means that KNT success is a high degree of integration of the knowledge transferred. That is completely different from a knowledge base perspective which would define success as a high amount of integrated knowledge.

¹⁰⁹⁶ The constructs to measure the completion of phase two of the KNT process are either not reliable (budget construct) or not explained sufficiently by the structural model (time, quality construct).

7.1 Successful governance in the knowledge ownership model

Knowledge ownership is the psychological ownership of the transferred knowledge by the customer team – i.e. the customer team considers it as its own knowledge.¹⁰⁹⁷ Knowledge ownership requires having mutual experience with the knowledge and to gain sufficient results when using it.¹⁰⁹⁸ It is the completion of the third phase of the knowledge transfer process.

In order to describe and discuss the findings for the successful governance of this phase of knowledge transfer, Figure 49 visualizes all the significant relationships and effects proved empirically. Green arrows indicate positive effects and thus the success drivers for knowledge ownership. Red arrows indicate negative effects and thus the difficulties that have to be managed to achieve knowledge ownership. Dotted arrows represent indirect effects, and solid arrows represent direct effects. The significance level is indicated by the asterisks.

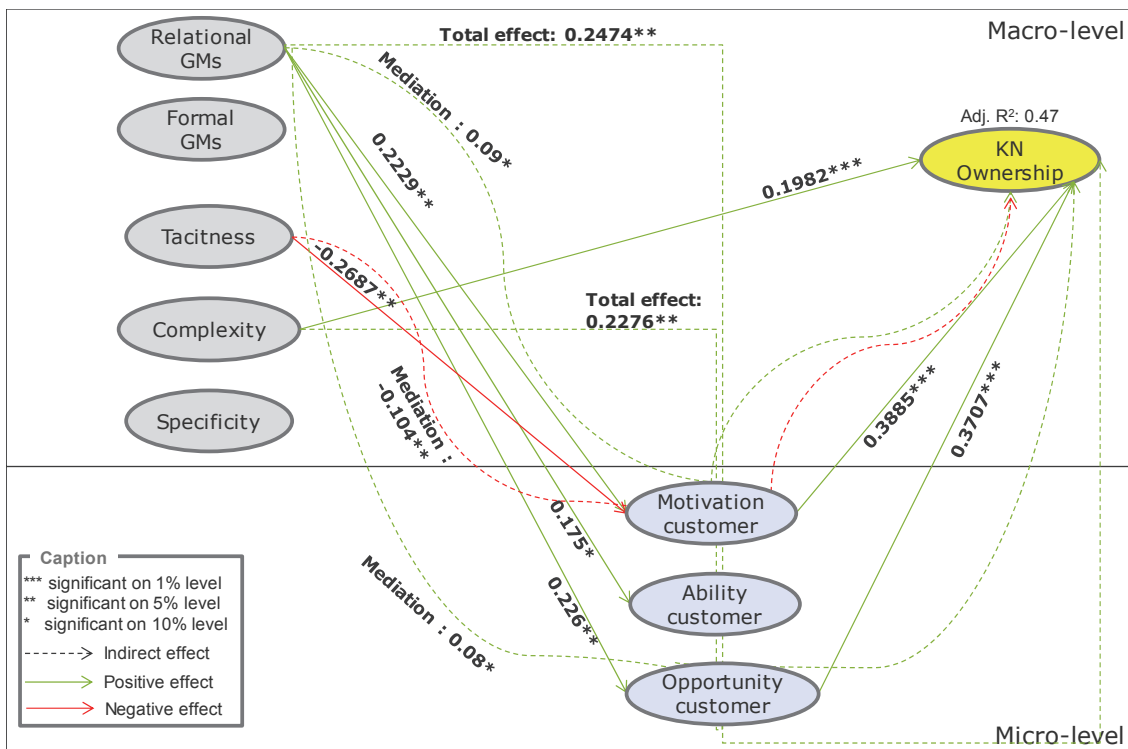


Figure 49: Significant direct and indirect relationships in the KNO model

¹⁰⁹⁷ Cf. Pierce et al. (2001), p. 299.

¹⁰⁹⁸ Cf. Cummings & Teng (2003), p.42.

7.1.1 Drivers and difficulties of knowledge ownership

In the knowledge ownership model, motivation to receive the knowledge, opportunity to receive the knowledge, and complexity of the knowledge are the direct success drivers. In addition, relational governance mechanisms have a positive indirect effect on knowledge ownership by increasing the motivation and opportunity to receive the knowledge. Difficulties in reaching a high ownership of the knowledge are posed only indirectly by tacitness (Figure 49).

Below, the findings for successful governance of knowledge characteristics are derived, discussed, and compared to the theoretical model.

7.1.1.1. Success drivers

The theoretical model defines success drivers for knowledge transfer on the macro level and on the micro level of the general model of social science explanation. In order to define the micro level mechanisms for success, the theory of work performance was used. It states that motivation, ability, and opportunity must be present to achieve performance. They are direct success drivers for knowledge transfer.

The empirical results support this theory only for the role of motivation and opportunity, but not for ability: The personal interest of the customer team to understand and learn the knowledge, in addition to having enough time and a productive atmosphere is crucial to achieving ownership of knowledge.

In order to increase knowledge ownership, motivation is slightly more effective ($p=0.3885$) than opportunity ($p=0.3707$). However, both effects are robust¹⁰⁹⁹ and relevant¹¹⁰⁰ to explaining the level of knowledge ownership and thus should be treated equally when managing the individual performance of a team supposed to achieve ownership of knowledge.

In contrast to H1b, the ability to receive the knowledge does not significantly increase knowledge ownership although the positive tendency of the path coefficient supports the general role of the variable¹¹⁰¹. This means that the capabilities and means to receive the knowledge are not important for achieving ownership of knowledge.

¹⁰⁹⁹ Medium f^2 values higher than 0.17.

¹¹⁰⁰ q^2 values higher than 0.02.

¹¹⁰¹ All path coefficients are reported in Table 82.

7. Findings

In conclusion, the success mechanisms of the micro level are the motivation and opportunity of the customer to receive knowledge.

The macro level success drivers are formal and relational governance mechanisms and proposed based on TCE and relational theory, respectively. Their direct effects could not be established (H2, 3). Thus, there is no macro level effect of governance on knowledge ownership. This means that changing governance from formal to relational or only altering their intensity does not explain more or less ownership of knowledge.

Relational governance is measured as a factor that contains the establishment of social ties, organizing events, and solving project problems. Formal governance is a factor that contains contract intensity and project management intensity. As a result, neither increasing information sharing and trust nor increasing the specification of outcome and behavior can directly influence the ownership of knowledge.

However, the total effects show that throughout the whole structural model, the effect of relational governance mechanisms is significantly important for increasing knowledge ownership. The reason for this significant total effect is that the success-driving effect of relational mechanisms is indirect. Relational governance mechanisms reveal their power via their mediation effects of motivation and opportunity, respectively (H2a, c). This means that relational governance mechanisms increase the ownership of knowledge by increasing the motivation and opportunity to receive knowledge.

The relational mechanisms “establishment of social ties,” “organizing events,” and “shared problem solving” increase the intensity and frequency of the contact between consultant and customer. They establish a cooperative and trustful interaction. This in turn increases the motivation to receive knowledge because they make the KNO process personally relevant and create a desirable way of working, which the customer wants to maintain. In addition, this increases the opportunity to receive knowledge because the physical and psychological distance between consultant and customer is reduced. Due to these effects on opportunity and motivation and their positive effects on knowledge ownership, relational governance mechanisms are very important for the successful management of knowledge ownership. The mediation effects of motivation and opportunity are partial but when taken together, the micro level mechanisms explain 70% of the relationship of the macro level relationship between relational governance mechanisms and knowledge ownership.

Formal governance mechanisms do not have significant indirect effects. This result was proposed for the indirect effect via ability and opportunity, but not for the effect via motivation. Formal governance mechanisms are neither able to affect the familiarity with the knowledge¹¹⁰² nor the psychological distance between the two parties, but they define consequences of action that are able to motivate people. However, the results indicate that defining the consequences of actions that people engage in and directing their engagement do not influence their motivation to receive the knowledge.

In summary, relational governance mechanisms are success drivers of knowledge ownership because they increase motivation and opportunity. Formal governance mechanisms do not have any impact on achieving ownership of knowledge. This finding supports the application of the general model of social science explanation because the micro level is valuable and needed to explain the macro level effects.

These results imply that the strategic management of knowledge ownership can only manage its success effectively by applying relational governance mechanisms. The application of formal governance is neither effective nor efficient.

In addition to the success drivers identified above, knowledge ownership is significantly positively affected by the complexity of knowledge. The effect of complexity is direct and also significant throughout the whole model. This finding is in contrast to the proposed negative impact of complexity on knowledge transfer success (H5) and to research studies that failed to prove a significant effect of complexity on knowledge transfer success¹¹⁰³.

Complexity was measured by a factor value that has to be interpreted as “knowledge that depends on many combined processes, procedures, and resources including experience knowledge.”¹¹⁰⁴ Thus the empirical results indicate that the more the knowledge consists of multiple assets and is grounded in multiple resources, the more will the customer consider the knowledge as his own. For this finding, two reasons could apply:

¹¹⁰² Pre-condition to influence the ability to receive knowledge.

¹¹⁰³ Cf. Simonin (1999a), Kogut & Zander (1995).

¹¹⁰⁴ Cf. factor loadings of the knowledge items in Chapter 5.5.2.

First, a significant positive effect could be caused by the process-oriented view on knowledge ownership in this thesis. KOGUT & ZANDER (1995) analyzed the speed of transfer and SIMONIN (1999a) the ease of the transfer, but neither found any effects for complexity. The degree of ownership is different from these variables which measure characteristics of the transfer (speed and ease), because the degree of ownership is interested in the characteristics of the result (feeling ownership). Thus, the success dimensions are not comparable, and neither are the identified effects.

Second, the hypothesis focuses on the last stage of knowledge transfer and not on the third. The effect of complexity on knowledge ownership might be positive because the customer has to concentrate and invest more attention when receiving knowledge from multiple resources. He has to speak to more people and has to collect and structure all the parts of the knowledge for himself. As a result, he might have a “feeling of having invented it here” for the knowledge and feels that it is his own.

7.1.1.2. Difficulties

The theoretical model proposed difficulties in achieving a knowledge transfer on the macro level of the general model of social science explanation from the knowledge-based view. In addition, difficulties are explained by the micro level proposing the interaction of knowledge characteristics and the AMO variables. The empirical results do not support the macro level effects and thus reject the application of the KBV to explain knowledge ownership.

The difficulties in achieving knowledge ownership are not represented by direct negative effects of the knowledge characteristics as proposed in H4-6. Complexity was already discussed above and actually identified as a success driver. For tacitness and specificity, no significant effects could be found at all. This means that achieving knowledge ownership does not depend on the characteristics of tacitness or specificity directly.

The explanation provided by the micro level can be supported partly as the characteristic of tacitness impedes the ownership of knowledge indirectly. As proposed in H4a, the reduced motivation of the customer to receive the knowledge is the reason why tacitness impedes the ownership of knowledge. In other words, as tacit knowledge fails to specify any specific benefits for the buyer or to limit punishments, it creates a lack of positive consequences that limits the buyer’s motivation to receive the tacit

knowledge. This decreased motivation results in a decreased level of knowledge ownership.

The mediation effect of motivation for the effect of tacitness on knowledge ownership is not partial but total (VAF= 2.461). It is limited motivation that explains why tacitness hinders the ownership of knowledge rather than the difficulties of codification as proposed by the direct effect in H4.

In summary, tacitness creates difficulties for knowledge ownership because it decreases motivation. Specificity does not have any impact on achieving ownership of knowledge, and complexity is a success driver for knowledge ownership. These findings support the application of the general model of social science explanation because the micro level is valuable and needed to explain the effect of tacitness. They do not support the application of the KBV to the process-based view on success in knowledge transfer.

These results imply that the strategic management of knowledge ownership only has to manage the difficulties of tacitness.

7.1.2 Effective and efficient governance of knowledge characteristics

The central findings in the model of knowledge ownership are that only tacitness creates a challenge for the governance of knowledge ownership, that complexity increases knowledge ownership, and that only relational governance mechanisms are effective in governing the success of knowledge ownership. These findings lead to the following answers to the initial research questions.

7.1.2.1. Governance of tacitness

The ownership of tacit knowledge is effectively governed by relational governance mechanisms. Compared to formal mechanisms, they are also the more efficient means to manage tacitness effects in the transfer since formal governance mechanisms do not have any impact in the knowledge ownership model at all.

From a macro level perspective, the insignificant effect of tacitness on knowledge ownership stands in contrast to research that proved direct, negative effects of tacitness on the success of knowledge transfer. When the micro level mechanisms are not

considered in the explanation, the effect of tacitness is based on difficulties in codification and increased ambiguity.¹¹⁰⁵ If this explanation is not valid, the strategic management of knowledge ownership has no indication for action.

The total mediation effect of motivation now clearly points out the value of the inclusion of the micro level in analyses. When knowing that the effect of tacitness on knowledge ownership is negative, because the motivation of the customer team is decreased, the strategic management can use counteractive measures to manage the motivation, by managing the micro level.

One of these counteractive measures is relational governance. Relational governance mechanisms are an effective means to counterbalance the level of motivation because they directly increase the motivation to receive knowledge ($p= 0.2229^{**}$). Governance mechanisms do not change the effect of tacitness on knowledge ownership.¹¹⁰⁶ Thus, applying relational governance to the transfer is not about providing the missing positive consequences of the transfer. Rather it is about balancing the level of motivation in such a way that any negative effects of tacitness on motivation are not so severe that the motivation to receive the knowledge becomes actually negative – i.e. the refusal to receive the knowledge.

Formal governance mechanisms are not counteractive measures to manage motivation. Therefore, they are not effective means for the strategic management of tacit knowledge when aiming for knowledge ownership.

7.1.2.2. Governance of complexity

The positive effect of complexity on knowledge ownership indicates that this characteristic of knowledge does not pose a difficulty that needs to be governed at all. The effect is neither mediated by the individual conditions of the team (support of H 5a-c), nor is it moderated by the intensity of governance (support of H9). Thus, the effect of complexity on knowledge ownership cannot be changed through the application of governance mechanisms. This implies that effective strategic management of complex knowledge – i.e. doing the right thing – is indeed not an application of governance

¹¹⁰⁵ Simonin (1999a,b, 2004) argues and provides evidence that tacitness does not have a direct influence on knowledge transfer, but is mediated by knowledge ambiguity.

¹¹⁰⁶ This was indicated by the failure to prove a moderation effect of relational or formal governance on the effect of tacitness on KNO (H7).

mechanisms. The investment into governance is actually inefficient (*ceteris paribus*) for the transfer of complex knowledge.

Of course, the positive effect of relational governance mechanisms is effective when relational governance is applied to a transfer characterized by highly complex knowledge. Still, under efficiency aspects, the investment in relational governance mechanisms is not necessary. Moreover, strategic management can save the resources for establishing relational governance mechanisms such as implementing social contacts and solving all problems jointly.

7.1.2.3. Governance of specificity

Specificity has no significant impact in the structural model and therefore does not require any kind of governance. It neither creates any difficulties to the transfer (rejection of H6) nor does it indirectly create positive effects on knowledge ownership (rejection of H6a).

In conclusion, the application of relational governance will have a positive effect on knowledge ownership by increasing the motivation to receive the knowledge, but it is actually not necessary to invest in those means. There is no negative impact to influence or counterbalance. This implies that an investment in governance is not the most efficient way to reach knowledge ownership when the transfer is characterized by specific knowledge.

Figure 50 summarizes the findings for effective and efficient governance of knowledge characteristics in the model of knowledge ownership, providing a clear answer to the initial three research questions.

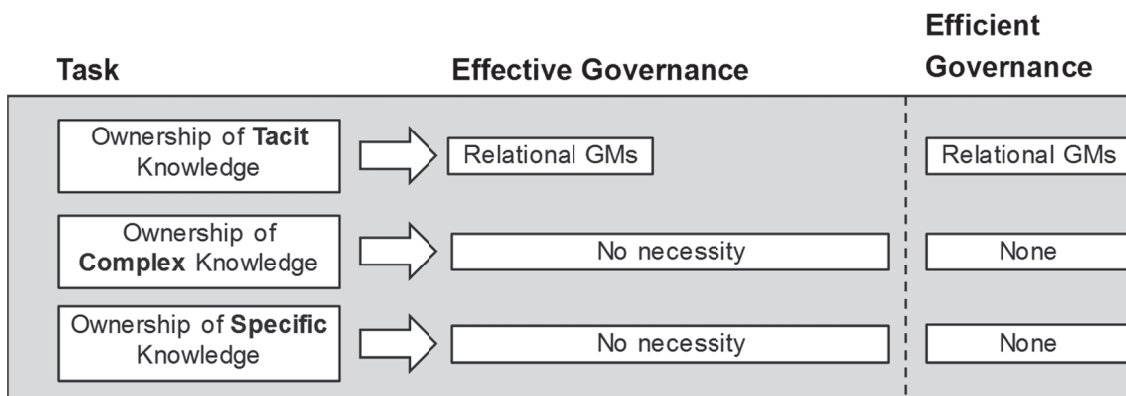


Figure 50: Successful governance for different types of knowledge in KNO¹¹⁰⁷

7.2 Successful governance in the knowledge integration model

Knowledge integration is the autarkic use of the transferred knowledge by the customer – i.e. the customer learned to use the knowledge on his own and to re-create it.¹¹⁰⁸ Achieving KNI reflects the completion of the last stage of the knowledge transfer process. The autarkic usage of the knowledge requires having established roles and responsibilities for the use of the knowledge within the organization of the customer.¹¹⁰⁹ In order to describe and discuss the findings for the successful governance of knowledge integration, Figure 51 visualizes all the significant relationships and effects proved empirically. Green arrows indicate positive effects and thus the success drivers for knowledge integration. Red arrows indicate negative effects and thus the difficulties that have to be managed to achieve knowledge integration. Dotted arrows represent indirect effects, and solid arrows represent direct effects. The significance level is indicated by the asterisks.

¹¹⁰⁷ Effective governance mechanisms affect the effect of the knowledge characteristics before it creates an impact on KNT success – i.e. it changes the effect (moderation) or counterbalances the effect on the micro level. Efficient governance mechanisms are those mechanisms that by comparison have the largest impact on the final KNT success. They do not necessarily need to create this impact before the effect reaches KNT success or on the micro level.

¹¹⁰⁸ Cf. Cummings & Teng (2003), p.42.

¹¹⁰⁹. Cf. Cummings & Teng (2003), p.42.

