A Dynamic Model for Knowledge Transfer and Alliance Learning in Cross-border Strategic Alliances of Software Companies

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The thesis at hand examines knowledge transfer in cross-border strategic alliances of software companies. The purpose of the thesis is to provide theoretical foundations for a proposed cluster initiative (Asia Software Competence Project) and a software system innovation, ANIS (Alliance Network Information System). The first part of the thesis describes the strategic management context and the following three chapters the dimensions of epistemology, ontology and culture as relevant to this thesis. Epistemology is concerned about how knowledge is acquired and processed while the ontological dimension is here used to refer to the different levels of social interaction in an organizational setting (individual, team, organization and interorganizational levels). The third dimension, culture, is a significant source of ambiguity in knowledge transfer in cross-border context. The core contribution of the thesis is the conceptual development through describing the *4-Tier Tube -model* as the model of knowledge transfer and alliance learning in cross-border strategic alliance context.

Key words: strategic alliances, knowledge transfer, absorptive capacity, transparency, trust, tacit knowledge, interorganizational knowledge creation, alliance learning, alliance innovation, complementary competences, 4-Tier Tube, Innovation Tube, Knowledge Bus, Knowledge Pool, Skein of Alliance Learning, Alliance Learning Synchronicity (ALS)

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Appendix I: Positional and modal coding in the 4-Tier Tube -model

Appendix II (non-public): Alliance Network Information System (ANIS)

1. Introduction

The thesis at hand provides a theoretical framework for knowledge transfer in cross-border strategic alliances in the software industry - focusing on East-West crossing partnerships. Knowledge transfer between strategic alliance partners has peculiar challenges tracing back to different sources, such as properties of knowledge to be transferred, organizational attributes and the dynamics of an evolving alliance relationship. A common knowledge pool of an alliance enables nurturing the shared knowledge.

Cultural distance is something to pay special attention to in East-West crossing relations where, the other member hails from collective vertical culture and the other one from individualist horizontal culture. Such is the case, for example, between Finland (or other Nordic countries) and India or China.

My purpose with this thesis is - along with answering the research questions - to provide theoretical base for the 'Asia Software Competence Project' (ASCP) that I have initiated. The ASCP project has practical and research interests side by side – it aims to facilitate strategic alliances between Finnish and Asian software companies and conduct research on "Asian Software Competence" – on the levels of company, strategic alliance and industry. The objective of this venture is to support the emergence of Finnish-Asian collaboration in the software industry. Software industries in Finland and Asia could potentially benefit from the strategic cooperation, but these cross-border alliances are being established slowly. The reasons might include geographical and cultural distance – at both - national and organizational level. Indeed, both the previous are challenges from the knowledge transfer view: geographical distance necessitates IT mediated communication along with frequent "on-site" partner visits and team or team member exchanges. Cultural distance requires double-checking that a piece of information has been understood similarly on both sides.

Why have I selected the particular topic? Firstly, it converges in a fascinating way the three threads of interest, the dimensions of epistemology, ontology and culture into the Skein of Alliance Learning. The 'skein' forms the core of the model 'Innovation Tube' within the 4-Tier Tube -model that is the principal result of this research. In this work, the academic streams of strategic management and knowledge management are being converged into one: this allows one to perceive how different strategic choices relate to 'knowledge transfer challenge' and further, to innovation. For me, this research can be seen

as one image that has beauty as a whole and fascinating details to zoom in. For example, it would be naïve to claim that the cultural dimension could be explored in one chapter of a Master's thesis thoroughly. To understand another culture and how cultures shape an individual personality and thinking, is more like a lifetime challenge than just a Master's thesis project.

Knowledge transfer can be examined on different levels: between individuals, organizations, and industries, to name a few. The flow of data and information forms the foundation for the knowledge transfer process itself, but is not the primary level of study in this thesis. The total knowledge transferred from an organization to another consists of the cumulated knowledge transferred from any two employees of these organizational entities, but is supposedly very difficult to measure. Knowledge may be transferred through personal communication or may be facilitated by the use of information systems.

Why to study knowledge transfer? Firstly, knowledge transfer, in my opinion is an *atomic determinant* of joint-innovation in strategic alliances. By 'atomic determinant' I refer to all those conditions and factors that must be present in order for a strategic alliance to emerge as a platform for innovation. For example, without knowledge transfer between organizations, there will be hardly any joint learning; without joint learning there is not much scope for the development of interorganizational competence that could lead to a series of joint-innovations. Another reason to study knowledge transfer is more personal: if a person needs to select one topic to immerse oneself a bit more in depth in his university education, knowledge transfer may be a good bet: at least it has application possibilities all through the professional and personal life regardless of the domain.

Ontological, epistemological and cultural factors that influence knowledge transferability in cross-border strategic alliances are examined (Figure 1) in their own chapters. The ontological dimension (or thread) refers to the levels of interaction that are present in interorganizational learning: individual, team organization, and alliance. Epistemology is a field of philosophy that examines knowledge and its characteristics, creation and acquisition of knowledge. Cultural thread is a significant contributor to the knowledge transfer challenge: individuals are conditioned by their native culture to the extent that the individuals may not even be aware. The threads of epistemology, ontology and culture are integrated into one 'skein' of alliance learning in Chapter Seven.

The *research pool* of Figure 1 depicts the focal problem domain in which ontological, epistemological and cultural factors raise a wide variety of challenges of research interest.