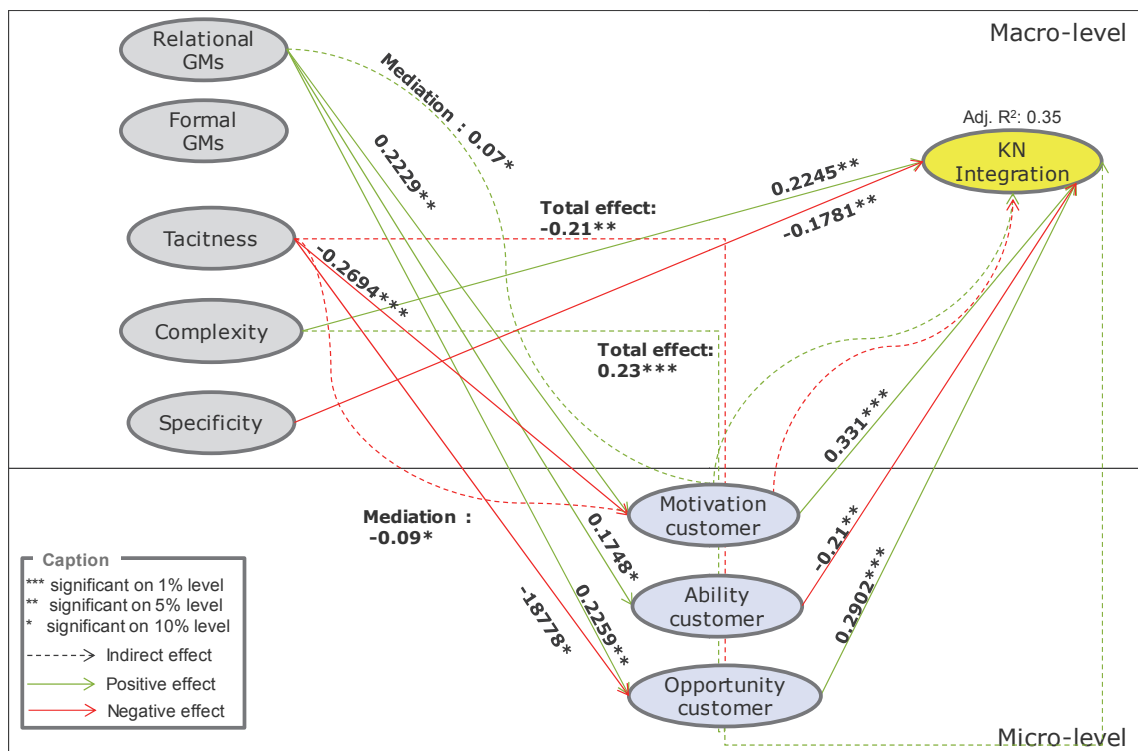


Figure 51: Significant direct and indirect relationships in the KNI model

7.2.1 Drivers and difficulties of knowledge integration

In the knowledge integration model, the motivation to receive the knowledge, opportunity to receive the knowledge, and complexity of the knowledge are the direct success drivers. In addition, relational governance mechanisms have a positive indirect effect on KNI by increasing the motivation to receive the knowledge. Difficulties to achieve a high integration of the knowledge are posed directly by specificity and the ability to receive the knowledge as well as indirectly by tacitness (Figure 51).

7.2.1.1. Success Drivers

The theoretical model defines success drivers for knowledge transfer on the macro level and on the micro level of the general model of social science explanation.

In order to define the **micro level success drivers** for knowledge transfer, the theory of work performance was applied. The empirical results support this theory only for the role of motivation and opportunity, but not for ability: The personal interest of the customer team to understand and learn the knowledge, in addition to having enough time and a productive atmosphere, is crucial to achieving organizational integration of knowledge.

7. Findings

In order to increase knowledge integration, motivation is slightly more effective (highest path coefficient) than opportunity. However, both effects are robust¹¹¹⁰ and relevant¹¹¹¹ to explaining the level of knowledge integration and thus should be treated equally when managing the individual performance of a team that is supposed to integrate the knowledge.

In contrast to H1b, the ability to receive the knowledge significantly decreases knowledge integration. This means that the more capabilities and means to receive the knowledge are present at the customer team, the less the knowledge is integrated into the customer organization.

This result stands in contrast to the theory of work performance. Reasons to back up this empirical result are outlined below.

Excursus: Reasoning for negative effects of ability

Knowledge integration is measured using items which ask for increased learning, increased independence from the supplier, and the autarkic use of the transferred knowledge. Ability was measured by asking for the current capacity, skills, and means to receive the knowledge.

The items of the knowledge integration construct describe the increase of knowledge compared to the original level of knowledge. The following might be a reason for the negative relationship: If the project leader, who rates the questionnaire, feels that the project team had a high ability to receive the knowledge, they probably have already been very independent from the supplier. Thus he perceives that the level of independency has not increased very much because of the project.¹¹¹² Moreover, if the ability is very high, he does not perceive any increase at all, thus stating a negative relationship.

This proposes a non-linear relationship between ability and knowledge integration in such a way that an increase in ability increases knowledge integration only until the added increase in independence becomes zero. Then the value of increased ability

¹¹¹⁰ f^2 values higher than 0.09.

¹¹¹¹ q^2 values higher than 0.03.

¹¹¹² In line with this argumentation, Powell et al. (1996), Lane and Lubatkin (1998), and Inkpen and Pien (2006) recognized that what can be learned is directly related to what is already known.

becomes negative. In other words, the ability has a diminishing marginal utility for knowledge integration, and the relationship could rather resemble an inverted U than a line.

The average level of ability was rated as very high in the sample (mean=10.8), and the SEM is limited to linear relationships. The effect found in the knowledge integration model might have only described the decreasing part of the inverted U relationship.

A second reason could be that both constructs were rated by the customer project leader. Since he considers only his own scope of the organization, he might not have differentiated between the autarky of the individual and the level of autarky of the organization. This confusion can only be prohibited by measuring knowledge integration at a different organizational level than that of the project team. For example, a manager superior to the project team leader or someone from the project's steering committee would have assessed the level of integration based on the use of the knowledge in a wide scope of the organization.

-End of excursus

The results of the knowledge integration model indicate that the mechanisms of the micro level which are able to explain knowledge integration are different from the model of knowledge ownership. For knowledge integration, not only motivation and opportunity, but also ability serves as a significant micro mechanism to explain the performance. The relationship of ability and knowledge integration is probably not linear and stays unclear due to the limitations of the empirical method. In conclusion, ability is not interpreted any further, but the success mechanisms of the micro level are defined as the motivation and opportunity of the customer to receive knowledge.

The **macro level success drivers** are formal and relational governance mechanisms and are proposed based on TCE and relational theory respectively. The results of the knowledge integration model indicate that neither relational nor formal governance mechanisms directly affect knowledge integration (rejection of H2,3). This is the same result as for the model of knowledge ownership.

Also in line with the model of knowledge ownership is the finding that relational governance mechanisms affect the success indirectly via the mediation through

motivation. This means that relational governance mechanisms increase the integration of knowledge by increasing the motivation to receive knowledge. This indirect effect explains 45% of the relationship between relational governance and knowledge integration.

The mediation via opportunity and a total effect throughout the model were not significant. In conclusion, the impact of relational governance on knowledge integration is limited to the mediation via motivation. This finding supports the application of the general model of social science explanation because the micro level is valuable and needed to explain the macro level effects.

Formal governance mechanisms do not have any impact on the model. Thus the strategic management of knowledge integration can only manage its success effectively by applying relational governance. The application of formal governance is neither effective nor efficient.

In addition to the success drivers identified above, complexity shows significant positive effects on the integration of knowledge. Complexity increases knowledge integration even more than knowledge ownership. This direct effect on knowledge integration is neither mediated by one of the AMO constructs nor moderated by any type of governance mechanisms (support for H5a-c and H9). Thus, the empirical results indicate that the more the knowledge consists of multiple assets and is grounded in multiple resources, the more the customer gains autarky from the supplier.

Again the effort of the customer to integrate complex knowledge can be considered greater than the effort of integrating simple knowledge because he has to contact multiple persons to receive the knowledge. In return, the multiple contacts he gains knowledge from might explain why his independence is afterwards perceived as being higher. When contacting only one person, he gained independence from one person, but when contacting multiple persons, he gained more independence.

7.2.1.2. Difficulties

Difficulties in achieving knowledge transfer that are explained on the macro level of the general model of social science explanation are proposed based on the knowledge-based view. On the micro level, these difficulties are explained by proposing the interaction of knowledge characteristics with the AMO variables.

The empirical results do not support the macro level effects for complexity and tacitness. The major difficulties in achieving knowledge integration are not represented by direct negative effects of the tacitness and complexity as proposed by H4 and H5, but only by specificity (H6). As a result, the application of the KBV to explain knowledge ownership is only applicable to specificity.

Specificity decreases the integration of knowledge directly. Thus the more knowledge is dependent on the specific project context and has interdependence with it, the less it is used in autarky from the customer organization.

This effect was not significant in the knowledge ownership model. Accordingly, the role of specificity is different for knowledge integration and for knowledge ownership.

The role of tacitness in knowledge integration is the same as that in knowledge ownership: Reaching autarky of the supplier of knowledge and applying it independently does not directly depend on the characteristic of tacitness. Moreover, the characteristic of tacitness indirectly impedes the integration of knowledge.

As proposed by H4a, the reduced motivation of the customer to receive the knowledge is the reason why tacitness impedes the integration of knowledge as well. In other words, as tacit knowledge fails to specify any specific benefits for the buyer or to limit punishments, it creates a lack of positive consequences which in turn limits the motivation of the buyer to receive the tacit knowledge. This decreased motivation results in a decreased level of knowledge integration.

The mediation effect of motivation for the effect of tacitness on knowledge integration is less than on knowledge ownership. It represents a partial mediation as motivation only accounts for 39% of the relationship between tacitness and knowledge integration.

In summary, tacitness creates difficulties for knowledge integration because it decreases motivation. Specificity has a direct negative impact on the ownership of knowledge. Complexity is indeed a success driver. These findings support the application of the general model of social science explanation, because the micro level is valuable and required to explain the effect of tacitness. They support the application of the KBV to explain difficulties of knowledge characteristics only for specificity.

These results imply that the strategic management of knowledge integration has to manage the difficulties of tacitness and specificity.

7.2.2 Effective and efficient governance of knowledge characteristics

The central findings in the model of knowledge integration are that tacitness and specificity create challenges for the governance of knowledge integration, that complexity increases knowledge integration, and that only relational governance mechanisms are effective in governing the success of knowledge integration. These findings lead to the following answers to the initial research questions.

7.2.2.1. Governance of tacitness

The integration of tacit knowledge needs to be governed the same way as the ownership of tacit knowledge: by relational governance mechanisms.

They need to be applied to balance the level of motivation so that any negative effects of tacitness on motivation are not so severe that the motivation to receive the knowledge becomes actually negative – i.e. the refusal to receive the knowledge.

Since formal governance mechanisms do not have an impact in the knowledge integration model, relational governance is also the more efficient means to manage tacitness effects in the transfer.

7.2.2.2. Governance of complexity

The effect of complexity on knowledge integration is positive and cannot be explained on an individual level. The effective strategic management of complex knowledge in knowledge integration therefore, as in knowledge ownership, is not to apply governance mechanisms. The positive effect of relational governance mechanisms via motivation is effective, but from an efficiency perspective, the investment in relational governance mechanisms is not necessary. The management of the project can save the resources for establishing relational governance mechanisms such as implementing social contacts and solving all problems jointly.

7.2.2.3. Governance of specificity

The negative effect of specificity on knowledge transfer is only found in the model of knowledge integration, and thus the governance recommendations differ for the two models.

In the model of knowledge integration, the negative effect of specificity is neither mediated by AMO nor moderated by any type of governance. It cannot be changed or

managed at the individual level, but creates a major difficulty for the strategic management of knowledge integration. Therefore, the integration of specific knowledge cannot be governed effectively.

The only way to manage the success of knowledge integration characterized by specific knowledge is to create positive effects on knowledge integration equal to the negative effects of specificity. These positive effects are created by relational governance mechanisms. The investment in social ties, joint problem solving and events are able to create such counter effects by increasing the customer's motivation. Thus, the use of relational mechanisms is recommended to efficiently manage the success of knowledge integration characterized by specificity.

Figure 52 summarizes the findings for effective and efficient governance for the transfer of different types of knowledge in the model of knowledge integration and provides a clear answer to the initial three research questions.

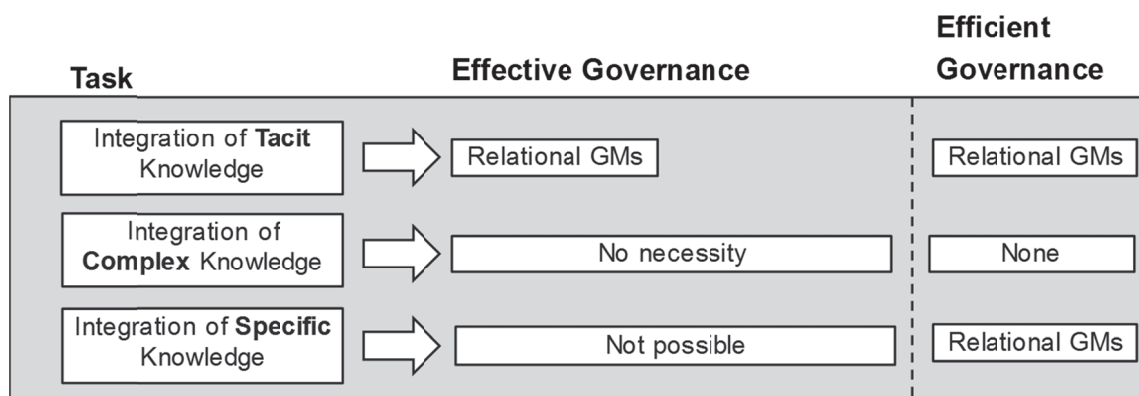


Figure 52: Successful governance for different types of knowledge in KNI

7.3 Successful governance of the whole knowledge transfer process

Some of the findings for the governance of knowledge ownership differ from those for the governance of knowledge integration whereas others are the same. This implies that the roles of the independent constructs differ for explaining knowledge ownership and knowledge integration. However, the strategic management of knowledge transfer has to govern both knowledge ownership and knowledge integration in order to complete the transfer. This section discusses and compares the roles of governance mechanisms, knowledge characteristics, and micro mechanisms (AMO) and derives the findings for the governance of the whole knowledge transfer process.

7.3.1 The role of micro level mechanisms

The empirical analyses show that the AMO constructs explain a crucial part of the variance of knowledge ownership and knowledge integration. Macro models that do not contain these constructs, but only governance and knowledge constructs, explain knowledge ownership and knowledge integration insufficiently.¹¹¹³ This finding supports the social science-based research stream¹¹¹⁴, which calls for more micro foundations when explaining social outcomes such as success in knowledge transfer.

The impact and relevance of motivation, opportunity, and ability to receive the knowledge differ when, on the one hand, compared to each other and on the other hand they depend on the knowledge transfer success dimension they are explaining.

Motivation and opportunity are important for knowledge ownership as well as for knowledge integration, whereas ability does not have any relevant effect on knowledge ownership and even has a negative effect on knowledge integration. The latter was explained by a potential inverted U relationship.

These findings imply that motivation and opportunity are more important for the overall management of knowledge transfer in buyer-supplier relationships than ability.

¹¹¹³ Adjusted R² of 0.11 for KNO and 0.16 for KNI.

¹¹¹⁴ E.g. Foss et al. (2009, 2010), Felin & Foss (2005), Felin & Hesterly (2007), Felin et al. (2009), and Argote et al. (2003).

Moreover, the path coefficients indicate that motivation has a stronger effect on both of the dependent success variables than opportunity. Consequently, for explaining knowledge transfer in buyer-supplier relationships, the role of motivation is more important than that of opportunity and ability.

This finding stands in contrast to the original theory, but is in line with research on the ability of AMO to explain social outcomes. For example SIEMSEN AND BALASUBRAMANIAN (2008) developed a constraining factor model for AMO, proposing that the relevance of the single AMO factors depends on the bottleneck function of each. This model was found to fit the data better than the traditional multiplicative model of AMO.¹¹¹⁵

The central role of motivation is underlined by the constant mediation effects proved for it: Motivation mediates the relationship between relational governance and knowledge integration and knowledge ownership respectively. Aside from that, it also mediates the relationship between tacitness and both success dimensions. In contrast, opportunity has only a mediation function for relational governance in the model of knowledge ownership. In other words, motivation becomes the central explanatory construct to explain the effective governance of knowledge transfer. The level of motivation caused by relational governance and tacitness explains the level of knowledge ownership and integration respectively.

7.3.2 The role of formal and relational governance mechanisms

In contrast to traditional TCE and relational theory, neither formal nor relational governance mechanisms can directly cause higher levels of knowledge ownership and knowledge integration. Relational mechanisms reveal their power on knowledge integration and knowledge ownership via their mediation by motivation. Formal mechanisms do not show any indirect effects in both models. In conclusion, only relational governance mechanisms are effective in managing the success of knowledge transfer.

¹¹¹⁵ Cf. Siemsen and Balasubramanian (2008), pp. 439 ff.

This finding fits the state of the art analysis. Formal governance mechanisms do not have an impact on the results of the late phases of knowledge transfer, but relational governance mechanisms do (cf. insight 3). The finding that relational governance is the most important governance type also fits the perspective of the general research on consultancy and buyer-supplier governance: The research on the success of consulting projects found that the customer-consultant interaction is the most important factor for the success of consulting projects and, consequently, for the survival of every consulting company.¹¹¹⁶ For the general governance of buyer-supplier relationships, BEALE AND DUGDALE (1975) found that heavy reliance on contracts was expensive and constraining, whereas reliance on trust and the belief in mutual fairness was more effective in sustaining the relationships.

The role of relational mechanisms is superior to formal governance mechanisms in both models, but their relative impact differs. In the model of knowledge ownership, relational governance has a total impact throughout the whole model ($p=0.247^{**}$), whereas in the KNI model, the total impact is not significant but limited to the indirect effect via motivation ($p=0.07^{**}$). Consequently, the strategic management of knowledge transfer has to consider that the application of relational governance supports achieving the customer's ownership but its marginal utility diminishes during the process of knowledge transfer as the impact decreases with the successful integration of knowledge.

7.3.3 The role of knowledge characteristics

All three characteristics have been posited to create difficulties for the success of knowledge transfer. The empirical results indicate that these difficulties reveal themselves differently and in one case are not existent at all:

Tacitness¹¹¹⁷ does not impede the success of knowledge transfer directly. It impacts knowledge ownership and knowledge integration indirectly via the negative mediation

¹¹¹⁶ Cf. Schon (1983).

¹¹¹⁷ Due to the factor building of KN types, the factor "Tacitness" has to be interpreted only based on the codifiability of the knowledge whereas the factor "Complexity" has to be interpreted as knowledge that

effect from motivation. Tacitness decreases both knowledge transfer phases because it limits the customer's motivation to receive the knowledge. This finding is in line with SIMONIN (1999b), who proved an indirect effect of tacitness on the ease of knowledge transfer.¹¹¹⁸

There is not much difference between the sizes of the mediation effects of motivation for tacitness when comparing the models of knowledge ownership and knowledge integration. It only slightly decreases from 0.10 to 0.09 from KNO to KNI. Thus, the role of tacitness is considered the same for both success dimensions: Tacitness is a challenge for the strategic management of knowledge transfer that reveals itself only when considering the micro level of the transfer.

Complexity was found to have a direct, positive effect on knowledge ownership as well as on knowledge integration. This stands in contrast to the hypotheses. The attempt was made to explain this with the intense engagement and contact to multiple resources, both of which reduce the “not invented here” syndrome and provide an increased feeling of independence and autarky.

The positive impact of complexity defines its role as a success driver for knowledge transfer instead of as a challenge for the strategic management of knowledge transfer.

The success-driving effect of complexity is greater in the model of knowledge integration than in the model of knowledge ownership. This implies that the positive role of complexity increases during the knowledge transfer process – i.e. from the third to the fourth phase of the process.

Specificity takes different roles in the explanation of knowledge ownership compared to knowledge integration. It has neither direct nor indirect effects on knowledge ownership, but it shows a significant negative effect on knowledge integration.

depends on many combined processes, procedures, and resources including experience knowledge (implicit knowledge).

¹¹¹⁸ He proved that tacitness impacts the ease of KNT via ambiguity but not directly.

Consequently, the role of specificity to explain knowledge ownership is not relevant. It is neither a challenge nor a success driver that has to be accounted for when designing governance for the strategic management of the transfer.

This is in line with COASE (2006), who already went as far as to conclude that specificity is actually irrelevant to explaining transactions.¹¹¹⁹ This also supports the findings of SIMONIN (1999), who could not prove a relationship between specificity and ambiguity to explain knowledge transfer.

The direct, negative effect on knowledge integration defines specificity as a challenge in the last phase of the knowledge transfer process. Therefore, the strategic management of knowledge transfers has to account for the characteristic in order to design governance that safeguards the complete success of the knowledge transfer process.

In order to summarize the role of knowledge characteristics, their impact sizes in the model of knowledge ownership are compared to those in the model of knowledge integration. This shows that knowledge characteristics become more important, the more the knowledge transfer process progresses towards knowledge integration. The impact of complexity increases, and the effect of specificity is only significant in the last phase. The impact of tacitness is almost equal, but it is the only one to decrease slightly.

Table 100 lists all findings of the previous chapters and derives the main findings.

¹¹¹⁹ Cf. Coase (2006), p. 259; Mesquita, Brush (2008), p. 786.

Finding	Main finding
AMO constructs explain a crucial part of the variance of KNO and KNI	Motivation and opportunity are the important micro-mechanisms to explain KNT success
Motivation and opportunity explain the effects of relational governance and tacitness	
For explaining KNT success in buyer-supplier relationships, the role of motivation is more important than that of opportunity and ability.	
The level of motivation that is caused by relational governance and tacitness explains the level of knowledge ownership and integration respectively.	
Tacitness decreases both KNT dimensions because it limits the motivation of the customer to receive the knowledge.	Tacitness and specificity create difficulties for KNT whereas complexity is a success driver
Specificity is a challenge only in the last phase of KNT	
The positive impact of complexity defines its role as a success driver	
None of the effects of knowledge characteristics on KNT success can be changed due to the application of governance mechanisms	Effects of knowledge characteristics on KNT success can't be changed due to the application of governance mechanisms
The effective governance of KNT is limited to relational governance, formal governance has no impact on KNT success	The effective governance of KNT is limited to relational governance
The marginal utility of relational governance diminishes during the KNT process	To govern efficiently, relational governance has to be increased during the KNT process when managing tacitness and specificity whereas it can be saved when managing complexity
Knowledge characteristics become more important, the more the KNT process reaches its end of knowledge integration	
Relational governance can balance difficulties caused by tacitness on the micro-level of motivation	
Relational governance can only create a counterbalance to specificity effects	
Relational governance has to be increased in phase four of the KNT process when governing a KNT process for tacit knowledge.	
Relational governance can be decreased in phase three and even more in phase four of the KNT process when governing a KNT process for complex knowledge.	
Relational governance is only necessary in phase four of the KNT process when governing a KNT process for specific knowledge	Specificity is the biggest challenge for strategic management of KNT followed by tacitness.
Governance of the whole KNT process is most expensive for specific knowledge followed by tacit knowledge. In contrast, transferring complex knowledge provides savings options for the investment in governance.	

Table 100: Overview of findings

8 CONCLUSIONS

Knowledge transfer from supplier to buyer has the objective of integrating new knowledge in the buyer's organization.¹¹²⁰ Such an intended knowledge transfer has to solve the knowledge leverage paradox which is defined by the simultaneous difficulty to interpret and assimilate knowledge and the need to apply it to commercial ends.¹¹²¹

Managing this knowledge leverage paradox means managing the success of the knowledge transfer; accordingly, this topic has employed economic scholars for a long time.

The intense research of the last decade revealed that the characteristics of knowledge as well as governance mechanisms are predictors of the success of knowledge transfer.¹¹²²

Tacitness, complexity, and specificity are such characteristics of knowledge that create difficulties in the transfer process and the integration of the knowledge in the buyer's organization.¹¹²³ The negative impact of these knowledge characteristics on the success of knowledge transfer is based on the argumentation of imitability as proposed by RBV and KBV, respectively.¹¹²⁴

The role of governance mechanisms in explaining the success of knowledge transfer is based on TCE and relational theory. Governance mechanisms represent an important means for coordinating and controlling opportunistic behavior and information sharing. They manage the transfer and secure its success by limiting costs and increasing the value.¹¹²⁵

The strategic management of knowledge transfer has to choose and design the governance mechanisms in such a way that they compensate the negative effects of the knowledge characteristics effectively and efficiently. Thus the interaction of governance

¹¹²⁰ Cf. Szulanski (1996); von Krogh/Köhne (1998).

¹¹²¹ Van Wjik et al. (2008) p. 844, cf. also Coff et al. (2006).

¹¹²² Cf. KNT framework in Chapter 3.

¹¹²³ Cf. Birkinshaw et al. (2002), Van Wjik et al. (2008); Simonin (1999b, 2004); Coff et al. (2006).

¹¹²⁴ Cf. Winter (1987); Reed/DeFilippi (1990); Simonin (1999b).

¹¹²⁵ Li et al. (2010), p.272. and cf. Adler (2001); Bradach and Eccles (1989); McEvily et al. (2003); Liu et al. (2009).

8. Conclusions

mechanisms and knowledge characteristics is the major question for the strategic management of a knowledge transfer.

Notwithstanding the amount of conceptual and empirical accomplishments that have been contributed to an understanding of the interaction of governance mechanisms and knowledge characteristics, it has been concluded that these relationships are still an unresolved puzzle. Research has proved that tacit knowledge is governed most effectively by using relational governance mechanisms¹¹²⁶ and that formal governance has no or minor effects on managing tacit knowledge.¹¹²⁷ However, this is only one third of the question regarding the governance of knowledge characteristics. For complexity and specificity, the interaction with governance mechanisms has not yet been discussed. Moreover, the empirical effects of knowledge characteristics and governance mechanisms have not been associated with the respective phase of the knowledge transfer process that was the subject of the analysis. Thus a differentiated governance of the phases of knowledge transfer has neither been questioned nor specified.

In addition, the analysis of alliances has so far been in the focus of research on knowledge transfer. Professional and intended knowledge transfer from supplier to buyer has been neglected.

Finally, the theoretical discussion of the interaction between governance mechanisms and knowledge characteristics never left the macro level of explanation. The macro level is the traditional explanatory level arguing on the level of firms. Micro level reasoning integrates the individual level of the transfer and reflects the causal mechanisms. Theory on this level is rare, and empirical evidence is lacking.

Therefore, this thesis investigated the role of governance mechanisms and knowledge characteristics from a macro and micro level perspective with stronger conceptual rigor regarding the knowledge transfer phases and with the objective to solve the puzzle for the “knowledge-governance choice”.

A PLS-based structural equation model analysis based on empirical data from 101 consultant-client knowledge transfer projects was employed to test a system of 27

¹¹²⁶ Lawson et al. (2009), p. 159.

¹¹²⁷ See insight 5 in Chapter 3.

hypotheses. It investigated the relationships between knowledge characteristics, the chosen governance mechanisms, the performance conditions of the buyer's employees, and the completion of different knowledge transfer phases in the buyer's organization.

The purpose of this analysis was to answer the question of effective governance for all knowledge characteristics while simultaneously recognizing that knowledge transfer is a result of different process phases enacted by individuals. This analysis overcomes the common approach of investigating the governance of knowledge for only one knowledge characteristic, addressing the neglected micro level investigation of governance and knowledge, and covering the rare process-based understanding of success in knowledge transfer. Implications of the major findings, key contributions, some limitations, as well as an outlook on future research are given in the following.

8.1 *Managing the knowledge leveraging paradox*

The initial research question of this thesis asked how the different types of knowledge can be leveraged by applying proper governance to a transfer. The results of the empirical analyses indicate that none of the effects of knowledge characteristics can be changed with the application of governance mechanisms. This finding implies that the fit between governance mechanisms and knowledge characteristics cannot be explained on the macro level. Instead the micro level mechanisms of AMO need to be analyzed to identify a joint impact of governance mechanisms and knowledge characteristics. Only the micro mechanism affected by both independent variables can be used to explain their successful combination.

The micro mechanism that explains the impact of relational governance on knowledge integration is motivation. The impact on knowledge ownership is additionally explained by opportunity. Consequently, relational governance can only manage difficulties in knowledge transfers addressing motivation or opportunity.

Formal governance mechanisms neither have an impact on the knowledge transfer phases nor on the micro mechanisms. Thus the effective governance of knowledge transfer is limited to relational governance.

The only knowledge characteristic that shares a micro mechanism with relational governance mechanisms is tacitness.

Tacitness decreases knowledge transfer by reducing the motivation to receive the knowledge within the model of knowledge integration and the model of knowledge ownership.

The strategic management of knowledge transfer can use relational governance to counterbalance this effect. The level of motivation needs to be balanced in such a way that any negative effects of tacitness on motivation do not cause a negative motivation to receive the knowledge – i.e. the refusal to receive the knowledge.

Formal governance mechanisms are no means for increasing the customer's motivation to receive the knowledge. Therefore, the governance of knowledge transfer is not about deciding for the one or the other type of governance, but about how much of relational governance is sufficient to balance out the negative effects of tacitness on motivation.

The path coefficients¹¹²⁸ of relational governance mechanisms and knowledge characteristics indicate that an additional unit of relational governance increases motivation by 0.2229 units, whereas an additional unit of tacitness decreases motivation by 0.2687 units. Consequently, for every additional unit of tacitness, relational governance has to be increased by 20.5% ($0.2687 / 0.2229$) to balance out the negative effects of tacitness. This ratio of the path coefficients defines the efficient use of relational governance when managing tacitness to reach knowledge ownership.

In the model of knowledge integration the path coefficients are slightly different. To manage the integration of tacit knowledge efficiently, relational governance has to be increased for 20.9% ($0.2694/0.2229$). This increase balances the negative impact on motivation when tacitness is increased for one unit.

In summary, relational governance has to be increased from the knowledge ownership phase to the knowledge integration phase when governing a complete knowledge transfer process characterized by tacit knowledge.

In both phases of the knowledge transfer process, tacitness also decreases the opportunity to receive knowledge, but this impact does not have an overall impact on

¹¹²⁸ According to Hair et al. (2013), path coefficients can be interpreted like regression coefficients.

the knowledge transfer.¹¹²⁹ Thus counterbalancing governance is not needed for this impact.

The characteristic of complexity does not address any micro mechanism and is not a challenge for the knowledge transfer. The constant, positive impact of complexity defines its role as a success driver.

This implies that effective strategic management of complex knowledge – i.e. doing the right thing – is indeed no application of governance.

Still, complexity has an independent, positive effect that needs to be accounted for in order to design efficient governance. The strategic management of a knowledge transfer characterized by complex knowledge can improve the efficiency of the governance design by saving the investments in governance mechanisms.

The total impact of relational governance on knowledge ownership is 0.2474, and the impact of complexity is 0.2276. Thus, when complexity increases by one unit, relational governance can be decreased by 1.09 units ($0.2474/0.2276$) (*ceteris paribus*).

In the model of knowledge integration, the total impact of complexity is 0.23, whereas that of relational governance is not significant. For relational governance mechanisms, only the indirect effect via motivation has an impact on the level of knowledge integration and can be used to increase efficiency. This indirect effect is 0.07. As a result, relational governance can be reduced by 3.29 units ($0.23/0.07$) when complexity increases by one unit.

In conclusion, the investment in relational governance can be decreased in the knowledge ownership phase and even more in the knowledge integration phase when governing a knowledge transfer process characterized by complex knowledge.

The direct, negative effect on knowledge integration defines specificity as a challenge in the integration phase of knowledge transfer. The lack of mediation effects from motivation or opportunity indicates that this effect cannot be counterbalanced effectively on the micro level.

The only means to manage the success of knowledge integration characterized by specific knowledge is creating as many positive effects on knowledge integration as

¹¹²⁹ All indirect effects are insignificant or do not fulfill one of the prior requirements of a mediation effect.

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specificity is creating negative effects - which is actually not management of the characteristic's effects but can be more likened to "fire fighting."

To do this efficiently, the relative impacts of the path coefficient indicate that an increase of specificity by one unit has to be countered by using 2.5 (0.1781/0.07) additional units of relational governance mechanisms.

For the governance of knowledge ownership, specificity is not relevant. It neither creates any difficulties for the transfer nor does it create any positive effects on knowledge ownership. Therefore, specificity does not demand any kind of governance to manage successful knowledge ownership.

Still, the application of relational governance will show positive effects on knowledge ownership by increasing the motivation to receive the knowledge. Since there is no negative impact to counterbalance, it is not necessary to invest in those means. This implies that no investment in governance is the most efficient way to reach knowledge ownership in a transfer of specific knowledge.

In order to summarize the governance recommendations to manage the transfer of specific knowledge, the investment in governance needs to be increased when managing knowledge integration compared to knowledge ownership.

Table 101 summarizes the needed units of governance to manage the effects of the knowledge characteristics in the ownership and integration phase of the knowledge transfer.

It shows that the governance of the whole knowledge transfer process is most expensive for specific knowledge (0+2.5), followed by tacit knowledge (1.205+1.209). In contrast, transferring complex knowledge provides savings option for the investment in governance.

	Knowledge ownership (KNT phase 3)			Knowledge integration (KNT phase 4)		
	tacitness	complexity	specificity	tacitness	complexity	specificity
Relational GMs	1.205 units	-1.09 units	0	1.209 units	-3.29 units	2.5 units
Formal GMs	0	0	0	0	0	0

Table 101: Degree of efficient governance of knowledge characteristics

In addition, the table visualizes that relational governance has to be increased during the knowledge transfer process when managing tacit and specific knowledge whereas it can be decreased when managing complex knowledge.

The initial research questions asked for the effective and efficient governance mechanisms to manage knowledge transfers with different characteristics. Figure 53 summarizes the findings and provides an answer to each research question. It visualizes that the management of different knowledge types in knowledge transfer cannot be solved by recommending the effective type of governance. Rather the characteristics pose efficiency questions to the strategic management of knowledge transfer, i.e. how to apply the correct amount of relational governance mechanisms as defined by Table 101 above.

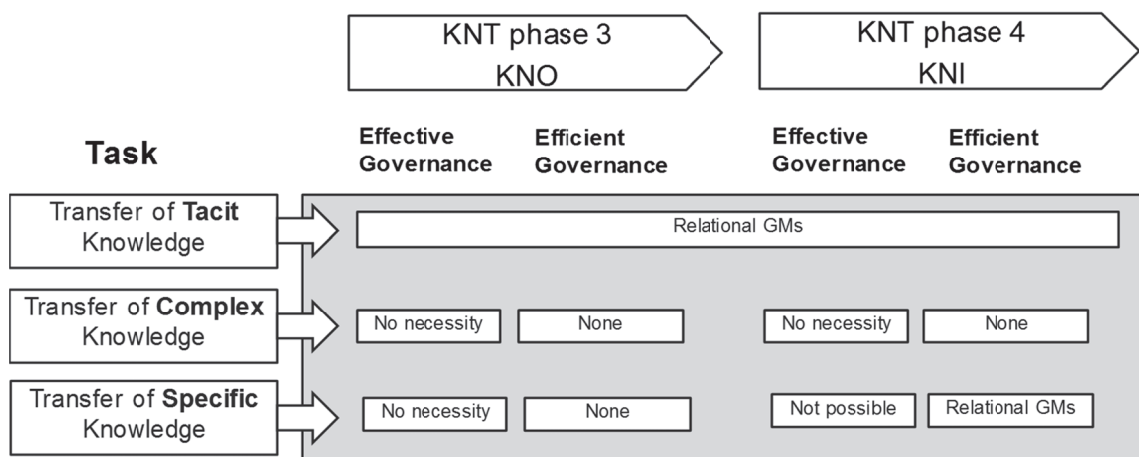


Figure 53: Comparing governance of knowledge types for KNO and KNI

These research results have implications for the practical management of knowledge transfer in consultancy firms as well as in customer firms, which will be outlined in Chapter 8.3. The underlying findings to some extent support the theoretical underpinnings used to build the system of hypotheses, but they reject the application of others. Therefore, the implications on the theoretical frameworks for the explanation of knowledge transfer success and on the practical management and organization of knowledge transfer are outlined in the following.

8.2 *Theoretical implications*

This thesis began its analysis of the appropriate governance for the transfer of different types of knowledge by identifying the roles of governance and knowledge types in the knowledge transfer framework.¹¹³⁰ The framework identified governance as well as knowledge characteristics as predictors of knowledge transfer. They interact in the complex transaction of knowledge from sender to receiver. Additionally, this thesis reviewed the theoretical discussion of the micro level versus the macro level of knowledge transfer based on the model of social science explanation created by COLEMAN (1995). The role of governance mechanisms and knowledge types was specified as social facts and macro level elements. The micro level of the social science model defines that personal mechanisms explain the success of knowledge transfer. Knowledge transfer research has not yet defined which micro mechanisms are relevant for explaining knowledge transfer. The theoretical model of this thesis applied the ToWP to define the ability, motivation, and opportunity to receive the knowledge (AMO) as micro mechanisms. The AMO mechanisms were used to explain the impact of governance mechanisms and knowledge characteristics, serving as the explanatory mechanisms for the fit of certain governance mechanisms to certain knowledge characteristics.