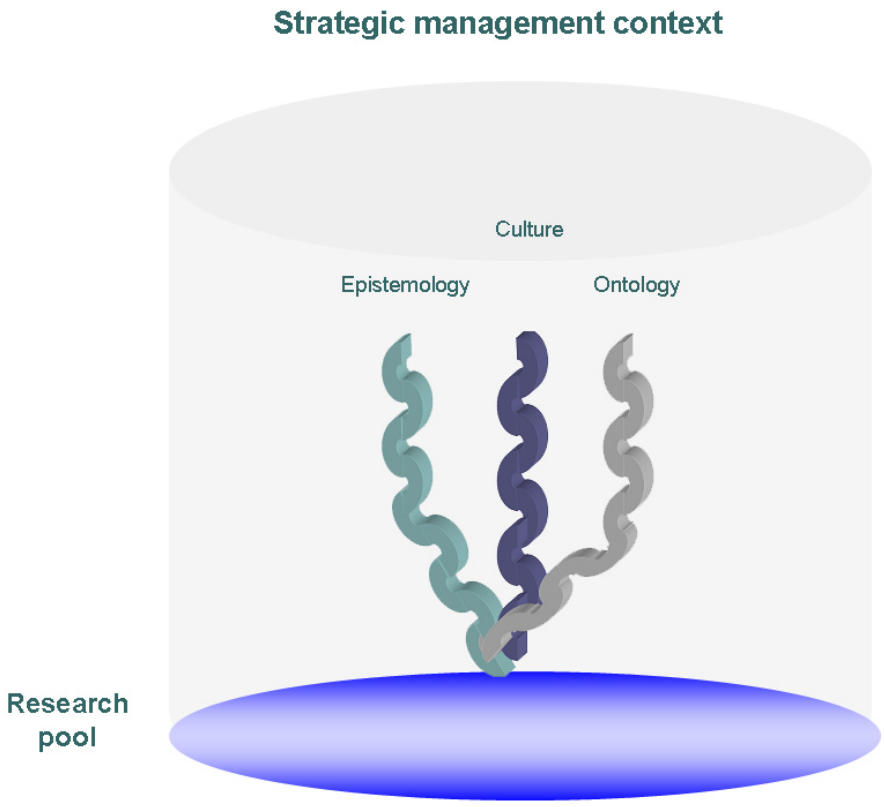

Figure 1. The context and different 'streams' of the thesis.

In addition to different streams contributing to the research pool, it is important to note that the thesis belongs to the strategic management context: the decision of engaging – or not engaging – in an alliance or partnership is a strategic choice itself. Further, the choice between all the possible alliance types is again a strategic choice of most importance that the corporate management should not take lightly. All through the alliance life cycle, the company executives have various concerns, many of which are more or less directly related to the knowledge transfer in the alliance. For example, the changing levels of partner commitment during the alliance life cycle will impact the level of transparency directly. If a partner is engaged in the alliance with an opportunistic mindset, it will close 'the knowledge taps' right away when its own learning goals have been achieved.

The major contribution of this thesis is the 4-Tier Tube -model described in Chapter Seven. The model identifies four nested tubes that are used to visualize different modes and positions to lock-in for a particular alliance in regard to innovation, strategic alliance (partnership perspective), information system support, and strategic management. The purpose of the 4-Tier Tube -model is

to be used as a tool to better understand the peculiarities and interdependencies of different layers of management concerns in R&D strategic partnering. Practical benefit of the model is that it enables taking a snapshot of a particular strategic alliance at any chosen time. The analysis of the snapshot together with having theoretical understanding and practical experience of R&D strategic alliances may lead to better management of these challenging organizational arrangements.

2. Research window

2.1. Introduction

The purpose of this Master's thesis is to provide foundations for a PhD dissertation. The theoretical review of the Master's thesis is more meaningful when it is seen as the groundwork to help define the framework and constraints for a software system innovation (Figure 2). Epistemological, ontological and cultural dimensions identified in the first part of the research (M.Sc) contribute to the system constraints of a MIS[1] -product (ANIS, Appendix II).

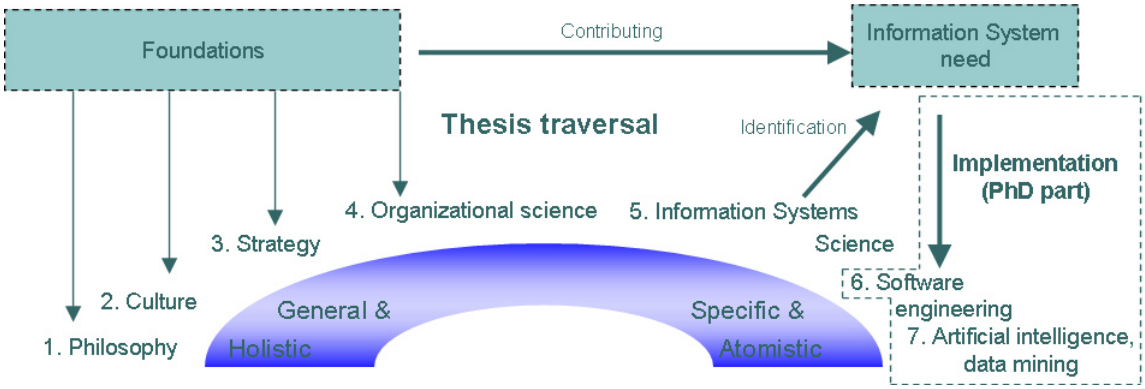

Figure 2. Thesis roadmap.

The implementation of the MIS is conducted in the PhD part. In the spirit of information system science, the latter part does not limit only on building a technological innovation, but includes the whole journey identifying the system constraints from the theoretical framework in M.Sc phase, and implementation and evaluation of the system.

2.2. Research questions

The research questions for this Master's thesis are the following:

1. What are the challenges of knowledge transfer in (East-west) cross-border strategic alliances of software companies?
2. What kind of model is best suited to describe the 'knowledge transfer challenge'?

[1] Management Information System

3. What are the strategic choices when entering cross-border strategic alliances and how the 'knowledge transfer challenge' relates to these?

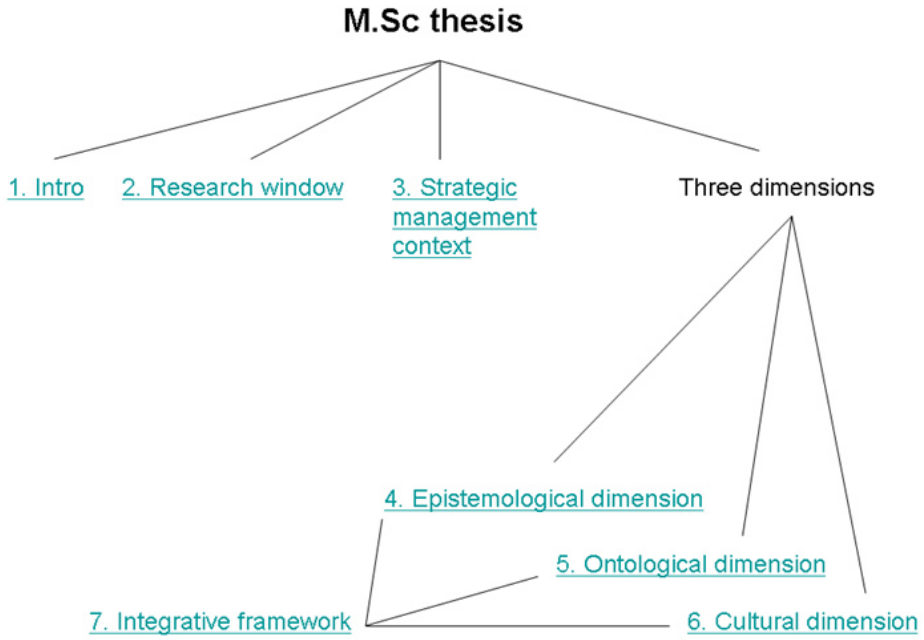

Figure 3. Research tree.

2.3. Research approaches and methods

The research foundations of this thesis are explored in the following by reviewing research methods in general and design-science approach in particular. Järvinen [2004] categorizes research approaches as mathematical approaches and approaches studying reality (Figure 4). Mathematical approaches are concerned with symbol systems, such as formal languages and algebraic units that do not relate to objects of reality. Approaches studying reality can be divided further based on whether research questions are concerned with 'what is a part of reality' or utility of an innovation. However, the rigid classification by Järvinen [2004] denies interconnectedness of mathematical approaches and approaches studying reality, and should be viewed critically. The reality based study could utilize mathematical theories, for example, a question could be raised: what kind of mathematical theory could be utilized in the design of a novel information system[2]?

Further, we can distinguish between conceptual-analytical approaches and empirical research approaches. When using a theory-testing research method, a theory, model, or framework is guiding the research. On the other hand, a

[2] A remark and question raised by Hannu Kangassalo.

completely new theory can be created based on gathered raw data [Järvinen, 2004].

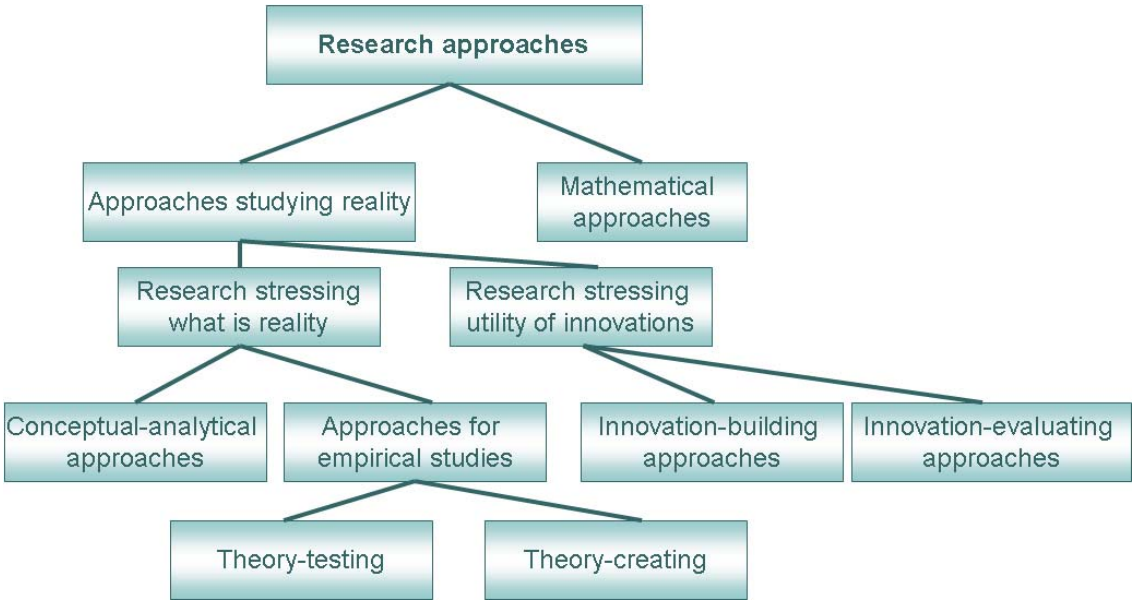

Figure 4. Research approaches [Järvinen, 2004].

Systems theory aims at a better understanding of systems. It views a system holistically in a particular environment [Järvinen, 2004]. General systems theory dates back to the 50's when it was established as a distinct discipline to address the domain that falls between highly generalized constructions of pure mathematics and the theories of the highly specialized disciplines [Boulding, 1956]. This thesis belongs to the field of Information Systems Science. Regardless, whether the strategic alliance partners examined in this research have interfacing IT systems or not, their interaction forms an information system consisting of the people of the two organizations and communication between these. However, special alliance information system (ANIS, Appendix II) is proposed in this thesis to support the knowledge transfer and thus facilitate the joint learning process.

Observing Järvinen's [2004] taxonomy, it is evident that this thesis belongs to reality-based research and in regard to the PhD part, to research that examines the utility of innovations. The research as whole belongs to design-science research [see March and Smith, 1995; Hevner *et al.*, 2005]. In the following, both natural science and design science research streams are introduced.

Natural science is the stream of science most popularly associated with the 'science' word: it aims at understanding reality better in physical, biological,

social and behavioral domains. New concepts or specialized language may be needed for this purpose. Laws, models and theories are the principal ways to characterize the reality. Two activities are an integral part of the natural science theory: *discovery* for generating and proposing scientific claims, and *justification* for testing their validity. The first one, discovery, is a creative cognitive process of the researcher, which may be difficult to formalize and explain in objective terms. Justification instead is 'heavily prescribed' in the field of philosophy of science. Inductive logic (which refers to 'justifying' by pointing to accumulating number of confirming instances) was abandoned by Popper's falsificationism: a single negative instance could be used to falsify a theory that apart from that one fallacy would seem to be perfectly watertight [Järvinen, 2004].

In contrast, design science attempts at creating artifacts that in a way or other are useful for a human [March and Smith, 1995]. Hevner et al. [2005] emphasize that design-science is essentially a problem-solving paradigm with its roots in engineering and that design science is technology-oriented and thus not aiming at producing general theoretical knowledge. The products of design science fall into four categories: (1) constructs, (2) models, (3) methods and (4) implementations [March and Smith, 1995]. Hevner et al. [2005] emphasize that in design-science research the distinction must be drawn between routine design and system innovation grounded on design research. In routine design, application is built based on existing knowledge of organizational problems. In design-science, however, unsolved problems are addressed in unique and innovative ways.

The models built in this thesis can be thought as products of design science research since there is no requirement of physical or information technology implementation in the respective stream of research. Three of these models are in the form of 3D-cubicles (knowledge transfer challenge, and support; and strategic choices), the fourth one as 4-Tier Tube -model.