In summary, this thesis theorized the role of governance mechanisms and knowledge characteristics by integrating the theory of work performance into the model of social science explanation. It argued that they both impact micro mechanisms, but in different ways. This explains the fit of governance and knowledge.

Therefore, the findings of this thesis have theoretical implications for the design of the general knowledge transfer framework, the applicability of the general social science model for explaining the success of knowledge transfer, and the applicability of the ToWP explaining knowledge processes. In addition, new insights are gained for the relevance of the KBV, TCE, relational theory, and the process- based view on the success of knowledge transfer.

¹¹³⁰ Introduced by Easterby-Smith, Lyles, Tsang (2008).

8.2.1 Applicability of the general model of social science explanation and ToWP to knowledge transfer

The increase in explanatory power from macro models to micro models of the knowledge transfer phases indicates that it is very beneficial to engage in micro level considerations of knowledge transfer. Thus, this thesis supports the research faction based on the general model of social science explanation. More micro-foundations are necessary in the research on knowledge transfer.¹¹³¹

ToWP was used to define the micro mechanisms as the ability, motivation, and opportunity to receiver the knowledge. According to ToWP, the three AMO mechanisms are essential ingredients for personal performance in such a way that each mechanism “serves only as a necessary, but not sufficient condition.”¹¹³²

The findings of this thesis support this to some degree. Only motivation and opportunity show significant positive impacts on knowledge ownership and knowledge integration and as a result on knowledge transfer. Ability is a significant explanation criterion only for knowledge ownership, but shows a negative impact on knowledge integration. This effect occurs because the relationship between ability and KNI is an inverted U, rather than a linear shape, and because the average level of ability is rated very highly in the sample. Since a PLS-based SEM cannot calculate non-linear effects, the further interpretation of the ability role was rejected in favor of definite conclusions.

In summary, the results show that the ToWP basically serves well to explain the success of knowledge transfer. The constraints, in contrast to the original theory, are that the relevance of the AMO variables differs in explaining the performance of knowledge ownership and knowledge integration and that the relationships are probably not linear. Although not expressed in BLUMBERG & PRINGLES’s (1983) original formula of the ToWP, they theorize that the relative effects of the micro mechanisms “probably vary from setting to setting.”¹¹³³ “For example, opportunity appears to be a critical determinant of performance in coal mines, but it may have less impact in an insurance

¹¹³¹ E.g. Foss et al. (2009, 2010), Felin & Foss (2005), Felin & Hesterly (2007), Felin et al. (2009), and Argote et al. (2003).

¹¹³² Andrews (1988), p. 220.

¹¹³³ Blumberg & Pringle (1982), p. 566.

company.”¹¹³⁴ This assumption of relative importance can be supported by the findings of this thesis. For knowledge ownership, motivation and opportunity are important determinants of performance. For knowledge integration, all three AMO mechanisms are important determinants of performance.

As the strategic management of successful knowledge transfer includes both phases, it has to ensure the presence of all three AMO mechanisms and has to note that the relationship of AMO and the success of knowledge transfer is more complicated than initially proposed by the ToWP. This finding is in line with the work of SIEMSEN AND BALASUBRAMANIAN (2008). They developed a constraining factor model for AMO which proposes that the relevance of the single AMO factors depends on the bottleneck function of each.

In summary, the ToWP is assessed to be suitable for explaining the success of knowledge transfer. It provides a valuable theoretical source for defining the causal mechanisms for knowledge transfer. It extends the current understanding of knowledge transfer by explaining the impact of macro level constructs on the knowledge transfer success.

Using the ToWP, this thesis provides evidence that the success of relational governance mechanisms in managing the success of knowledge transfer and the dominant negative effect of tacitness can be explained by the motivation to receive knowledge. Thereby, it forms the need to formally recognize and integrate micro mechanisms in future research on the success of knowledge transfer. It creates a future research interest in testing the applicability of AMO to explain the impact of the remaining predictors of performance in the success of knowledge transfer framework.

In line with current empirical research, this thesis proved that a single AMO mechanism is not equally important to explain social outcomes like the success of knowledge transfer. In addition, their relevance differs for different performance constructs. Motivation is more important than the other mechanisms, and the impact of all three mechanisms changes for knowledge ownership in comparison to knowledge integration.

¹¹³⁴ Blumberg & Pringle (1982), p. 566.

This thesis could not clarify the role of ability in explaining knowledge transfer, but it assumes a non-linear relationship of ability with the performance construct. These findings suggest that the roles of AMO need to be differentiated in the theoretical grounding.

8.2.2 Relevance of KBV, TCE, relational theory, and the process-based view on knowledge transfer success

The macro level argument for the effects of governance mechanisms and knowledge characteristics was based on TCE, relational theory, and the KBV. The micro level argument was based on the ToWP. The results of this thesis provide new insights into the relative importance of these theories for explaining the success of knowledge transfer.

The KBV argues on the firm level that knowledge characteristics create transfer difficulties because they decrease the imitability of the knowledge. This reasoning is only valid for specificity because it is the only characteristic that places direct difficulties on the transfer success. Tacitness effects are only indirect, and complexity effects are positive. The indirect effect of tacitness could be explained by its effect on motivation. As a result, the ToWP is superior to the KBV in explaining the successful ownership and integration of tacit knowledge.

The positive effect of complexity could not be argued by one of the theories. This relationship defines a need for future research.

The TCE argues that formal governance mechanisms are effective in increasing the success of knowledge transfer, because they reduce opportunistic behavior and moral hazard. Relational theory argues that relational governance mechanisms increase the success of knowledge transfer because they promote information sharing and social contacts.

Neither relational nor formal governance mechanisms show direct effects on knowledge transfer. TCE and relational theory arguments for the governance of transactions are not applicable to explaining the effective governance of knowledge transfer. In contrast, ToWP can be applied to explain effective governance as it explains the effects of relational governance via the mediation of motivation and opportunity. Consequently,

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ToWP is superior to TCE and relational theory in explaining the governance of knowledge transfer.

The exclusive effect of relational governance mechanisms on knowledge transfer implies that the research question is not a question of superior governance mechanisms – i.e. relational or formal. Rather it is a question of the efficient use of relational governance. This rephrasing the research gap frequently addressed by previous research thus specified the question of the governance of knowledge types - i.e. the actual research arena.

This thesis considered the success of knowledge transfer from a process-based view. The results indicate that the effects of relational governance mechanisms and knowledge characteristics differ for knowledge ownership compared to knowledge integration. Consequently, the question of the governance of knowledge transfer cannot be answered globally for the whole knowledge transfer process. This finding indicates that the chosen process-based view on knowledge transfer is very valuable for future research, because success in knowledge transfer and its governance can be explained differently for each phase.

The differentiated analyses of the phases ownership and integration in this thesis already showed valuable insights: The KBV cannot be used to explain knowledge effects on every phase of the knowledge transfer. Research based on the KBV used the knowledge base view as the predominant dimension to measure the success of knowledge transfer.¹¹³⁵ In contrast to the findings of this thesis, they successfully explained and established direct effects of different knowledge types. Thus, the unconstrained applicability of KBV for a different view on the success of knowledge transfer other than the knowledge base view has to be neglected. A knowledge base view does not reflect the complexity of the governance question for the knowledge transfer process. Future research therefore might put more emphasis on differentiating all findings for the different phases of the knowledge transfer process.

¹¹³⁵ Cf. Simonin (1999,2004), Kogut & Zander (1995).

8.2.3 Adaptation of the general knowledge transfer framework

This thesis established the need to integrate micro mechanisms into the explanation of knowledge transfer. Therefore, the overall framework of knowledge transfer as developed by EASTERBY-SMITH, LYLES, TSANG (2008) needs to be adapted. It should not only differentiate between different predictors of knowledge transfer but show that the predictors operate on different levels of the knowledge transfer explanation.

The framework already contains “motivation” on the part of the sender as well as the receiver as a predictor that explains success in knowledge transfer. This thesis provides the reason why motivation is already prominent in the framework: It is the most important micro level factor, which has the highest impact on knowledge ownership and knowledge integration and mediates relational governance and tacitness effects. Still, the position of motivation in the framework is misleading. Motivation can be considered a cause for success in knowledge transfer, not only a predictor. The framework does not differentiate these two general roles in its concept and visualization.

In addition to motivation, opportunity is a second central micro level factor. Its direct effect is as important as motivation and causal for success in knowledge ownership and knowledge integration. For a complete theoretical framework of knowledge transfer, both motivation and opportunity need to become causal factors of the knowledge transfer framework.¹¹³⁶

The integration of the micro level broadens the existing perspective on the explanation of knowledge transfer. It provides a new lens with which to examine the predictors of performance for knowledge transfer. The empirical results show that huge portions of the effects of tacitness and relational governance on knowledge transfer are explained by the mediation of motivation. In contrast, the direct effects of tacitness and relational governance on knowledge transfer are insignificant. Based on these results, it is questionable whether the direct effects found by research on the macro level are really suitable to sufficiently identifying predictors of performance. Direct effects could even be misleading in the direction of their impact if the mediation on the micro level creates a suppressor effect. This thesis suggests reviewing the impacts of macro level effects in order to really understand their impact on knowledge transfer.

¹¹³⁶ The role of ability is still vague. Therefore, the positioning on the KNT framework is not justified yet.

8.3 *Practical implications*

For the strategic management of a buyer-supplier knowledge transfer, specific practical questions have been phrased at the beginning of this thesis:

- 1) Can the difficulties of a certain knowledge type be resolved by applying either relational or formal governance mechanisms to the knowledge transfer?
- 2) Is one type of governance useful for covering all the difficulties of different knowledge characteristics, or is it necessary to adopt a combination dependent on the knowledge type?
- 3) Is a single application of one or the other group effective and efficient, or is a combination of relational and formal mechanisms needed?

These questions address the effective and efficient organization of a knowledge transfer characterized by different types of knowledge.

This thesis provides answers to all of these questions and derives the implications for organizing and managing knowledge transfer at consultancy companies and at buyers of consultancy services as follows.

8.3.1 **Effective governance of knowledge transfer**

When the goal of a consultant project is knowledge transfer, the only effective governance is relational governance. Formal governance¹¹³⁷ does not have any impact on the success of the knowledge transfer. This does not mean that they are useless in governing consultancy projects. In fact, these types of mechanisms are important for securing the success of the project in terms of time and budget.¹¹³⁸ However, when concentrating on managing a knowledge transfer in terms of knowledge ownership and integration, these mechanisms can be ignored. In conclusion, engaging in arguing about contract clauses and project management procedures at the beginning of a project, which has a focus on knowledge transfer, is wasting money for consultants and customers alike.

¹¹³⁷ E.g. the design of contracts that specify the obligations of the buyer or define the consultants for the projects.

¹¹³⁸ Cf. Bstieler, Hemmert (2010), pp.485 ff.

In order to organize the transfer, both parties should concentrate on implementing procedures ensuring that every project installs relational governance mechanisms. Since relational mechanisms are not well known in a project management culture¹¹³⁹, definitions and examples that are listed and described in a standard project procedure may help to increase the awareness and use of such mechanisms.

Shared problem solving with the customer, informal events, and the establishment of close relationships are such successful relational governance mechanisms. They are effective because they increase the motivation of the customer team to receive the knowledge and to create the opportunity to learn from the consultants. Of course, there are many more relational mechanisms that increase motivation and opportunity the parties can apply. Thus companies that frequently engage in knowledge transfer are recommended to set up a collection of relational mechanisms that can serve as a tool kit for the project managers. This means that project managers can apply standard relational mechanisms to manage the knowledge transfer effectively.

The personal ability of the customer team to receive the knowledge is not relevant for increasing knowledge ownership. This implies that the customer company does not need to staff a project with people that are familiar with the subject of the project or that have similar capabilities like the consultants. The customer company should rather staff the project with people interested in learning the knowledge provided by the consultants.

The results of this thesis indicate that it does not matter what kind of knowledge is transferred to govern the transfer effectively. When managing knowledge transfers, relational governance is always needed. The general advice to practitioners is: The more relational governance is used, the more the knowledge will be owned and integrated by the customer. In conclusion, the choice can be easily made in the governance of knowledge transfer.

The implications for consultants and customers are summarized by practical DOs and DON'Ts below:

¹¹³⁹ Cf. PMI standard procedure.

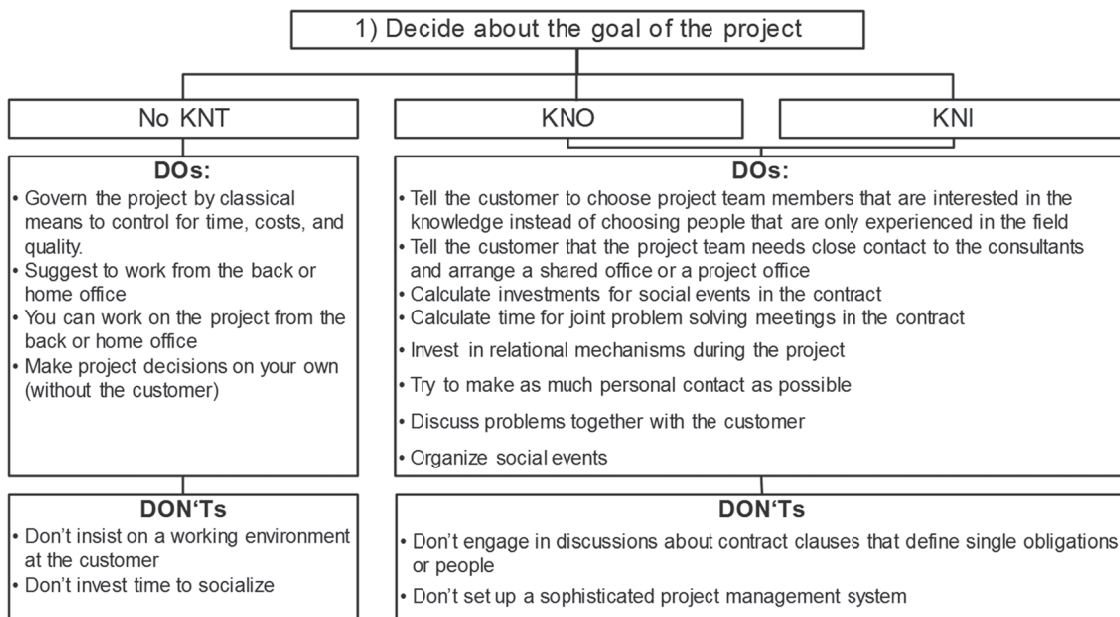


Figure 54: DOs and DON'Ts for practitioners

8.3.2 Efficient governance of knowledge transfer

Making the right choice is one aspect of the strategic management of knowledge transfer. Doing things right is another. Creating an efficient governance design is not as easy as recommending that the more relational governance mechanisms are used, the better the knowledge transfer will work. The type of knowledge transferred and the goal of the transfer determine the amount of relational governance that is needed. Consequently, managers need to figure out what type of knowledge is the subject of the transfer and what knowledge transfer phase result they are aiming for.

If the project aims to integrate the knowledge into the customer’s organization and not only add it to the knowledge ownership by the customer’s project team, the impact of relational mechanisms decreases. Thus, the intensity of relational governance mechanisms has to be increased during the knowledge transfer process in order to maintain a constant performance in both knowledge transfer phases. This implies that a knowledge transfer aiming for knowledge integration is more expensive than a knowledge transfer aiming for knowledge ownership. As a result, the investments for relational governance mechanisms have to be accounted for when calculating the project in the beginning.

In addition to the goal of the knowledge transfer, the efficient design of governance also has to take into account the type of knowledge to be transferred.

If the objective of the knowledge transfer is knowledge ownership of the team, efficient governance design has to take into account the effects of tacit and complex knowledge.

If the objective is knowledge integration, efficient governance design needs to consider the effect of specificity as well. Specific knowledge causes a difficulty only for knowledge integration. This effect cannot be changed, but it needs to be counterbalanced with substantial investments in relational governance mechanisms.

Whenever tacit¹¹⁴⁰ knowledge has to be transferred in a project, the company has to make extraordinary investments in relational governance mechanisms. Knowledge that is tacit reduces the motivation of the customer team, because the people do not know where to focus their efforts. It creates the need for more contact with the consultant to understand and learn these experiences. Relational governance mechanisms can manage the level of motivation and opportunity to receive the knowledge and thereby secure the success of knowledge transfer characterized by tacitness.

Knowledge that is rather complex and includes many inter-dependent procedures or tools directly increases its acceptance at the customer. Complex knowledge does not influence the customer's team performance. Instead it makes the customer pay more attention and concentrate on working with the knowledge to understand it. This directly affects his feeling of ownership and acceptance of the knowledge. As a result, the investment in relational governance mechanisms can be modest when the project contains complex knowledge.

These results indicate that the governance of the whole knowledge transfer process is most expensive for specific knowledge, followed by tacit knowledge, whereas transferring complex knowledge requires less investment in governance.

In practice, knowledge is never defined purely by only one characteristic. Rather, it is defined by a combination of characteristics. Thus in addition to the specification of the goal of the transfer, management needs to determine what characteristics of knowledge are present in the transfer to apply efficient governance.

¹¹⁴⁰ E.g. experience or ways of handling something.

8.3.3 Strategic implications for knowledge suppliers

The traditional governance of consultancy project relies on project management standards like PMI.¹¹⁴¹ The results of this thesis indicate that this traditional governance of consultancy projects does not create any effective governance for knowledge transfer projects. This implies that stepping into the knowledge economy is not business as usual. Even in a knowledge-intensive industry like consultancy, familiar with the management mechanisms of projects, the step towards becoming a successful knowledge supplier is huge. Governance that is best practice for project management success is neither sufficient nor even effective for achieving success in a knowledge transfer.

This finding also implies consequences for the business model of a consultancy: When aiming for knowledge transfer, the value proposition of a consultancy is as a knowledge supplier. This is completely different from being a project supplier. The consultants of a knowledge supplier have to be able to develop social contacts and create relationships with the customer instead of being experts in managing time, costs, and quality. The projects need to be managed in cooperation with the customer rather than by formal project management. Furthermore, the project results have to be delivered by frequent personal contact.

The results of this thesis indicate that such a business model characterized by relational governance mechanisms pays off. The financial concept of a knowledge supplier should however include billing the use of relational mechanisms. The customer gets the value he was proposed when investing in these mechanisms.

¹¹⁴¹ Cf. Chapter 5.1.

8.4 Key contributions

Previous research on the governance of knowledge transfer formulated a research gap which is effective governance of knowledge transfer characterized by different types of knowledge.

This thesis shows that knowledge characteristics have different impacts on the success of knowledge transfer. Specificity is the biggest challenge in knowledge transfer followed by tacitness. A surprising result is that complexity has a positive effect on knowledge transfer. These findings correct the call for a differentiated analysis of knowledge characteristics so that research does not have to investigate the governance of complexity any further.

In addition, these findings reject the general explanatory power of the KBV to explain the effects of knowledge characteristics on knowledge transfer when taking a process based-view on the success of knowledge transfer. Thereby, this thesis specifies that the usability of the KBV is more appropriate for the knowledge base perspective on the success of knowledge transfer and limited for the process-based view on the success of knowledge transfer. This contributes to a more precise understanding of the theory application and scope of the KBV.

Further, contribution to precise theory application is provided by the differentiated analysis of governance effects within the single phases of knowledge transfer. The impact of relational governance decreases from knowledge ownership to knowledge integration. Thus it is necessary to differentiate research on governance for different phases of knowledge transfer in the future.

The effect of knowledge characteristics differs for knowledge ownership and knowledge integration. This finding defines the same need for differentiated research on the knowledge-based view.

First of all, this thesis focuses on the research arena for the governance of knowledge on tacitness and specificity, defining a limited usability of the KBV for the process-based view on the success of knowledge transfer and defining the need for a differentiated view on the single knowledge transfer phases when explaining governance and knowledge effects.

A second contribution is the increased understanding of how governance and knowledge affect the success of knowledge transfer. The dominant effects of relational governance, tacitness, and motivation in previous knowledge transfer research can be explained now, because this thesis specifies the role of motivation. Motivation is the central explanation of performance dynamics in the success of knowledge transfer. It is the mechanism on the micro level that mediates multiple relationships which do not have direct effects on the success of knowledge transfer.

Motivation and opportunity mediate the effect of relational governance mechanisms on the success of knowledge transfer but not that of formal governance mechanisms. The two mechanisms explain the overwhelming power of relational mechanisms and the limited strength of formal mechanisms when managing knowledge transfer.

Motivation also explains the impact of tacitness on the success of knowledge transfer. Thus, the consideration of the micro level provides a deep understanding of the predominant role of tacitness as a research object. The neglected role of specificity and complexity can now be reasoned because the challenges of these knowledge characteristics are not relevant on the micro level. Their effects are not interconnected to other determinants of the success of knowledge transfer.

The mediation effects of motivation and opportunity provide first empirical insights into the interaction of macro and micro mechanisms in knowledge transfer research. The fact that tacitness and relational governance mechanisms affect the people in the transfer process supports the call for micro level research. Moreover, it provides empirical support for the theoretical work of NONAKA (1994) and the theoretical research on the multi-level knowledge transfer process¹¹⁴². In addition, the finding that not all AMO mechanisms are equally important details the understanding of the micro level. It shows that every single AMO mechanism has different roles that need to be recognized by the research community. This leads to a more differentiated understanding of the causal mechanisms for the success of knowledge transfer.

Finally, understanding the effects of governance mechanisms and knowledge on the success of knowledge transfer contributes to being able to assess the relative value of theories in explaining the success of knowledge transfer. ToWP, explaining the role of

¹¹⁴² Researchers that established and represent this multi level view on the KNT process include Cohen/Levinthal (1990), Grant (1996), Squire et al. (2009).

micro mechanisms, is superior to traditional arguments based on KBV, TCE, and relational theory.¹¹⁴³

The goal of this research was to identify the effective and efficient governance of different knowledge characteristics. Prior research tried to argue for the effectiveness of governance by explaining the interaction of governance mechanisms and knowledge characteristics on a macro level. This thesis proved that the relationship between governance mechanisms and knowledge characteristics unfolds on the micro level of motivation and opportunity. The integration of the micro level provides the insight that motivation is limited by tacitness and simultaneously can be managed by relational governance. In contrast, formal governance mechanisms, specificity, and complexity do not affect the micro level. This explains the effectiveness of governance in managing knowledge transfer at a level of detail that is new to research on knowledge transfer. It opens the black box of macro level interaction effects by providing the causal relationships of those interactions.

An additional contribution of this micro level analysis is the correction of the question of governance in knowledge transfer. This question is not about effectiveness, but about efficiency. The amount of relational governance matters in managing the knowledge transfer efficiently - the decision for relational or formal governance mechanisms does not. As a result, this thesis calculated that specificity needs the highest investment in relational governance, followed by tacitness, to manage a successful knowledge transfer. For managing complexity, the investment is moderate and can be saved as the knowledge becomes more complex.

In addition to answering the question of effective and efficient governance of knowledge transfer, the empirical analyses differentiate the results for the governance-knowledge fit for the different phases of knowledge transfer. The results provide evidence that not only knowledge characteristics, but also the phase of the knowledge transfer matters to design efficient governance. The impact of relational governance decreases during the process of knowledge transfer, and specificity only needs to be managed in the final phase of the knowledge transfer process (KNI). Thus, the major

¹¹⁴³ ToWP explains the effects of relational GMs and tacitness on KNT success whereas KBV explains only specificity. TCE and relational theory could not explain any effect significantly.

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contribution of this thesis is that the advice for the efficient governance of knowledge transfer can now be differentiated for the three characteristics of tacitness, complexity, and specificity as well as for the phases of knowledge ownership and knowledge integration. Thereby, the thesis provides evidence that the knowledge leveraging paradox can be managed if the governance design consciously accounts for the knowledge type, the process, and the levels of knowledge transfer.

Defined by the prominent role of relational governance mechanisms, the results encourage practitioners to focus on their socialization and interaction processes. Firms in the knowledge economy have to emphasize human resources that are able to create social relationships with external partners, on a production of the service in cooperation with the customer, and on delivery channels based on frequent personal contact. In contrast, the traditional governance of consultancy projects relies on project management standards like PMI.¹¹⁴⁴ This thesis contributes to understanding the need for a fundamental shift in the forms governing economic activity when stepping into the knowledge economy. It can help organizational scholars and practitioners in recognizing the urgent need to differentiate their models, assumptions, and practices significantly to account for how knowledge transfer is and will be performed and organized.

In summary, this research extends and details the findings on the governance of knowledge transfer, the relevance of knowledge characteristics in knowledge transfer research, and the performance dynamics of knowledge transfer in general. It contributes to understanding the value of different theories for explaining the success of knowledge transfer and the limitations of their application. As a result, it provides practical advice for the management of knowledge transfer and the business model of knowledge suppliers by providing a solution to managing the knowledge leveraging paradox.

¹¹⁴⁴ Cf. Chapter 5.1.

8.5 *Limitations and suggestions for future research*

The results of this thesis should be considered in light of its constraints. In order to correctly evaluate and interpret the results of this thesis, the limitations that apply for this thesis are outlined below, and suggestions for future research are provided.

All findings presented in this research are limited to a single knowledge supplier and geographic area. This focus is grounded in the application of the ToWP that asks for very sensitive personal information and has the advantage of eliminating uncontrolled exogenous influences that may confound results. Nevertheless, it also means that generalizability to other knowledge suppliers and to less knowledge-rich environments than consultancy needs to be explored by future research.

A general limitation that also applies to all findings is the statistical power of the model. The independent variables explain up to 45% of the variance in the knowledge transfer. This means that the explanation of success in knowledge transfer is not limited to the findings in this thesis, but that future research needs to explore the reasons for the remaining variance.

The research design of this thesis took a customer-based view. It analyzed the micro level of the customer team (AMO to receive the knowledge) to define how governance affects them. As the knowledge transfer process involves both parties on the micro level, the role of the AMO of the supplier team is equally important. Future research might set up models that investigate the micro level mechanisms of both parties. This thesis was not able to test a more complex model as the number of independent constructs was limited to ten due to the sample size. Thus, the challenge to be addressed by future research is a large sample size to test the complex model.

All data to measure the success of knowledge transfer was measured at the same time using one respondent. This approach was used to get reliable data for every phase of the knowledge transfer from a person involved during the whole process. However, measuring the results of the process from such a retro perspective limits the understanding of the results of the project team compared to the results of the

organization to a single source opinion. Consequently, the findings do not necessarily apply for a knowledge transfer measured by asking different respondents at different times of the process. A new element in the research on inter-organizational knowledge transfer is that the impact of the governance and knowledge characteristics needs to be differentiated for single knowledge transfer phases. Moreover, the results of this thesis indicate that this is a promising arena for future research.

In order to continue the research for different phases of the knowledge transfer process, future studies might benefit from longitudinal studies analyzing the development of the effects at different knowledge transfer stages. Furthermore, knowledge integration may be measured on a different management level than knowledge ownership to allow a clear evaluation of organizational and project effects.

In addition to limitations that apply to all findings, some limitations apply only to single findings:

The findings for the role of ability are limited because PLS analysis was chosen to test the system hypotheses. PLS was selected because the system of hypotheses is complex compared to the sample size and because the constructs are latent variables. However, PLS is limited to investigating linear relationships. The relationship of ability and knowledge integration is, in contrast to ToWP, negative and is assumed to actually be an inverted U. Since it is not possible to test non-linear relationships with PLS, the understanding of the role of ability could not be defined clearly. As not only ability but also motivation and opportunity might have non-linear relationships with knowledge transfer, future empirical tests need to be able to also cover non-linear methods. Therefore, it is recommended to use more flexible methods in future empirical research to analyze the effects of single AMO mechanisms.

The findings for moderation effects and heterogeneity are limited because of the sample size. The sample size of the empirical analysis is 101. This number of observations limits any analysis to a maximum of 10 influencing constructs.¹¹⁴⁵ As a result, each potential moderator effect has to be tested by itself instead of including all in one SEM. This approach limits the findings for moderation effects to the role of single units. The

¹¹⁴⁵ Cf. sample size rule (Chapter 5.4.2).

relevance of the moderators in a system-based analysis cannot be derived. A combined test might reveal moderation effects and is recommended for future research design that works with larger sample sizes.

The sample size also inhibits the analyses of heterogeneity for multiple classes. Only tests for differences in means could be performed. The finding that company age is a source of heterogeneity might not change all path coefficients in the model. It is only proved that the level of knowledge integration increases significantly for older companies.

Finally, the comparability of the findings for governance mechanisms and knowledge characteristics has to be mentioned. Governance mechanisms as well as knowledge characteristics are constructed as factor scores of an EFA. This approach was chosen to have independent constructs that do not interact with each other and to reduce the complexity of the model. However, when using factor scores one has to consider that “the individual effects of the indicators become confounded.”¹¹⁴⁶ Therefore, the single factors have been defined in detail.¹¹⁴⁷ This definition of the factors needs to be considered when comparing the findings to those of other researchers. It clearly defines the comparability of the results to research that provides equally detailed definitions of the knowledge characteristics and governance mechanisms. In addition, the single item approach can cause a PLS bias, which might have been the reason for the moderate explanatory power of the models. Therefore, future research is recommended to establish independent variables by using multiple items.

As only relational mechanisms are relevant for the governance of knowledge transfer, future research should analyze the effects of single relational mechanisms on AMO. Are there relational governance mechanisms that affect only A, M, or O? Which mechanisms are most efficient in increasing motivation? Knowing the answer to these questions will allow managers not to invest by accident in mechanisms that address predominantly one ability.

¹¹⁴⁶ Hair et al. (2013), p. 125.

¹¹⁴⁷ Cf. Table 31 (KN factors) and Table 61 (GM factors).

8. Conclusions

In order to identify more governance mechanisms that trigger motivation, future research should draw and combine insights from psychology research, which has investigated motivation as a meaningful construct for decades.¹¹⁴⁸

In the long run, future research might be able to establish a group of mechanisms that predominantly address motivation. It might be possible to define governance groups based on the micro level problem that has to be solved in a knowledge transfer, but not on a substantive (attribute-based) categorization of governance like formal and relational.¹¹⁴⁹ These governance groups based on micro level problems will help managers by identifying specific situations. They enable defining respective problem-solution strategies of governance, rather than addressing particular attributes of phenomena.¹¹⁵⁰

In addition to the suggestions for future research developed above, some suggestions for future research have already been outlined when deriving the implications. They are connected directly to the single findings and are summarized in Table 102 again for reasons of completeness.

¹¹⁴⁸ Cf. Siemsen et al (2008), p.430; Latham (2006).

¹¹⁴⁹ Christensen et al. (2002) point out that attribute-based categorization schemes often compete and overlap because there are so many dimensions of phenomena, which therefore can lead to confusion.

¹¹⁵⁰ Cf. Christensen et al. (2002) for the discussion about attribute-based (substantive-based) versus problem-based (circumstance-based) design of categories.

Main finding	Theoretical implication	Practical implication	Suggestion for future research
Motivation and opportunity are the important micro-mechanisms to explain KNT success	ToWP provides a valuable theoretical source for defining the causal mechanisms for KNT. AMO needs to be formally recognized and integrated in future research on KNT success. Adaptation and differentiation of the KNT framework: motivation and opportunity are causal mechanisms not predictors	Set up a project team with motivated people	Test the applicability of AMO to explain the impact of the remaining predictors of performance in the KNT framework Review the impacts of macro level effect critically in order to really understand their impact on KNT success Differentiate the roles and interaction of AMO in the theoretical grounding Analyze under which conditions the role of single AMO mechanisms changes (e.g. industry)
Tacitness and specificity create difficulties for KNT whereas complexity is a success driver	The unconstrained applicability of KEV for a different view on KNT success than the knowledge base view has to be neglected ToWP is superior to KBV in explaining tacitness		Investigate the role of complexity for the process-based view in theory and empiry in more detail
Effects of knowledge characteristics on KNT success can't be changed	More micro-foundations are necessary in the KNT research.	Implement procedures which secure that each project installs relational mechanisms	Put more emphasis on the efficiency question of governance than on the effectiveness question
The effective governance of KNT is limited to relational governance	ToWP is superior to TCE and relational theory for explaining the governance of KNT success		
To govern efficiently, relational governance has to be increased during the KNT process when managing tacitness and specificity whereas it can be saved when managing complexity	The process-based view on KNT is valuable because KNT success and its governance can be explained for each phase differently	Managers need to figure out what type of knowledge is the subject of the transfer and for what phase result they are aiming to design efficient governance of KNT	Differentiate the governance- knowledge fit for all phases of KNT
Specificity is the biggest challenge for strategic management of KNT followed by tacitness.			

Table 102: Suggestions for future research

These suggestions call for more differentiated theoretical work to explain the success of knowledge transfer phases and to untangle the role of governance mechanisms, knowledge characteristics, and the AMO mechanisms within it.

In summary, the reflection of the limitations of the findings shows that the results in this research could be wider if research were set up and conducted as recommended above. However, the fact that there could be more behind the horizon does not limit the contributions developed by this thesis. The management of the knowledge leveraging paradox was never addressed as differentiated as in this thesis. Future research thus should follow this promising path and invest research on multi-level knowledge transfer.

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APPENDIX

A) Introduction letter for questionnaire



Lehrstuhl für Unternehmensführung insb.
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Sehr geehrter Herr «PL_Kunde»

Die [Beratung] steht für umsetzungsstarke Managementberatung. Umsetzungsstärke erfordert exzellente Fähigkeiten darin, die erbrachten Beratungsleistungen wirksam in die Kunden-Organisation zu integrieren. Daher untersuchen wir im Rahmen einer Dissertation, inwieweit das Wissen vergangener Beratungsprojekte in der Organisation der Kunden verankert wurde und unter welchen Bedingungen im Projekt dies besonders erfolgreich war.

Die zentralen Fragestellungen unseres Vorhabens lauten:

- ⇒ Welche Bedeutung haben Projekt-Setup und Projektsteuerungsmechanismen für den Erfolg von Wissenstransfer in Beratungs-Projekten?
- ⇒ Welche Projektsteuerungsmechanismen sind für den Transfer unterschiedlicher Arten von Wissen besonders geeignet?

Zur Beantwortung dieser Fragen untersuchen wir im Rahmen der Dissertation von Fr. Schmidt über 100 Projekte der [Beratung]. Wir befragen sowohl die [Beratung]-Projektleiter als auch Sie auf Kundenseite zu Themen der Projektsteuerung und des Erfolgs des Wissenstransfers.

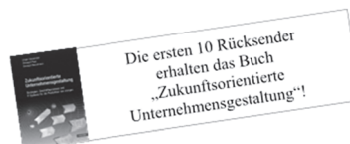
Wir bitten Sie, uns bei diesem Vorhaben wie folgt zu unterstützen:

Im «Beginn_Datum» haben Sie mit «Projektleiter_Name» ein Projekt zum Thema „«AngebotstitelBuchungsbeschreibung»“ begonnen. Bitte beantworten Sie den beiliegenden Fragebogen (Anlage 2) für dieses Projekt. Eine Kurzübersicht aller Arbeitspakete und Ergebnisse dieses Projektes finden Sie in Anlage 1.

Bitte beantworten Sie den Fragebogen möglichst spontan und vollständig, auch wenn Sie sich manchmal bei der Antwort nicht ganz sicher sind: Es gibt keine richtigen oder falschen Antworten. Eine ungefähre Angabe von Ihnen ist deutlich wertvoller als keine Angabe.

Der Fragebogen enthält 3 Abschnitte:

- A) Gestaltung und Steuerung des Projektes
- B) Projektzielsetzung und -ergebnisse
- C) Projektsituation



Die Beantwortung nimmt ca. 20 min Ihrer Zeit in Anspruch. Zögern Sie bitte nicht Fr. Schmidt anzurufen, sollten Sie Fragen haben.

Bitte senden Sie den Fragebogen bis zum 18. September 2013 zurück. Sie können den Fragebogen im PDF* ausfüllen und an Frau Schmidt zurück mailen oder den Ausdruck zufaxen an +49 89 13010065-19.

Gerne stellen wir Ihnen nach Abschluss der Analysen ein Management-Summary zur Verfügung, das den Erfolg unterschiedlicher Projektgestaltungsmerkmale gegenüberstellt. Die Ergebnisse werden voraussichtlich Mitte 2014 vorliegen.

Vielen Dank für Ihre Unterstützung und freundliche Grüße,

Ina Schmidt & Prof. Dr. Thomas Mellewig
(Projektleiterin) (Leiter des Lehrstuhls)

Anlagen:
1) Übersicht der Projekthalt
2) Fragebogen



Anlage 1): Übersicht der Projekthinhalte

Das Projekt zum Thema „AngebotstitelBuchungsbeschreibung“ hatte gemäß dem Vertrag mit der [Beratung] folgende dedizierte Ergebnisse in den einzelnen Arbeitspaketen (AP). Bitte rufen Sie Sich anhand dieser Übersicht, die Erstellung der Projektergebnisse und ihre spätere Verwendung noch einmal in Erinnerung und beantworten sie daraufhin den Fragebogen.