Bunge [1998] categorizes different models into theoretical and material (Figure 5). In the case of *conceptual models*, the primitive symbols correspond to concepts in certain theoretical context, but without real reference (being a true interpretation of an abstract theory). *Factual model* is a product of a non-formal interpretation that is compared to the primitives of formalism. Apart from conceptual and factual models, there exists *mixed models* in which some predicates represent real properties while some are not given factual interpretation. Examples of such semi-interpreted theories are information theory (applicable to a wide variety of open systems) or network theory (applied to electric circuits, for example). The theoretical models (conceptual, factual, mixed) are mental creations even if representing real objects. However,

in the case of *material model*, a real system, such as electric switching system can be a concrete physical analogue to the propositional calculus [Bunge, 1998]. Thus, the 4-Tier Tube -model presented in this thesis seems to fit the category of theoretical model and being a *factual* interpretation of the problem domain of knowledge transfer and alliance learning.

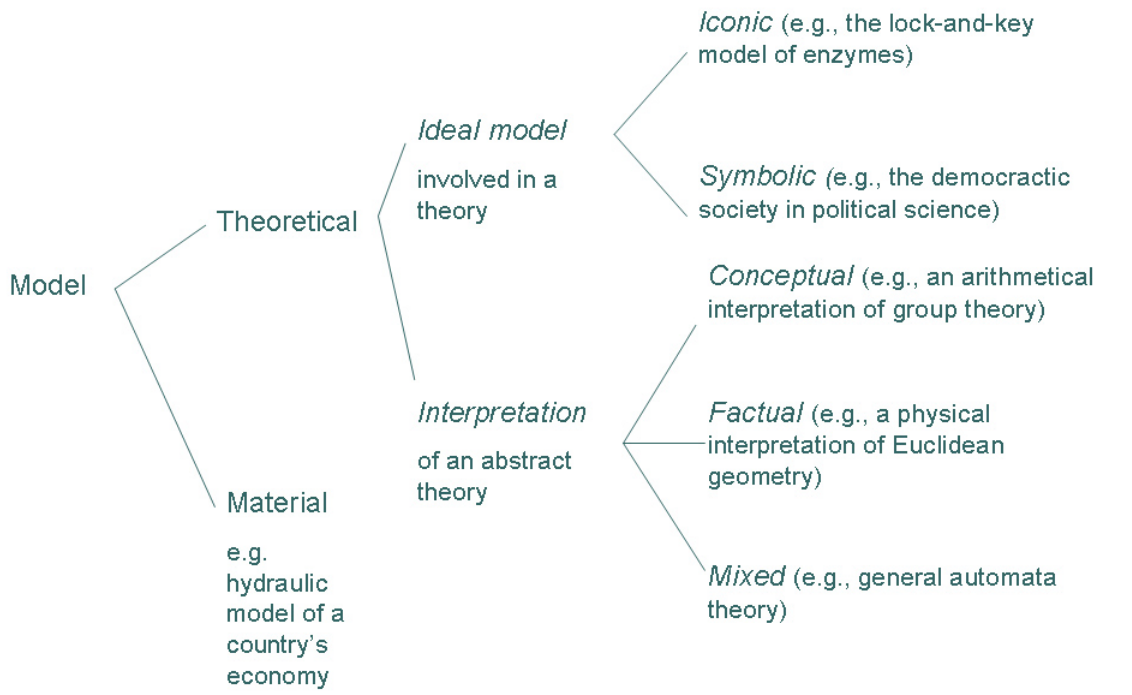

Figure 5. Different kinds of models [Bunge, 1998].

In design-science, understanding of the design problem and its solutions advances parallel to the building and applying of the artifact [March and Smith, 1994; Hevner, 2005]. Hevner et al. [2005] present seven guidelines for design-science: the first guideline "Design as an artifact" states that the output of the design-science research must include one or several artifacts as categorized by March and Smith [1995]: construct, model, method or an instantiation.

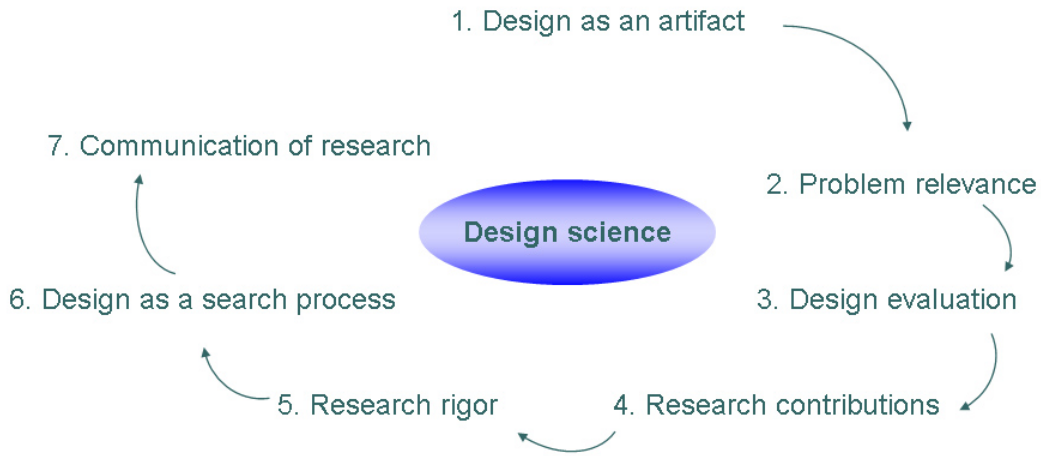

Figure 6. Design science guidelines by Hevner [2005].

The second guideline, "Problem relevance" states the purpose of design-science research: to develop technology-based solutions to important business problems. The third guideline, "Design evaluation", states that the evaluation of the utility, quality and efficacy of a design artifact must be 'rigorously demonstrated via well-executed evaluation methods'. The fourth guideline, "Research contributions", emphasizes the 'clear and verifiable contributions' in regard to artifacts, design foundations and methodologies. The fifth guideline, "Research rigor", refers to methods used in construction and evaluation of an artifact. The sixth guideline, "Design as a search process", acknowledges the iterative nature of design science; the continuous search process to discover an effective solution to a problem. Finally, the seventh guideline, "Communication of research", states the need to address both, technically and managerially, oriented audiences. Sufficient details of an artifact should be provided to the extent that a corresponding artifact can be constructed in an appropriate organizational context. Managerially oriented audience will need sufficient details for being able to decide whether the organizational resources should be committed in their organization for the construction of the artifact [Hevner *et al.*, 2005].