Ihre Projekt-ID: «Übertragen_aus_Angebot»
--

AP1:«Name_AP1»		
Ergebnisse: <ul style="list-style-type: none"> • «AP1_Result_1» • «AP1_Result_2» • «AP1_Result_3» • «AP1_Result_4» • «AP1_Result_5» 	<ul style="list-style-type: none"> • «AP1_Result6» • «AP1_Result7» • «AP1_Result8» • «AP1_Result9» 	<ul style="list-style-type: none"> • «AP1_Result10» • «AP1_Result11» • «AP1_Result12» • «AP1_Result13»
AP2:«Name_AP2»		
Ergebnisse: <ul style="list-style-type: none"> • «AP2_Result_1» • «AP2_Result_2» • «AP2_Result_3» • «AP2_Result_4» • «AP2_Result_5» 	<ul style="list-style-type: none"> • «AP2_Result_6» • «AP2_Result_7» • «AP2_Result_8» • «AP2_Result_9» 	<ul style="list-style-type: none"> • «AP2_Result_10» • «AP2_Result_11» • «AP2_Result_12» • «AP2_Result_13»
AP3:«Name_AP3»		
Ergebnisse: <ul style="list-style-type: none"> • «AP3_Result_1» • «AP3_Result_2» • «AP3_Result_3» • «AP3_Result_4» • «AP3_Result_5» 	<ul style="list-style-type: none"> • «AP3_Result_6» • «AP3_Result_7» • «AP3_Result_8» • «AP3_Result_9» 	<ul style="list-style-type: none"> • «AP3_Result_10» • «AP3_Result_11» • «AP3_Result_12» • «AP3_Result_13»
AP4:«Name_AP4»		
Ergebnisse: <ul style="list-style-type: none"> • «AP4_Result_1» • «AP4_Result_2» • «AP4_Result_3» • «AP4_Result_4» • «AP4_Result_5» 	<ul style="list-style-type: none"> • «AP4_Result_6» • «AP4_Result_7» • «AP4_Result_8» • «AP4_Result_9» 	<ul style="list-style-type: none"> • «AP4_Result_10» • «AP4_Result_11» • «AP4_Result_12» • «AP4_Result_13»

B) Original questionnaire items and final constructs

Dependent Variables of KNT Success:

Variable	Ownership ($\alpha=0.808$)	Integration ($\alpha=0.620$)
Introduction question	“Welche Einstellung haben Sie heute zu dem Wissen, dass Sie im Projekt erlangt haben?”	Inwieweit haben Sie dieses Wissen (Prozesse, Methoden, Werkzeuge und Fähigkeiten) zur Erstellung und Nutzung der vertraglich vereinbarten Ergebnisse in diesem Projekt aufgebaut?
Items	Wir haben uns das Wissen angeeignet und es aufgenommen.	Wir haben viel über das Wissen zur Erstellung und Nutzung der Ergebnisse von der UNITY gelernt.
	Wir fühlen uns dafür verantwortlich wie das erlangte Wissen weiterverwendet wird.	Wir haben die anfängliche Abhängigkeit von der UNITY zur Erstellung dieser Ergebnisse reduziert.
	Wir hatten ausreichend Umgang mit dem erlangten Wissen und sind heute damit vertraut.	Das UNITY-Wissen zur Erstellung und Nutzung dieser Ergebnisse wurde von uns aufgenommen und in weiteren Projekten in unserem Unternehmen eigenständig eingesetzt.
	Wir haben Zeit, Ideen, Fähigkeiten und Energie in den Aufbau dieses Wissens investiert.	
Scale	1: gar nicht - 5: in sehr hohem Maße	

Independent variables of knowledge types:

Variable	Tacitness (factor value *)	Complexity (factor value*)	Specificity (factor value*)
Introduction question	Bitte ruf dir das Projekt anhand der in Anlage 1 aufgelisteten Ergebnisse nochmal in Erinnerung und beurteile anhand der folgenden Fragen das gesamte Wissen (Ergebnisse + notwendiges Wissen zu ihrer Erstellung/Verwendung), das wir an den Kunden übertragen mussten.		
Items	Das gesamte an den Kunden zu übertragende Wissen ließ sich leicht verschriftlichen (z.B. Anleitungen).[R]	Das an den Kunden zu übertragende Wissen, ist ein Produkt aus vielen voneinander abhängigen Methoden, Prozeduren, Personen und Ressourcen.	Die benötigten Methoden zur Erstellung der Ergebnisse sind nur für diese Art von Aufgabenstellung anwendbar.
		Das Wissen zur Erstellung dieser Ergebnisse ist eher explizit als implizit. [R]	Es wird schwierig sein das Wissen auf ein anderes betriebliches Umfeld (z.B. Abteilung, Branche) zu übertragen.
			Das Wissen zur Erstellung der Ergebnisse dieses Projektes wurde extra für dieses Projekt entwickelt. (z.B. neue Methoden, Vorgehensweisen...)
Scale	1: gar nicht - 5: in sehr hohem Maße		
Interpretation of factor	Non-codifiability of the knowledge	knowledge that depends on many combined processes, procedures, and resources including experience knowledge (implicit knowledge)	Knowledge is dependent to the specific project context and has an interdependence with it respectively

* factor values of principal component EFA with varimax rotation

Variables of individual performance:

Variable	Motivation to receive knowledge (a=0.84)	Ability to receive knowledge (a=0.904)	Opportunity to receive knowledge (a=0.75)
Intro- duction question	Inwieweit stimmen Sie den folgenden Aussagen zum Umgang mit dem Projektwissen in Ihrem Team zu? Unter Wissen sind folgend die Ergebnisse des Projektes sowie die damals erlernten Prozesse, Methoden, Werkzeuge und Fähigkeiten zu verstehen.	Bitte beurteilen Sie die Situation Ihrer Projektmitarbeiter anhand folgender Aussagen. Unter Wissen sind folgend die Ergebnisse des Projektes sowie die damals erlernten Prozesse, Methoden, Werkzeuge und Fähigkeiten zu verstehen.	Bitte beurteilen Sie die Situation Ihrer Projektmitarbeiter anhand folgender Aussagen. Unter Wissen sind folgend die Ergebnisse des Projektes sowie die damals erlernten Prozesse, Methoden, Werkzeuge und Fähigkeiten zu verstehen.
Items	Wir hatten nicht die Absicht, das Wissen zur Erstellung der Projektergebnisse zu verstehen und aufzunehmen, sondern wollten nur die Projektergebnisse nutzen.[R]	Die Projektmitarbeiter hatten die nötigen Fähigkeiten, um das Wissen zu verstehen und aufzunehmen.	Das Projekt hat viel Zeit gelassen, das Wissen zu verstehen und aufzunehmen.
	Wir waren motiviert, Wissen von der [Beratung] aufzunehmen und etwas zu lernen.	Die Projektmitarbeiter hatten die nötigen Hilfsmittel, um das Wissen zu verstehen und aufzunehmen.	Die Atmosphäre im Projekt war förderlich, um das Wissen zu verstehen und aufzunehmen.
	Wir wollten, sowohl die Ergebnisse als auch das Wissen zu ihrer Erstellung verstehen und aufnehmen.	Die Projektmitarbeiter waren in der Lage, das Wissen zu verstehen und aufzunehmen.	Wir waren gut über die Zeiten im Projekt informiert, die dazu bestimmt waren das Wissen zu verstehen und zu erlernen.
Scale	1: gar nicht - 5: in sehr hohem Maße		

Independent variables of governance:

Variable	Relational governance (factor value based on principal component EFA with varimax rotation of all GMS)		
Underlying mechanisms	Social ties	Shared problem solving	Informal socialization
Items	Wie nah standet ihr euch mit den einzelnen Personen des Kunden-Teams?	Alle Änderungen bezüglich der Projektvereinbarung haben wir mit dem Kunden gemeinsam vereinbart.	Wir haben gemeinsame Veranstaltungen mit dem Kunden organisiert. (Teamabende, Sport, etc)
Scale	1: distanziert 2: nicht sehr nah 3: nah 4: außergewöhnlich nah	1: gar nicht - 5: in sehr hohem Maße	

Variable	Formal governance (factor value based on principal component EFA with varimax rotation of all GMs)	
Underlying mechanisms	Contract Intensity (Formative: Contract intensity= MEAN (explicit definition of individual persons in the contract ; definition of customer obligations and tasks in the contract)	Project Management Intensity (Formative: PM intensity= MEAN (item 1; item2; item 3; item 4)
Items	----	Ein Projekt-Scope Statement wurde erstellt. Das Projektziel inklusive der Anforderungen des Unternehmens wurde dokumentiert. Das Projektvorgehen inklusive Meilensteine, Entscheidungen, Arbeitspakete, Termine und Ressourcen wurde in einem Projektplan definiert. Ein Projektorganigramm wurde erstellt.
Contract Analysis	<ul style="list-style-type: none"> explicit definition of individual persons in the contract definition of customer obligations and tasks in the contract 	
Scale	1: defined in contract 0: not defined in contract	1: used in the project 0: not used in the project

C) Diagnostic questionnaire for formative vs. reflective measurements¹¹⁵¹

Kriterium	Formatives Messmodell	Reflektives Messmodell
Kausalitätsrichtung	Von dem MV zum Konstrukt	Vom Konstrukt zu den MV
Sind MV definierende Merkmale oder Erscheinungsformen des Konstruktes	Definierende Merkmale	Erscheinungsformen
Führen veränderte Ausprägungen der MV zu Veränderungen des Konstruktes	Ausprägungen der MV sollten zu Veränderung des Konstrukts führen	Konstruktänderungen sollten zu Änderungen der MV-Ausprägungen führen
Austauschbarkeit der MV	MV sind nicht austauschbar	MV sollten austauschbar sein
Haben die MV ähnliche Inhalte und ein „gemeinsames“ Thema?	Nicht notwendigerweise	MV sollten ähnliche Inhalte oder ein gemeinsames Thema haben
Verändert der Ausschluß einer MV den konzeptionellen Konstrukt-Rahmen	Ja	Sollte den konzeptionellen Konstrukt-rahmen nicht ändern
Kovariation zwischen den MV	Nicht notwendig	MV sollten kovariieren
Nomologisches Netz der MV	Nomologisches Netz der MV kann sich unterscheiden	Nomologisches Netz der MV sollte sich nicht unterscheiden
Sollten MV dieselben Antezedenzen und dieselben Konsequenzen haben?	Nicht notwendig	MV müssen dieselben Antezedenzen und Konsequenzen haben

¹¹⁵¹ Jarvis, Mackenzie and Podsakoff (2003), p.203.

D) Test results for common method bias**Context bias****Result for Harman's one-factor test for consultant items:****Total Variance Explained**

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,422	17,297	17,297	2,422	17,297	17,297
2	2,081	14,868	32,164	2,081	14,868	32,164
3	1,943	13,876	46,040	1,943	13,876	46,040
4	1,334	9,530	55,570	1,334	9,530	55,570
5	,997	7,124	62,694			
6	,866	6,185	68,879			
7	,795	5,677	74,556			
8	,704	5,027	79,582			
9	,646	4,616	84,198			
10	,629	4,494	88,692			
11	,537	3,837	92,529			
12	,413	2,949	95,478			
13	,348	2,489	97,966			
14	,285	2,034	100,000			

Extraction Method: Principal Component Analysis.

Component Matrix^a

	Component			
	1	2	3	4
U_Gov_PM_Anw_1	,408	,456	,364	-,097
U_Gov_PM_Anw_2	,521	,557	,382	-,107
U_Gov_PM_Anw_4	,624	,288	,391	-,007
U_Gov_PM_Anw_5	,696	,164	-,115	-,084
U_inf.socialisation_3	,555	-,479	-,029	,231
U_KN_complexity_AP1	,254	-,167	-,274	-,572
U_KN_Specific_1_AP1	,054	,236	-,593	,006
U_KN_Specific_2_AP1	,280	,242	-,632	,213
U_KN_Specific_3_AP1	,552	-,009	-,339	,274
U_social_ties_1	,448	-,645	,042	,178
U_shared_Prob_solv_2	,328	-,647	,230	-,002
U_KN_Tacit_1_AP1	-,111	-,239	,497	,434
U_KN_Tacit_2_AP1	-,163	,424	,223	,608
U_KNT_succs Budget AP1	-,071	-,093	,450	-,464

Extraction Method: Principal Component Analysis.

a. 4 components extracted.

Result for Harman's one-factor test for customer items:**Total Variance Explained**

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5,575	25,341	25,341	5,575	25,341	25,341
2	2,488	11,309	36,650	2,488	11,309	36,650
3	1,875	8,521	45,171	1,875	8,521	45,171
4	1,508	6,853	52,024	1,508	6,853	52,024
5	1,310	5,955	57,979	1,310	5,955	57,979
6	1,257	5,713	63,692	1,257	5,713	63,692
7	1,055	4,797	68,489	1,055	4,797	68,489
8	,924	4,201	72,690			
9	,799	3,634	76,324			
10	,726	3,300	79,624			
11	,669	3,040	82,664			
12	,626	2,846	85,510			
13	,569	2,588	88,098			
14	,469	2,130	90,228			
15	,426	1,937	92,164			
16	,354	1,608	93,773			
17	,343	1,557	95,330			
18	,294	1,336	96,666			
19	,261	1,185	97,851			
20	,223	1,011	98,863			
21	,156	,707	99,570			
22	,095	,430	100,000			

Extraction Method: Principal Component Analysis.

Component Matrix^a

	Component						
	1	2	3	4	5	6	7
K_KNT_succs_Quali_1	,029	,598	-,498	,406	,103	,163	,010
K_KNT_succs_Quali_2	-,013	,534	-,392	,591	,007	-,046	,134
K_KNT_succs_Quali_3	,281	,276	,301	-,201	,090	,064	-,495
K_KNT_succs_Zeit_1	-,013	,514	,014	-,145	,106	-,541	,090
K_KNT_succs_Zeit_2	,124	,517	,628	-,003	-,040	-,133	,265
K_KNT_succs_Zeit_3	,166	,611	,582	-,007	-,092	-,154	,197
K_KNT_succs_Budget	-,060	,654	-,208	-,276	-,020	,248	-,113
K_KNT_succs_learning_1	,596	,065	-,183	,053	,408	-,307	,194
K_KNT_succs_learning_2	,410	-,306	,022	-,182	,392	,083	,503
K_KNT_succs_learning_3	,494	,027	-,039	-,219	,608	,302	,012
K_KNT_succs_Ownership_1	,744	,035	,090	,237	,297	,188	-,026
K_KNT_succs_Ownership_2	,648	-,047	,273	,251	-,051	,114	-,125
K_KNT_succs_Ownership_3	,046	-,207	,111	,301	-,392	,272	,418
K_KNT_succs_Ownership_4	,735	,139	,244	,029	-,050	,348	-,080
K_KNT_succs_Ownership_5	,713	-,100	,245	,113	-,206	,188	,056
K_KNT_succs_Ownership_6	,542	,250	-,093	-,040	-,231	,039	-,200
K_Oppportunity_1	,507	,037	-,314	-,400	-,279	-,045	,220
K_Oppportunity_2	,693	,082	-,368	-,009	-,231	,114	,039
K_Oppportunity_3	-,314	-,251	,293	,609	,236	-,118	-,168
K_Motivation_1	-,632	,213	,034	-,065	,196	,305	-,009
K_Motivation_2	,737	-,206	-,132	,052	-,106	-,339	-,146
K_Motivation_3	,764	-,202	-,093	,097	,007	-,343	-,180

Extraction Method: Principal Component Analysis.

a. 7 components extracted.

Response bias

Analysis for non-response bias - fastest respondents

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
KN_Integration	Equal variances assumed	,719	,399	,539	98	,591	,31766	,58984	-,85285	1,48817
	Equal variances not assumed			,631	40,453	,532	,31766	,50364	-,69987	1,33520
KN_Ownership	Equal variances assumed	1,680	,198	,861	99	,391	,65893	,76493	-,85886	2,17671
	Equal variances not assumed			,999	39,403	,324	,65893	,65959	-,67479	1,99264
FAC_Specificity	Equal variances assumed	1,593	,210	-,915	99	,362	-,22451769	,24539180	-,71142826	,26239289
	Equal variances not assumed			-,776	26,251	,445	-,22451769	,28933069	-,81896871	,36993333
FAC_Complexity	Equal variances assumed	,601	,440	-,1471	99	,144	-,35863757	,24377676	-,84234356	,12506841
	Equal variances not assumed			-,1326	27,817	,195	-,35863757	,27037939	-,91264867	,19537352
FAC_Non_Codif	Equal variances assumed	1,767	,187	,493	99	,623	,12138296	,24612494	-,36698231	,60974823
	Equal variances not assumed			,536	35,307	,595	,12138296	,22639058	-,33807176	,58083769
F_GM_form	Equal variances assumed	,025	,876	1,976	96	,051	,47942670	,24257597	-,00208280	,96093620
	Equal variances not assumed			2,010	32,511	,053	,47942670	,23857872	-,00624299	,96509639
F_GM_rel	Equal variances assumed	5,103	,026	1,916	96	,058	,46525224	,24286331	-,01682761	,94733210
	Equal variances not assumed			1,577	25,723	,127	,46525224	,29493655	-,14131592	1,07182041
Motivation	Equal variances assumed	2,816	,097	2,079	97	,040	1,40659	,67669	,06355	2,74963
	Equal variances not assumed			2,524	43,864	,015	1,40659	,55721	,28351	2,52968
Ability	Equal variances assumed	,516	,474	,352	98	,726	,20976	,59616	-,97330	1,39283
	Equal variances not assumed			,378	34,919	,707	,20976	,55444	-,91589	1,33542
Opportunity	Equal variances assumed	3,413	,068	,580	97	,563	,32234	,55596	-,78108	1,42577
	Equal variances not assumed			,748	50,172	,458	,32234	,43096	-,54319	1,18787