2.4. Thesis mindset

This thesis follows four basic guidelines: (1) visualize when possible, (2) thoroughness and "slow conclusions", (3) conceptual integrity and completeness and (4) genuine research attitude (Figure 7). These are introduced in the following.

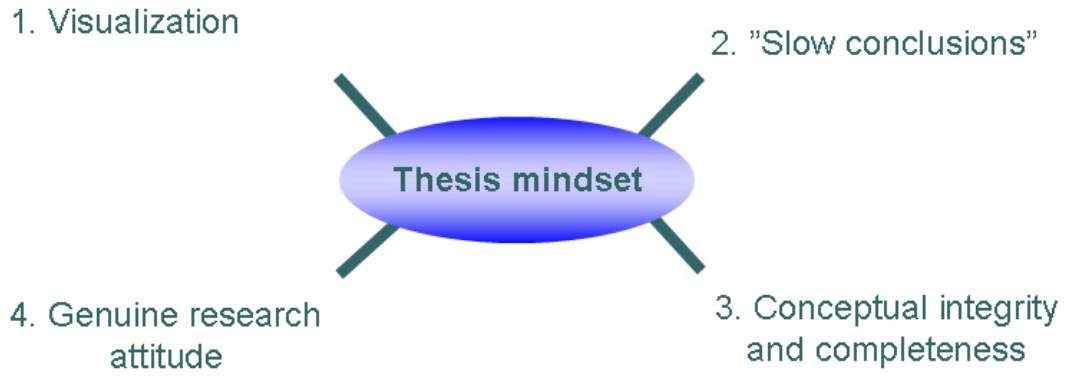

Figure 7. Thesis mindset.

Visualization of abstract phenomena is used throughout this thesis in the form of models, metaphors and analogues that a reader can relate in concrete terms. In the philosophy of science, phenomenology criticizes science as follows (Järvinen, 2004): "By losing contact with human experience, science has nothing of any real importance to say us". Therefore, the guiding principle in the writing process of this thesis has been to keep the theoretical framework understandable for 'laymen' who certainly are not experts in the field.

For example, the context of the thesis is depicted in Figure 1 representing how the thesis topic area consists of three different streams of epistemology, ontology and culture that merge into one. For many readers, the terms used in the thesis topic - 'epistemology' and 'ontology' - might already provide a barrier for getting into the reading process. However, the previous philosophical notions are not as difficult as one might think at first glance and light on their very essence is shed later on.

Slow conclusions demand digging down deep into the subject topic and not accepting the first possible conclusions. Since the topic area consists of different 'streams' originating in their own sources, impact of all of these must be taken into considerations equally: for example, it might be that in the field of information systems – which is my background – the impact of technology or systems might be emphasized over cultural factors.

By claiming c*onceptual integrity and completeness* I refer to two things. Firstly, all the important concepts used should be defined before use. Secondly, I may use concepts defined by myself, such as *innovation potential* and *alliance pay-off potential*. The use of the previous concepts would be vague if I would not have declared explicitly their meaning. Therefore, in which ever part of the thesis these words are used they carry always the agreed meaning.

Finally, by r*esearch attitude* I refer to research rigor that demands using valid methods and digging down deep into the research subject.

3. Strategic management context

3.1. Strategic alliances - look at the past

In the dawn of the 90's Ohmae [1989] stated in his Harvard Business Review article that to his knowledge "there is not even one scholar who specializes in the study of intercompany relationships". Since then interorganizational relationships have emerged as an important area of study in business research with an abundance of journals and conferences. The business research that was in the past firm-centric and which then has expanded to inter-firm level and company-networks, is evolving to larger entities, such as communities, the members of which are not seen only as customers, but co-creators of value (a term by Prahalad and Ramaswamy [2004]) and a potential source of innovators [von Hippel, 2001]. Further, Ohmae [1989] wrote about 'Global logic' of strategic alliances and stated that strategic alliances are 'critical instruments' in serving customers globally. Despite the previous, he stated that managers were slowly adopting strategic alliances in use: maybe because alliances are sometimes perceived as compromising the 'fundamental independence of economic actors'.

Other trailblazers of strategic partnering research were Gary Hamel, Yves L. Doz and C.K. Prahalad [1989] with their article "Collaborate with your competitors and win". The authors based their insights of the 'inner workings' of 15 strategic alliances observed for an average of three years. Many of the strategic alliances of their study included the American-Japanese or European-Japanese -axis which was considered relevant since traditionally fierce competitors such as General Motors and Toyota, Canon and Kodak, were engaged in collaborative activities more often than ever before. Authors also observed that alliances involved with a western and Asian partner tend to favor the Asian partner, e.g. Japanese or South-Korean company. The authors' view on the alliances shines through the title which implies that no matter how much the nature of partnering was supposed to be 'collaborative', what matters finally is winning the alliance race, instead of emphasizing WIN-WIN outcome for both parties. The authors' 'alliance world view' as well as the industry practices of that time were restricted to seeing alliances as opportunities to absorb as much knowledge from the partner in as short a time as possible, as they state: "It's not devious to absorb skills form your partner - that's the whole idea".

In the mid-90's emerged a research boom in knowledge management after Nonaka's and Takeuchi's seminal article and a book ‘Theory of organizational

knowledge-creation'. Eventually, in the late 90's the streams of strategic alliance research and knowledge management research converged: as the result a great number of papers were published about knowledge management in inter-organizational context, interorganizational learning and knowledge transfer between organizations (see Appleyard [1996], Inkpen [1998], Larsson et al. [1998], Das and Teng [2000], Parise and Henderson [2001]).

A great deal of academic research on knowledge transfer and interorganizational learning has based the next potential paradigm shift: seeing strategic alliances fundamentally as vehicles of innovation, and not to limit their use only to large global multinationals (target of the research most commonly). Only when entrepreneurial small and medium enterprises (SMEs) adopt (cross-border) strategic alliances in their standard portfolio of strategies, the business ecosystem has reached the mature level of genuine 'Alliance thinking' as opposite of 'Firm-centric thinking' (Figure 8). Reaching the stage of genuine 'Alliance thinking' is the result of all the pioneering work of authors in strategic management, such as Ohmae [1989], Hamel et al. [1991], Dyer and Singh [1999] and Spekman et al. [2000]; and on the other hand on the side of knowledge management: Nonaka and Takeuchi [1995] and knowledge-based view of the firm by Grant [1996].