Analysis for non-response bias – slow respondents

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
KN_Integration	Equal variances assumed	,958	,330	-,154	98	,878	-,08420	,54846	-,117259	1,00420
	Equal variances not assumed			-,140	37,839	,889	-,08420	,59956	-,129812	1,12972
KN_Ownership	Equal variances assumed	,872	,353	1,402	99	,164	,97748	,69716	-,40583	2,36079
	Equal variances not assumed			1,283	39,711	,207	,97748	,76174	-,56240	2,51735
FAC_Specificity	Equal variances assumed	,013	,910	-,207	99	,837	-,04672984	,22591836	-,49500088	,40154120
	Equal variances not assumed			-,206	46,048	,837	-,04672984	,22642143	-,50247966	,40901998
FAC_Complexity	Equal variances assumed	,001	,975	,248	99	,804	,05612007	,22589677	-,39210812	,50434827
	Equal variances not assumed			,262	51,529	,794	,05612007	,21398730	-,37337023	,48561038
FAC_Non_Codif	Equal variances assumed	1,192	,278	-,085	99	,933	-,01916112	,22595896	-,46751272	,42919049
	Equal variances not assumed			-,081	42,220	,936	-,01916112	,23774154	-,49886877	,46054654
F_GM_form	Equal variances assumed	4,226	,043	2,169	96	,033	,48699232	,22455581	,04125256	,93273208
	Equal variances not assumed			1,885	35,358	,068	,48699232	,25833735	-,03727039	1,01125503
F_GM_rel	Equal variances assumed	,299	,586	2,597	96	,011	,57731599	,22231494	,13602431	1,01860767
	Equal variances not assumed			2,736	49,076	,009	,57731599	,21102650	,15325896	1,00137302
Motivation	Equal variances assumed	,458	,500	1,654	97	,101	1,04795	,63361	-,20960	2,30549
	Equal variances not assumed			1,530	38,619	,134	1,04795	,68482	-,33768	2,43357
Ability	Equal variances assumed	,500	,481	1,145	98	,255	,62994	,55027	-,46205	1,72193
	Equal variances not assumed			1,176	46,062	,246	,62994	,53561	-,44815	1,70803
Opportunity	Equal variances assumed	3,616	,060	,821	97	,414	,42308	,51558	-,60021	1,44637
	Equal variances not assumed			,729	36,340	,471	,42308	,58069	-,75423	1,60038

E) Data distribution

Test for normal distribution for all original items

Hypothesis Test Summary				
	Null Hypothesis	Test	Sig.	Decision
1	The distribution of customer's satisfaction with quality of results is normal with mean 4,129 and standard deviation 0,78.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
2	The distribution of customer's satisfaction with quality of transferring the results to him is normal with mean 4,170 and standard deviation 0,88.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
3	The distribution of customer's satisfaction with results after a certain time of usage is normal with mean 3,041 and standard deviation 0,66.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
4	The distribution of customer's perception of starting point of project is normal with mean 2,673 and standard deviation 0,60.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
5	The distribution of customer's perception of time of usability of results is normal with mean 2,566 and standard deviation 0,80.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
6	The distribution of customer's perception of time they reach satisfying goals with the results is normal with mean 2,465 and standard deviation 0,80.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
7	The distribution of customer's perception of needed budget is normal with mean 2,891 and standard deviation 0,44.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
8	The distribution of consultants' perception of needed budget is normal with mean 2,800 and standard deviation 0,53.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
9	The distribution of K_KNT_succs_learning_1 is normal with mean 3,248 and standard deviation 0,96.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
10	The distribution of K_KNT_succs_learning_2 is normal with mean 3,010 and standard deviation 1,06.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
11	The distribution of K_KNT_succs_learning_3 is normal with mean 2,620 and standard deviation 1,14.	One-Sample Kolmogorov-Smirnov Test	,006	Reject the null hypothesis.
12	The distribution of K_KNT_succs_Ownership_1 is normal with mean 3,277 and standard deviation 0,93.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
13	The distribution of K_KNT_succs_Ownership_2 is normal with mean 3,733 and standard deviation 0,98.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
14	The distribution of K_KNT_succs_Ownership_3 is normal with mean 2,469 and standard deviation 1,22.	One-Sample Kolmogorov-Smirnov Test	,002	Reject the null hypothesis.
15	The distribution of K_KNT_succs_Ownership_4 is normal with mean 3,347 and standard deviation 0,94.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
16	The distribution of K_KNT_succs_Ownership_5 is normal with mean 3,594 and standard deviation 1,01.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
17	The distribution of K_KNT_succs_Ownership_6 is normal with mean 3,713 and standard deviation 1,00.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
18	The distribution of K_Opportunity_1 is normal with mean 2,890 and standard deviation 0,94.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
19	The distribution of K_Opportunity_2 is normal with mean 3,940 and standard deviation 0,85.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
20	The distribution of reverse is normal with mean 2,616 and standard deviation 1,09.	One-Sample Kolmogorov-Smirnov Test	,001	Reject the null hypothesis.

21	The distribution of K_Opportunity_3_umcodiert is normal with mean 3,384 and standard deviation 1,09.	One-Sample Kolmogorov-Smirnov Test	,001	Reject the null hypothesis.
22	The distribution of K_Opportunity_4 is normal with mean 3,310 and standard deviation 0,97.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
23	The distribution of K_Ability_1 is normal with mean 3,650 and standard deviation 0,90.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
24	The distribution of K_Ability_2 is normal with mean 3,600 and standard deviation 0,89.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
25	The distribution of K_Ability_3 is normal with mean 3,630 and standard deviation 0,85.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
26	The distribution of reverse is normal with mean 2,139 and standard deviation 1,25.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
27	The distribution of K_motivation_1_umcodiert is normal with mean 3,861 and standard deviation 1,25.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
28	The distribution of K_Motivation_2 is normal with mean 3,511 and standard deviation 0,94.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
29	The distribution of K_Motivation_3 is normal with mean 3,919 and standard deviation 1,04.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
30	The distribution of U_KN_Tacit_1_AP1 is normal with mean 3,594 and standard deviation 1,01.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
31	The distribution of U_KN_Tacit_2_AP1 is normal with mean 3,574 and standard deviation 0,78.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
32	The distribution of Tacitness_1 is normal with mean 2,406 and standard deviation 1,01.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
33	The distribution of Tacitness_2 is normal with mean 2,426 and standard deviation 0,78.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
34	The distribution of U_KN_complexity_AP1 is normal with mean 3,762 and standard deviation 0,98.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
35	The distribution of U_KN_Specific_1_AP1 is normal with mean 2,376 and standard deviation 1,18.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
36	The distribution of U_KN_Specific_2_AP1 is normal with mean 1,782 and standard deviation 0,94.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
37	The distribution of U_KN_Specific_3_AP1 is normal with mean 2,218 and standard deviation 1,25.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
38	The distribution of J_social_ties_1 is normal with mean 2,772 and standard deviation 0,63.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
39	The distribution of U_shared_Prob_solv_2 is normal with mean 4,220 and standard deviation 0,87.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
40	The distribution of J_inf_socialisation_3 is normal with mean 2,313 and standard deviation 1,36.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
41	The distribution of EXPLICIT DEFINITION of consultants in contract is normal with mean 0,238 and standard deviation 0,43.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
42	The distribution of customer obligations are defined in the contract is normal with mean 0,228 and standard deviation 0,42.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
43	The distribution of customer's participation obligation is defined in contract is normal with mean 0,673 and standard deviation 0,47.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.

44	The distribution of V_summe_Mitwirkung_festgelegt is normal with mean 0,901 and standard deviation 0,61.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
45	The distribution of DEFINITION OF customer obligations and tasks is normal with mean 0,762 and standard deviation 0,43.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
46	The distribution of Project-Scope Statement is normal with mean 0,327 and standard deviation 0,47.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
47	The distribution of Project Target is normal with mean 0,683 and standard deviation 0,47.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
48	The distribution of Detailed Project Plan is normal with mean 0,693 and standard deviation 0,46.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
49	The distribution of Documented Projekt Organisation is normal with mean 0,366 and standard deviation 0,48.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.

50	The distribution of K_Gründungsjahr is normal with mean 1,940,374 and standard deviation 73,35.	One-Sample Kolmogorov-Smirnov Test	,009	Reject the null hypothesis.
51	The distribution of type of project organisation is normal with mean 2,822 and standard deviation 1,11.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
52	The distribution of Anzahl_MA is normal with mean 30,763,470 and standard deviation 72,858,94.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
53	The distribution of type of contract is normal with mean 0,851 and standard deviation 0,36.	One-Sample Kolmogorov-Smirnov Test	,000	Reject the null hypothesis.
54	The distribution of days customer needed to return questionnaire is normal with mean 14,589 and standard deviation 14,43.	One-Sample Kolmogorov-Smirnov Test	,008	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is ,05.

F) Overview of all identified project management procedures

Items Project Intensity	Haben wir benutzt
Ein Projekt-scope Statement wurde erstellt.	<input type="checkbox"/>
Das Projektziel inklusive der Anforderungen des Unternehmens wurde dokumentiert.	<input type="checkbox"/>
Eine Stakeholderanalyse wurde durchgeführt.	<input type="checkbox"/>
Das Projektvorgehen inklusive Meilensteine, Entscheidungen, Arbeitspakete, Termine und Ressourcen wurde in einem Projektplan definiert.	<input type="checkbox"/>
Ein Projektorganigramm wurde erstellt.	<input type="checkbox"/>
Die Stakeholder wurden mit Kommunikations- Maßnahmen gemanaged.	<input type="checkbox"/>
Die Key-User/Key Player wurden identifiziert und eingebunden.	<input type="checkbox"/>
Ein Schulungskonzept wurde erstellt.	<input type="checkbox"/>
Risikomanagement wurde durchgeführt.	<input type="checkbox"/>
Es wurden Regeln zur Zusammenarbeit festgelegt.	<input type="checkbox"/>
Regeltermine für Statusmeeting, Lenkungskreise etc. wurden festgelegt und eingehalten.	<input type="checkbox"/>
Die Performance des Projektes wurde anhand von KPIs gemessen und reportet.	<input type="checkbox"/>
Alle Ergebnisse wurden in einer offiziellen Projektdokumentation zusammengefasst.	<input type="checkbox"/>
Die Ergebnisse für jede Projektphase sind dokumentiert und an den Kunden übergeben worden.	<input type="checkbox"/>
Geschäftsfeldleiter hat Projektergebnisse und -dokumentation zur Übergabe an den Kunden freigegeben.	<input type="checkbox"/>
Eine Abschlusspräsentation beim Kunden wurde durchgeführt.	<input type="checkbox"/>

The dark marked procedures are clearly formal mechanisms. They were chosen as items in the PM Intensity construct.

G) Missing value analysis

Univariate Statistics							
	N	Mean	Std. Deviation	Missing		No. of Extremes ^a	
				Count	Percent	Low	High
K_KNT_succs_Quali_1	101	4,13	,783	0	,0	4	0
K_KNT_succs_Quali_2	100	4,17	,877	1	1,0	5	0
K_KNT_succs_Quali_3	98	3,04	,657	3	3,0	.	.
K_KNT_succs_Zeit_1	101	2,67	,602	0	,0	0	0
K_KNT_succs_Zeit_2	99	2,57	,797	2	2,0	0	0
K_KNT_succs_Zeit_3	99	2,46	,799	2	2,0	0	0
K_KNT_succs_Budget	101	2,89	,445	0	,0	.	.
U_KNT_succs_Budget_AP1	100	2,80	,532	1	1,0	.	.
K_KNT_succs_learning_1	101	3,25	,963	0	,0	4	0
K_KNT_succs_learning_2	101	3,01	1,063	0	,0	0	0
K_KNT_succs_learning_3	100	2,62	1,135	1	1,0	0	4
K_KNT_succs_Ownership_1	101	3,28	,929	0	,0	2	0
K_KNT_succs_Ownership_2	101	3,73	,979	0	,0	4	0
K_KNT_succs_Ownership_3	98	2,47	1,220	3	3,0	0	0
K_KNT_succs_Ownership_4	101	3,35	,943	0	,0	3	0
K_KNT_succs_Ownership_5	101	3,59	1,012	0	,0	3	0
K_KNT_succs_Ownership_6	101	3,71	1,003	0	,0	4	0
K_Oppportunity_1	100	2,89	,942	1	1,0	0	5
K_Oppportunity_2	100	3,94	,851	1	1,0	.	.
K_Oppportunity_3	99	2,62	1,095	2	2,0	0	3
K_Oppportunity_3_umcod	99	3,3838	1,09458	2	2,0	3	0
K_Oppportunity_4	100	3,31	,971	1	1,0	4	0
K_Ability_1	100	3,65	,903	1	1,0	2	0
K_Ability_2	100	3,60	,888	1	1,0	3	0
K_Ability_3	100	3,63	,849	1	1,0	1	0
K_Motivation_1	101	2,14	1,249	0	,0	0	0
K_Motivation_2	101	3,91	,939	0	,0	0	0
K_Motivation_3	99	3,92	1,037	2	2,0	0	0
U_KN_Tacit_1_AP1	101	3,59	1,012	0	,0	2	0
U_KN_Tacit_2_AP1	101	3,57	,779	0	,0	1	0
U_KN_complexity_AP1	101	3,76	,981	0	,0	1	0
U_KN_Specific_1_AP1	101	2,38	1,182	0	,0	0	0
U_KN_Specific_2_AP1	101	1,78	,944	0	,0	0	7
U_KN_Specific_3_AP1	101	2,22	1,254	0	,0	0	0
U_social_ties_1	101	2,77	,631	0	,0	0	0
U_shared_Prob_solv_2	100	4,22	,871	1	1,0	4	0
U_inf.socialisation_3	99	2,31	1,360	2	2,0	0	0
V_Personen_sind_festgeschrieben	101	,24	,428	0	,0	.	.
V_Kundenaufgaben_sind_definiert	101	,23	,421	0	,0	.	.
U_Gov_PM_Anw_1	101	,33	,471	0	,0	0	0
U_Gov_PM_Anw_2	101	,68	,468	0	,0	0	0
U_Gov_PM_Anw_4	101	,69	,464	0	,0	0	0
U_Gov_PM_Anw_5	101	,37	,484	0	,0	0	0

a. Number of cases outside the range (Q1 - 1.5*IQR, Q3 + 1.5*IQR).

There are no variables with 5% or more missing values. TTEST table is not produced.
 There are no categorical variables. CROSSTAB is not produced.
 There are no variables with 5% or more missing values. MISMATCH table is not produced.

H) Outer loadings overview of KNT success HOC model

	KN Integration	KN Ownership	KNT Success	Project Success Quality	Project Success-Budget	Project Success T
K_KNT_succs_Budget			-0.0171			
K_KNT_succs_Budget					0.0287	
K_KNT_succs_Ownership_1		0.8324				
K_KNT_succs_Ownership_1			0.8248			
K_KNT_succs_Ownership_2		0.7589				
K_KNT_succs_Ownership_2			0.6981			
K_KNT_succs_Ownership_4		0.8327				
K_KNT_succs_Ownership_4			0.7649			
K_KNT_succs_Ownership_5		0.8031				
K_KNT_succs_Ownership_5			0.7256			
K_KNT_succs_Quali_1				0.895		
K_KNT_succs_Quali_1			0.0121			
K_KNT_succs_Quali_2				0.9223		
K_KNT_succs_Quali_2			0.0139			
K_KNT_succs_Zeit_2						0.9163
K_KNT_succs_Zeit_2			0.2885			
K_KNT_succs_Zeit_3						0.9211
K_KNT_succs_Zeit_3			0.2968			
K_KNT_succs_learning_1	0.7919					
K_KNT_succs_learning_1			0.5758			
K_KNT_succs_learning_2	0.6738					
K_KNT_succs_learning_2			0.4439			
K_KNT_succs_learning_3	0.7921					
K_KNT_succs_learning_3			0.5837			
U_KNT_succs_Budget_AP1			0.0653			
U_KNT_succs_Budget_AP1					0.9653	

l) Results of EFA for governance groups

Rotated Component Matrix^a

	Component	
	1	2
GM_SPS_5	,719	,117
GM_Inf.Social._5	,770	,140
GM_ST_mean	,845	-,119
GM_CONTRACT_INTENSITY		,792
PM_Intensity_formal		,760

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.^a

a. Rotation converged in 3 iterations.

Communalities

	Initial	Extraction
GM_SPS_5	1,000	,530
GM_Inf.Social._5	1,000	,612
GM_ST_mean	1,000	,728
GM_CONTRACT_INTENSITY	1,000	,630
PM_Intensity_formal	1,000	,580

Extraction Method: Principal Component Analysis.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,601
Approx. Chi-Square		57,512
Bartlett's Test of Sphericity	df	10
	Sig.	,000

J) Detailed reports for measurement model evaluations

	Ability	Complexity	Formal GMs	KN Owners hip	Motivation	Opportunity	Relational GMs	Specificity	Tacitness
Ability	0,9155								
Complexity	0,1006	single-item							
Formal GMs	-0,0438	-0,039	single-item						
KN Owners hip	0,3441	0,2848	-0,0078	0,8073					
Motivation	0,2721	0,0746	0,0079	0,56	0,8744				
Opportunity	0,518	0,1057	-0,0644	0,5737	0,4668	0,8133			
Relational GMs	0,2033	0,2326	0	0,3068	0,2816	0,2727	single-item		
Specificity	-0,0925	0	0,1009	-0,0534	0,0457	0,004	0,0360	single-item	
Tacitness	-0,1292	0	0,0538	-0,0925	-0,3107	-0,2262	-0,1932	0,0000	single-item

Table 103: Fornell-Larcker-Analysis KNO micro model

	Ability	Complexity	Formal GMs	KN Integrati on	Motivation	Opportunity	Relational GMs	Specificity	Tacitness
Ability	0,915478017	0	0	0	0	0	0	0	0
Complexity	0,1007	single-item	0	0	0	0	0	0	0
Formal GMs	-0,0431	-0,039	single-item	0	0	0	0	0	0
KN Integrati on	0,0837	0,2733	-0,1477	0,751265599	0	0	0	0	0
Motivation	0,2738	0,0757	0,0084	0,4573	0,87435691	0	0	0	0
Opportunity	0,5186	0,0928	-0,0661	0,3906	0,4631	0,81504601	0	0	0
Relational GMs	0,2034	0,2326	0	0,2545	0,2819	0,2714	single-item	0	0
Specificity	-0,092	0	0,1009	-0,1474	0,0456	0,0123	0,036	single-item	0
Tacitness	-0,1298	0	0,0538	-0,248	-0,3114	-0,2344	-0,1932	0	single-item

Table 104: Fornell-Larcker-Analysis KNI micro model

K) Detailed reports for structural model evaluations

Reflective constructs of the model	SSO	SSE	Q ² =1-SSE/SSO
KN Ownership	404	273,0535	0,3241
Motivation to integrate	303	265,468	0,1239
Opportunity to integrate	303	292,6455	0,0342
Ability to integrate	303	285,367	0,0582

Table 105: Stone-Geisser-Analysis for KNO micro model

Reflective constructs of the model	SSO	SSE	Q ² =1-SSE/SSO
KN integration	303	237,5397	0,216
Motivation to integrate	303	272,5445	0,1005
Opportunity to integrate	303	280,4966	0,0743
Ability to integrate	303	285,0634	0,0592