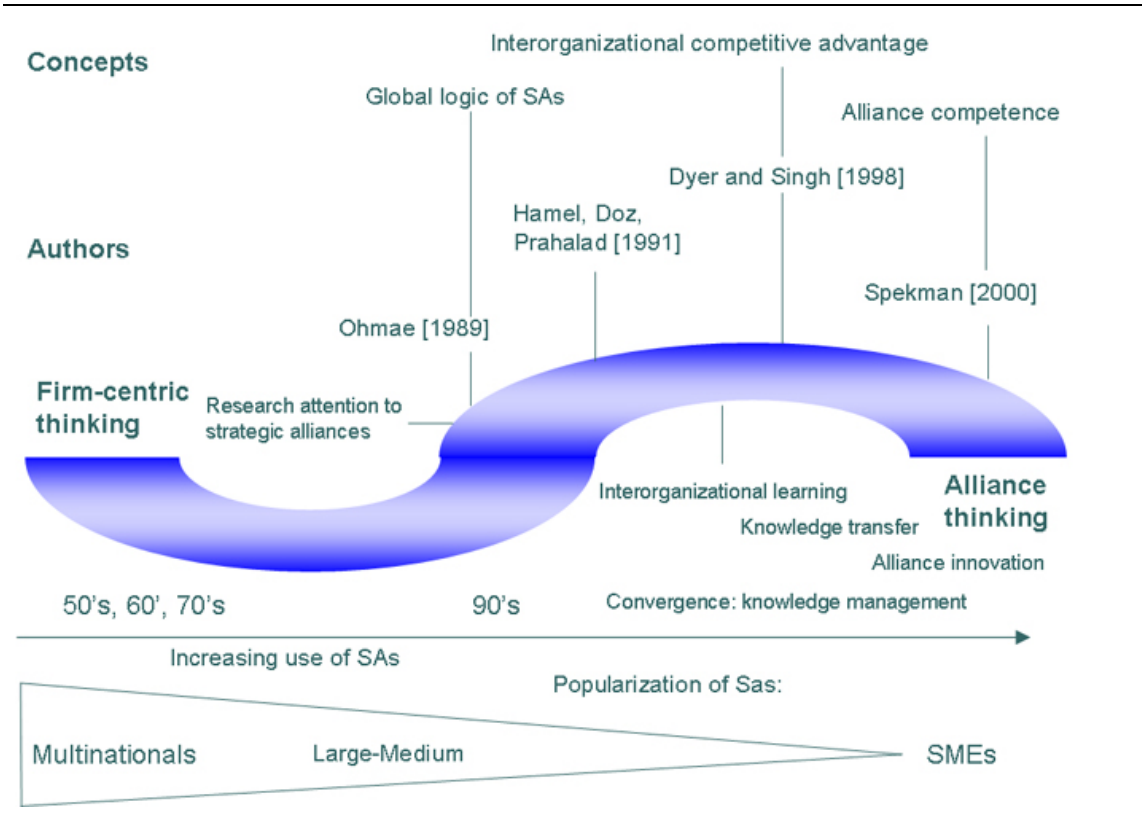

Figure 8. Towards alliance thinking.

In this thesis I am concentrating on knowledge-based view in strategic management and focusing on knowledge transfer of strategic alliances. However, this viewpoint is only one among many possibilities and some others could be considered equally, such as dynamic capabilities approach by Teece et al. [1997]. The dynamic capabilities approach is the latest node in the chain of strategy classics, such as "Porterian" competitive forces [Porter, 1980], the strategic conflict approach [Shapiro, 1989] and resource-based perspective (e.g. Penrose, [1959]). With their term, 'dynamic capabilities', Teece et al. [1997] refer to a capacity of the firm to renew its competences according to environmental changes. Strategic management plays an important role in developing the firm's capabilities, i.e. ensuring that internal or external organizational skills are sufficiently adapted and integrated.

Das and Teng [2000] as representatives of resource-based view of the firm, consider resource alignment as a critical factor in performance of strategic alliances. With the term they refer to the resource matching and integration pattern of an alliance. The authors propose broader interpretation of resource alignment concept – not restricted to supplementary vs. complementary classification of resources – and this broader view includes the value-creating aspect. Also they stress well that "similar is not the same as supplementary, and dissimilar is not the same as complementary". Table 1 clarifies the different possibilities of resource alignment.

Table 1. A typology of inter-partner resource alignments [Das and Teng, 2000]

Resource similarity	Resource utilization	
	Performing resources	Nonperforming resources
Similar resources	Supplementary [Similar-Performing]	Surplus [Similar-Nonperforming]
Dissimilar resources	Complementary [Dissimilar-Performing]	Wasteful [Dissimilar-Nonperforming]

Resource similarity is high when both partners contribute comparable amounts of similar resources to the alliance. Resource utilization refers to the degree that shared resources are utilized in realization of alliance goals. The cases of resource surplus and wasteful resources are included in the typology, and point to situations when similar or dissimilar resources – respectively - are not utilized. Complementary resources are in question when resources are

compatible and 'pressed into effective service' as Das and Teng [2000] put it in words.

3.2. Business relationship

While we have to understand the strategic management context of this thesis research interest, knowledge transfer, we also have to understand and define the context for strategic alliances - a business relationship. Holmlund's and Törnroos's [1997] definition of a business relationship is following: "an interdependent process of continuous interaction and exchange between at least two actors in a business network context". This definition clearly emphasizes the process nature and continuity aspects of the relationship.

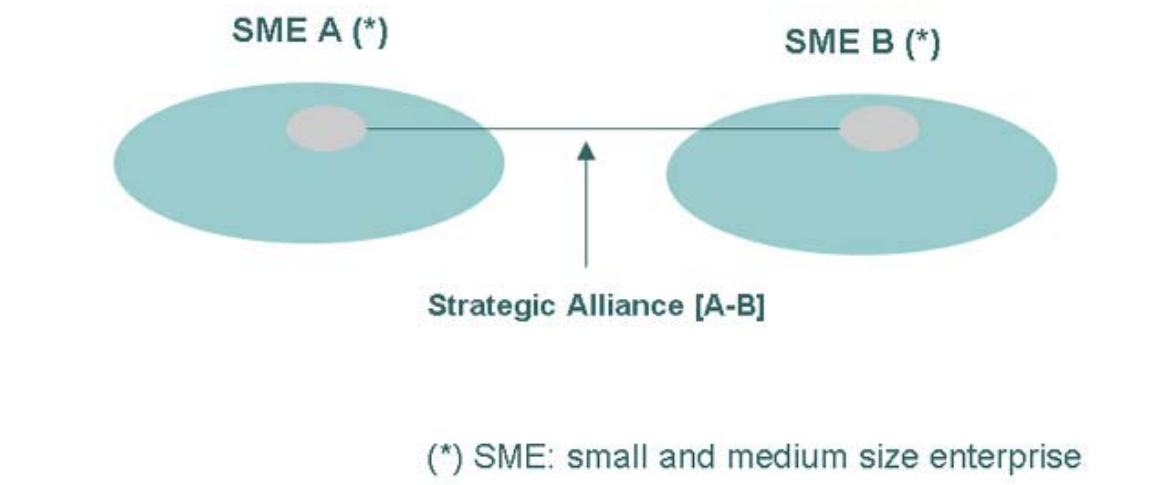

Figure 9. The simplest case of a strategic alliance.

Further, Holmlund and Törnroos [1997] describe business relationships as 'mutual arrangements having technical, economic, social, knowledge and legal bonds'. A relationship is relatively *symmetrical*, when both counterparts have fairly equal possibilities to influence the relationship. As *power-dependent* structures, none of the partners are supposed to have absolute control over the relationship. While firms develop some resources internally, they gain access to others (e.g. financial or technological assets) through the relationship, thus implying *resource dependence* [Holmlund and Törnroos, 1997].

Strategic alliances vary in their scope and breadth: from an agreement of a pool of companies to collaborate in a certain narrow area to a contract between two partners that decide to commit all their shared resources to achieve a

common vision and goals. The simplest case is when there is a partnership between two organizations and one strategic alliance in the chosen collaboration area (Figure 9). In the case of multinational companies (later briefly MNCs) there can be dozens of strategic alliances that cover a certain area of the collaboration that are independent from each other [Spekman *et al.*, 2000; Ohmae, 1989].

Although a strategic alliance can be a contract between more than two companies, in this thesis, by default, alliances involving a company dyad, i.e. two companies, are studied. Involvement of more complicated alliance arrangements could raise important issues as how to manage conflicts in an alliance network in which the firm's most crucial alliance partners are allied also with the firm's serious competitors (Figure 10). This kind of arrangement would impact knowledge transfer between the two companies if the third party would impose restrictions for transparency of its partner towards its competitors.

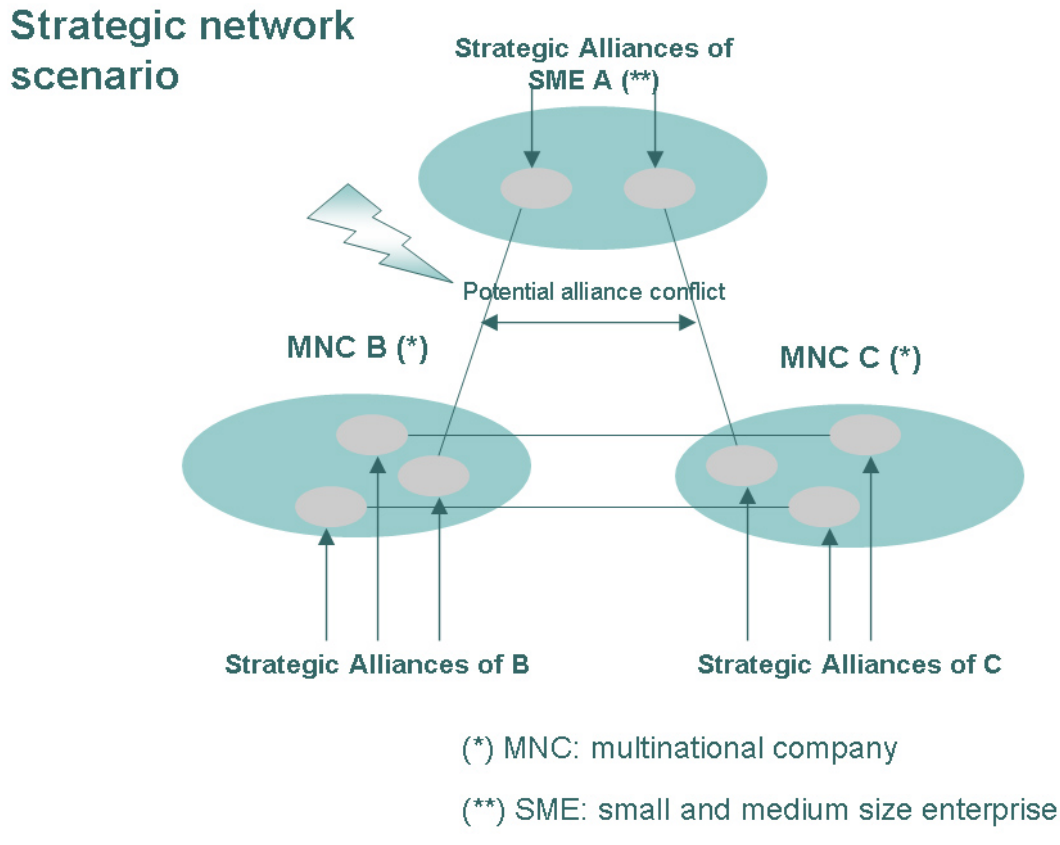

Figure 10. An alliance network of two MNCs and one SME company.

Outsourcing relationships have been very much in the focus of academics and practitioners in the recent years [see Kishore *et al.*, 2004; Kern and

Willcocks, 2002]. Some of the research, such as the ones examining cultural impacts on a relationship, is perfectly applicable to symmetrical strategic alliance context. However, outsourcing relations differ from R&D alliances in two important dimensions: most important is the distinction between parallel and intertwining processes. The former one being the 'mode' most commonly in outsourcing and the latter one in R&D alliances. In the software development, implementation with well-known technologies is the most likely target for outsourcing. Alternatively, the vendor may be given the total responsibility of the process from the requirements specification stage onwards [Messerschmitt, 2003]. Finally, it should be noted that outsourcing is the term used only in the context where something that is conducted by the organization earlier is acquired through outsourcing from the outsider, a vendor, through outsourcing contracts. Thus, there exists resource leverage –relationships which resemble outsourcing relationships, but which aim at 'new growth', not outsourcing some existing operations.