Table 106: Stone-Geisser-Analysis for KNI micro model

Collinearity-Analysis for KNO micro model

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	4,133E-006	,073		,000	1,000		
Ability	,022	,086	,022	,255	,800	,716	1,396
Complexity	,198	,075	,198	2,628	,010	,938	1,066
Formal_GMs	,022	,074	,022	,304	,762	,980	1,020
Motivation	,389	,086	,389	4,501	,000	,716	1,396
Opportunity	,371	,094	,371	3,937	,000	,602	1,661
Relational_GMs	,073	,080	,073	,918	,361	,840	1,190
Specificity	-,076	,074	-,076	-1,020	,310	,974	1,027
Tacitness	,128	,078	,128	1,641	,104	,880	1,136

a. Dependent Variable: KN_Ownership

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-5,737E-006	,099		,000	1,000		
Complexity	,059	,102	,059	,575	,566	,942	1,062
Formal_GMs	-,027	,100	-,027	-,268	,789	,985	1,015
Relational_GMs	,175	,104	,175	1,679	,097	,907	1,103
Specificity	-,096	,100	-,096	-,962	,338	,988	1,012
Tacitness	-,094	,101	-,094	-,926	,357	,957	1,044

a. Dependent Variable: Ability

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	1,827E-006	,095		,000	1,000		
Complexity	,024	,097	,024	,242	,810	,942	1,062
Formal_GMs	,020	,095	,020	,206	,837	,985	1,015
Relational_GMs	,223	,099	,223	2,244	,027	,907	1,103
Specificity	,036	,095	,036	,375	,709	,988	1,012
Tacitness	-,269	,097	-,269	-2,779	,007	,957	1,044

a. Dependent Variable: Motivation

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	2,545E-006	,097		,000	1,000		
Complexity	,051	,100	,051	,512	,610	,942	1,062
Formal_GMs	-,053	,097	-,053	-,542	,589	,985	1,015
Relational_GMs	,226	,102	,226	2,226	,028	,907	1,103
Specificity	,001	,097	,001	,012	,990	,988	1,012
Tacitness	-,180	,099	-,180	-1,817	,072	,957	1,044

a. Dependent Variable: Opportunity

Collinearity-Analysis for KNI micro model

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	2,593E-008	,082		,000	1,000		
Ability	-,226	,097	-,226	-2,340	,021	,714	1,400
Complexity	,225	,084	,225	2,667	,009	,939	1,066
Formal_GMs	-,110	,082	-,110	-1,329	,187	,979	1,021
Motivation	,331	,096	,331	3,444	,001	,720	1,389
Opportunity	,290	,105	,290	2,763	,007	,603	1,658
Relational_GMs	,066	,089	,066	,736	,463	,840	1,191
Specificity	-,178	,083	-,178	-2,155	,034	,973	1,028
Tacitness	-,088	,087	-,088	-1,008	,316	,878	1,139

a. Dependent Variable: KN_Integration

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	7,132E-006	,099		,000	1,000		
Complexity	,059	,102	,059	,577	,565	,942	1,062
Formal_GMs	-,026	,100	-,026	-,260	,795	,985	1,015
Relational_GMs	,175	,104	,175	1,677	,097	,907	1,103
Specificity	-,096	,100	-,096	-,958	,340	,988	1,012
Tacitness	-,095	,101	-,095	-,933	,353	,957	1,044

a. Dependent Variable: Ability

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	9,741E-006	,095		,000	1,000	
	Complexity	,025	,097	,025	,253	,801	,942
	Formal_GMs	,020	,095	,020	,213	,832	,985
	Relational_GMs	,223	,099	,223	2,245	,027	,907
	Specificity	,036	,095	,036	,374	,709	,988
	Tacitness	-,269	,097	-,269	-2,787	,006	,957

a. Dependent Variable: Motivation

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	6,390E-007	,097		,000	1,000	
	Complexity	,038	,100	,038	,383	,703	,942
	Formal_GMs	-,056	,097	-,056	-,570	,570	,985
	Relational_GMs	,226	,101	,226	2,226	,028	,907
	Specificity	,010	,097	,010	,101	,920	,988
	Tacitness	-,188	,099	-,188	-1,901	,060	,957

a. Dependent Variable: Opportunity

L) Detailed reports for macro- model evaluations

Collinearity analysis for the macro model KNO

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-1,163E-006	,094		,000	1,000	
	Complexity	,226	,097	,226	2,328	,022	,942
	Formal_GMs	,015	,095	,015	,158	,875	,985
	Relational_GMs	,257	,099	,257	2,593	,011	,907
	Specificity	-,067	,095	-,067	-,710	,480	,988
	Tacitness	-,044	,096	-,044	-,452	,652	,957

a. Dependent Variable: KN_Ownership

Measurement model evaluation: KNO macro model

Construct quality	Macro Model Ownership						
Construct quality	Indicator reliability (Outer loadings of indicators)	AVE	Internal consistency	Composite Reliability	Discriminant construct validity	Fornell-Larcker criterion	Cross loadings
Cut off value	≥0,4; >0,7	≥0,5		≥0,5		√AVE > correlation with other constructs	highest on own construct
KN Ownership		0.6498		0.881		yes	yes
K_KNT_succs_Ownership_1	0.856						
K_KNT_succs_Ownership_2	0.743						
K_KNT_succs_Ownership_4	0.8251						
K_KNT_succs_Ownership_5	0.7959						
Complexity	1	1		1		yes	yes
Specificity	1	1		1		yes	yes
Tacitness	1			1		yes	yes
Relational governance	1	1		1		yes	yes
Formal governance	1	1		1		yes	yes

Fornell-Larcker analysis Macro model KNO

	Complexity	Formal GMs	KN Ownership	Relational GMs	Specificity	Tacitness
Complexity	1					
Formal GMs	-0.039	1				
KN Ownership	0.2856	-0.003	0.8061			
Relational GMs	0.2326	0	0.3156	1		
Specificity	0	0.1009	-0.0566	0.036	1	
Tacitness	0	0.0538	-0.0924	-0.1932	0	1

Stone-Geisser-Analysis for KNO macro model

Total	SSO	SSE	1-SSE/SSO
KN Ownership	404	365.348	0.0957

Measurement model evaluation: KNI macro model:

Construct quality	Macro Model					
	AVE	Internal consistency	Composite Reliability	Discriminant construct validity	Fornell-Larcker criterion	Cross loadings
Cut off value	≥0,5		≥0,5		√AVE > correlation with other constructs	highest on own construct
KN Integration	0.567		0.797		yes	yes
K_KNT_succs_learning_1						
K_KNT_succs_learning_2						
K_KNT_succs_learning_3						
Complexity	1		1		yes	yes
Specificity	1		1		yes	yes
Tacitness	1		1		yes	yes
Relational governance	1		1		yes	yes
Formal governance	1				yes	yes

Fornell-Larcker analysis Macro model KNI:

	Complexity	Formal GMs	KN Integration	Relational GMs	Specificity	Tacitness
Complexity	1.00					
Formal GMs	-0.0390	1.0000				
KN Integration	0.2761	-0.1569	0.752728371			
Relational GMs	0.2326	0.0000	0.2537	1.0000		
Specificity	-0.0000	0.1009	-0.1565	0.0360	1.0000	
Tacitness	0.0000	0.0538	-0.2555	-0.1932	0.0000	1.0000

Stone-Geisser-Analysis for KNI macro model

Total	SSO	SSE	1-SSE/SSO
KN Integration	303.0000	268.0342	0.1154

Collinearity analysis for the macro model KNI:

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-1,214E-005	,092		,000	1,000		
1 Complexity	,233	,094	,233	2,475	,015	,942	1,062
Formal_GMs	-,121	,092	-,121	-1,312	,193	,985	1,015
Relational_GMs	,163	,096	,163	1,694	,094	,907	1,103
Specificity	-,150	,092	-,150	-1,631	,106	,988	1,012
Tacitness	-,218	,094	-,218	-2,325	,022	,957	1,044

a. Dependent Variable: KN_Integration

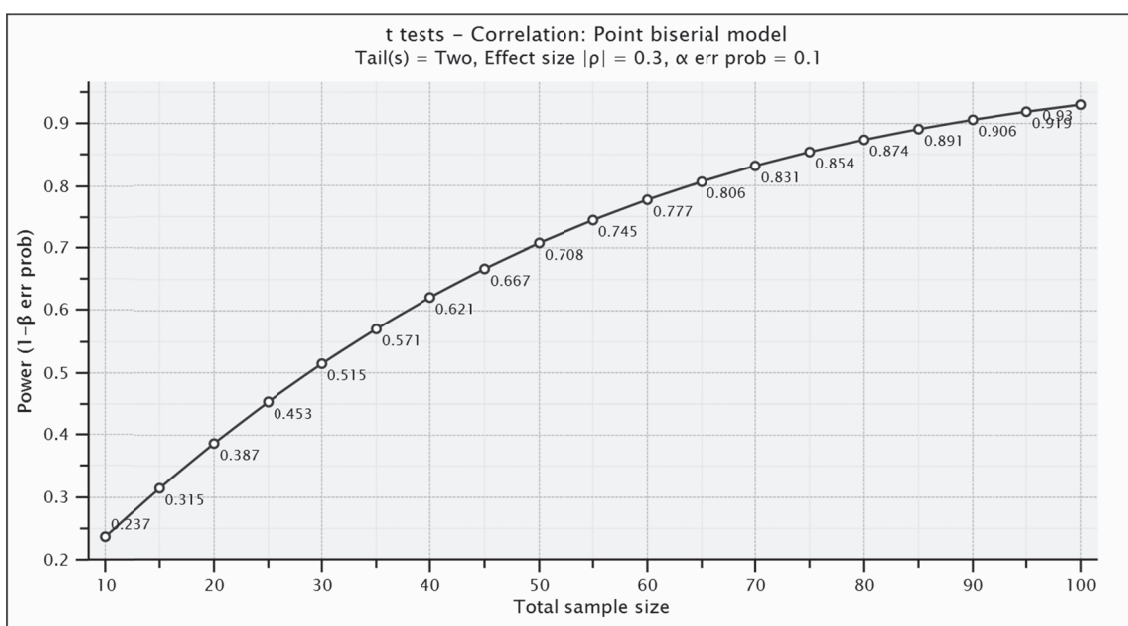
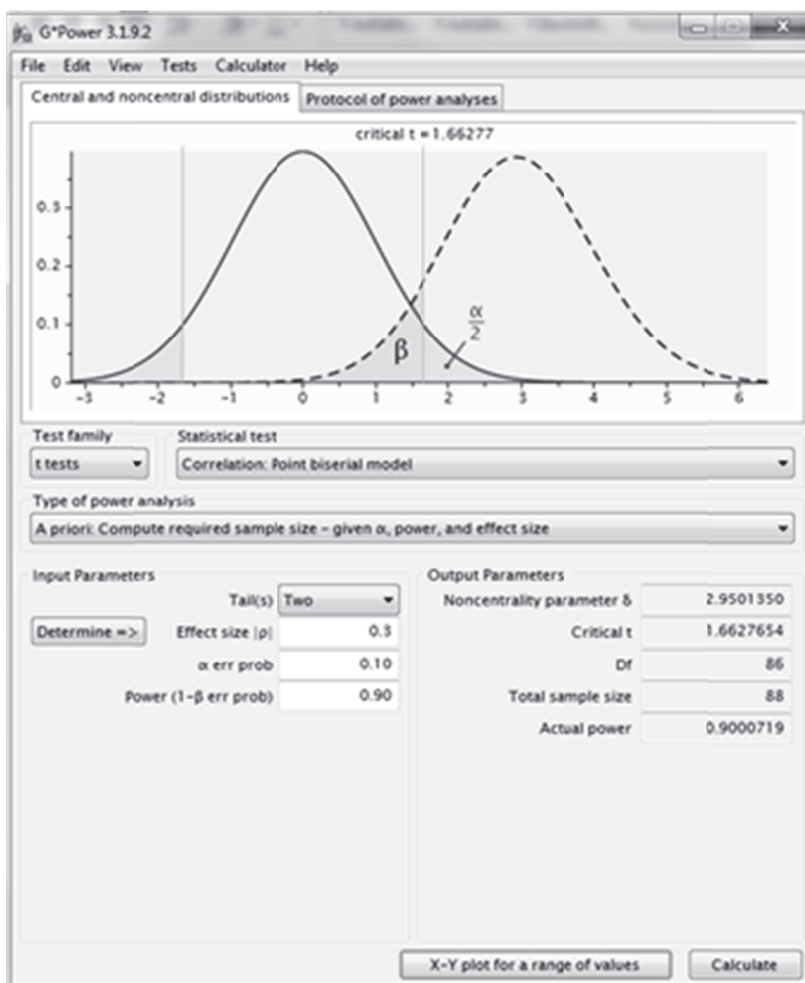
Adjusted coefficient of determination for KNI and KNO macro models

	KNO Macro model	KNI macro model
R ²	0.1536	0.20
Adj. R ²	0.11	0.16
Q ²	0.096	0.1154

M) Additional moderation analysis for AMO constructs

Interaction term (predictor * moderator)	Ownership		Integration	
	p	t	p	t
Complexity * Motivation	-0.187	1.558	0.03	0.2
Complexity * Ability	0.089	0.888	-0.029	0.124
Complexity * Opportunity	0.083	0.581	-0.083	0.396
Specificity * Motivation	0.079	0.916	-0.176	1.026
Specificity * Ability	0.096	1.268	-0.032	0.2
Specificity * Opportunity	0.095	0.992	-0.046	0.286
Tacitness * Motivation	Mediation		Mediation	
Tacitness * Ability	-0.068	0.668	0.043	0.343
Tacitness * Opportunity	x	Opportunity depends on tacitness	Mediation	
Formal GM * Motivation	0.082	0.815	0.142	0.801
Formal GM * Ability	-103	1.242	0.037	0.317
Formal GM * Opportunity	0.09	0.844	0.09	583

N) Results of power analyses



O) Homogeneity of sample with main population

Data

	EM	IT	PDP	SUF	Sum
101 Projects	16	23	38	24	101
	16%	23%	38%	24%	
509 Projects	104	125	156	124	509
	20%	25%	31%	24%	
Sum	120	148	194	148	610

Degrees of Freedom

$$f=(2-1)*(4-1)=3$$

Expected allocation

101 Projects	19,86885246	24,50491803	32,1213115	24,504918
509 Projects	100,1311475	123,495082	161,878689	123,495082

Chi-Square

	perceived allocation	Expected allocation	Chi-Square
101 Projects			
	16	19,86885246	0,75334091
	23	24,50491803	0,09242138
	38	32,12131148	1,07588941
	24	24,50491803	0,01040372
509 Projects			
	104	100,1311475	0,14948415
	125	123,495082	0,01833902
	156	161,8786885	0,2134869
	124	123,495082	0,00206439

Chi-Square	2,31542986
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Ho neglected if Chi-Square > 11,3448667

Ho (Homogeneity) confirmed if Qui-Square </= 11,3448667

Abstract

English

Knowledge transfer is a critical factor of a firm in its ability to rapidly respond to change, innovate and achieve competitive success. In order to achieve successful knowledge transfer the process needs to be governed effectively.

Current research analyses the effective governance of knowledge transfer only on a macro level of explanation. Direct effects of governance mechanisms on the success of knowledge transfer tried to be explained and proved. Thereby it is neglected that knowledge transfer always occurs between individuals. This motivates this thesis to apply the general model of social science explanation and the theory of work performance as its theoretical basis. It analyses how governance mechanisms affect the success of knowledge transfer from supplier to buyer by influencing the motivation, the ability, and the opportunity of the buyer to receive knowledge. Special interest is also placed on the effects of knowledge characteristics within these relationships.

The subject of the empirical analysis is knowledge transfer in consultant-customer relationships. 101 projects of a German consultancy are analyzed by using a PLS based SEM.

The results show that motivation is the central factor to explain successful knowledge transfer. It explains that only relational governance matters to manage the knowledge transfer. Formal governance has no effect on the success of knowledge transfer. The investment in relational governance needs to be highest for specific knowledge followed by tacit knowledge. Transferring complex knowledge provides savings option for the investment in governance.

In addition to knowledge characteristics, also the phase of the knowledge transfer matters to design efficient governance. Relational governance has to be increased during the knowledge transfer process because its marginal utility diminishes from stage 3 to stage 4 of the knowledge transfer.

These results close a research gap in governance of knowledge transfer for different types of knowledge. In addition, it opens a promising research arena by initially integrating the micro level in the explanation of knowledge transfer, which was dominated by macro level explanations so far.

German

Die Fähigkeit, Wissen effektiv zu transferieren, ist ein kritischer Erfolgsfaktor von Unternehmen, um auf Veränderungen schnell zu reagieren, Innovationen zu entwickeln und so am Markt erfolgreich zu sein. Ein erfolgreicher Wissenstransfer muss effektiv gesteuert werden.

Die Steuerung von Wissenstransfer wird in bisherigen Forschungsarbeiten lediglich auf einem Makro-Level analysiert. Es wird versucht, direkte Einflüsse von Steuerungsmechanismen auf den Erfolg eines Wissenstransfers nachzuweisen. Dabei wird außer Acht gelassen, dass Wissenstransfer immer zwischen Menschen erfolgt. Daher nimmt diese Arbeit das „general model of social science explanation“ und die „theory of work performance“ als theoretisches Fundament. Sie analysiert wie Steuerungsmechanismen die Motivation, die Fähigkeit und die Gelegenheit des Empfängers, Wissen aufzunehmen, beeinflussen und somit den Erfolg des Wissenstransfers steuern. Dabei berücksichtigt sie auch die Einflüsse unterschiedlicher Wissensarten.

Gegenstand der Analyse ist der Wissenstransfer in Käufer-Verkäufer-Beziehungen. 101 Projekte einer deutschen Unternehmensberatung werden empirisch analysiert und mit einem PLS Strukturgleichungsmodell ausgewertet.

Die Arbeit stellt fest, dass die Motivation des Wissenskäufers die zentrale Größe ist, um die erfolgreiche Steuerung von Wissenstransfer zu erklären. Motivation erklärt, dass lediglich relationale Steuerungsmechanismen einen Effekt auf den Transfererfolg ausüben. Formale Steuerungsmechanismen sind nicht wirksam. Die Art des Wissens beeinflusst die notwendige Menge an Steuerung: Der Transfer von spezifischem Wissen erfordert die größte Investition in relationale Steuerungsmechanismen gefolgt von dem Transfer von implizitem Wissen. Bei komplexem Wissen können relationale Steuerungsmechanismen reduziert werden. Für die effiziente Gestaltung der Steuerungsmechanismen ist ferner die Phase des Wissenstransfers zu berücksichtigen. Die Steuerung ist in der letzten Phase des Transferprozesses zu steigern, um den Wissenstransfer erfolgreich zu beenden.

Mit diesen Ergebnissen schließt die Arbeit eine Forschungslücke in der Steuerung des Wissenstransfers von unterschiedlichen Wissensarten. Des Weiteren eröffnet sie eine vielversprechende Forschungsarena indem sie erstmalig die Mikro-Ebene in die Erklärung des, bislang lediglich makroskopisch analysierten, Wissenstransfers analysiert.