3.3. Typology of strategic alliances

Kishore et al. [2004] classify four different relationship types: reliance, alliance, support, and alignment. This model is dynamic in nature; relationship may evolve over time and shift from, e.g. 'support' to 'alliance' quadrant. Das and Teng [2000] divide alliance types into four categories: (1) joint ventures, (2) minority equity alliances, (3) bilateral contract-based alliances and (4) unilateral contract-based alliances. Broader classification is possible by distinguishing equity and non-equity alliances from each other. Equity alliances refer to equity joint ventures (EJVs) in which a new jointly financed and managed entity is created; and minority equity alliances in which one partner invests in the other. However, in the typology of Das and Teng [2000], equity agreements such as joint ventures are considered a subclass of strategic alliances, contrary to Duysters et al. [1999].

Koza and Lewin [2000] categorize strategic alliances based on March's [1991] distinction between exploration and exploitation in three categories of alliances: learning, business and hybrid alliances (Figure 11).

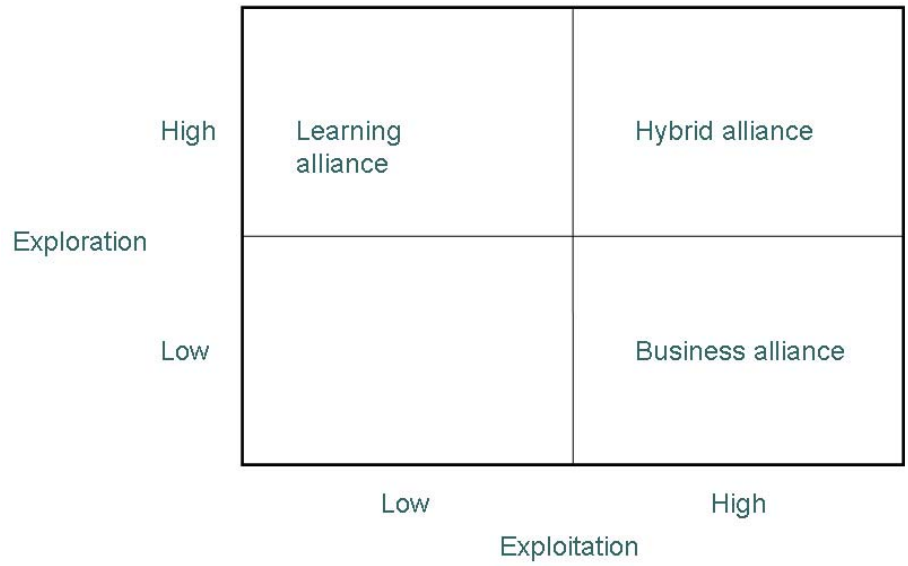

Figure 11. Three alliance forms in regard to exploration and exploitation [Koza and Lewin, 2000].

As defined by March [1991]: exploration is diverging and open-ended: "search, variation, experimentation, play, flexibility, discovery, innovation"; exploitation is converging and of finite nature: "refinement, choice, production, efficiency, selection, implementation, execution". In learning alliances there is no hidden exploitation agenda from the side of neither partner, whereas in business alliance this is common. The latter are established commonly for securing certain market positions or segments. Hybrid alliances have the motives, exploration and exploitation, side by side [Koza and Lewin, 2000].

Das and Teng [2000] refer to Kogut's (1988) research by stating that EJVs are 'the most instrumental' in regard to tacit knowledge transfer because of the significant exposure of partners to each other. Thus, EJVs are an attractive option for those firms that aim at accessing partner's knowledge-based resources. If partner's resources are mostly property-based, joint ventures may not be an ideal choice [Das and Teng, 2000]. Regardless of which type of ownership is in question, the important point is that shared ownership structure decreases the likelihood of opportunistic behavior [Gulati, 1995].

When equity sharing is not present in any form in an alliance, we deal with contract-based alliances. In unilateral contract-based alliances, such as licensing, distribution agreements and R&D contracts, property rights are well-defined. When partners are allied with the purpose of exchanging "technology for cash", they perform their activities independently without real need for

integration. Unilateral contract-based alliances are proposed to be suitable when partners intend to contribute mainly property-based resources that include capital, plants, distribution channels and patents [Das and Teng, 2000]. Since no real joint learning occurs in unilateral alliances, the knowledge transferred is mostly explicit.

On the other hand, bilateral contract-based alliances (shortly: bilateral alliances), including joint R&D or joint production or marketing, require close collaboration and pooling of resources [Mowery, 1996]. Bilateral alliances provide to great extent many of the learning benefits of joint ventures, but might turn out to be 'races-to-learn' since equity investment as an alliance equilibrating mechanism is not present. If long-term collaboration is not even targeted, bilateral alliances provide suitable context, since they provide an opportunity for joint learning, but are not as laborious to dissolve as equity-sharing -based joint ventures [Das and Teng, 2000]. Because of the intertwining learning processes in bilateral alliance, they provide an excellent opportunity for internalizing partner's tacit knowledge. Participants in bilateral alliances are well aware of this and do regulate the exposure of their knowledge resources to the other party [Mowery, 1996].

Equity-based alliances tend to be more stable than those involving only contractual commitment [Mowery, 1996]. Another aspect of equity ownership in an alliance is that this often results in replication of the parent organization's hierarchical controls in the alliance [Gulati and Singh, 1998]. Mowery et al. [1996] argue that equity-based -alliances promote greater knowledge transfer and thus are well suited to learning critical capabilities from the partner. Ohmae [1989] implies that equity investments may be seen negatively as a way of controlling the alliance partner with money.

3.4. Motivation for strategic alliances

Strategic alliances have become more and more popular over previously dominating joint ventures and other forms of equity agreements. The proportion of equity agreements compared to the total number of agreements has declined based on the data from 70's to mid 90's [Duysters *et al.*, 1999]. Strategic alliances are used as tools or vehicles to achieve competitive advantage through various means, such as gaining access to new markets or technologies and scale of economies [Ohmae, 1989, Hamel, 1991]. Especially resource-based view of the firm emphasizes resource access as an important aspect and motivator of strategic alliances [Das and Teng, 2000].

Strategic alliances provide an opportunity for aggregation and exchange of valuable (knowledge) resources when these resources are not available at reasonable costs through other means such as market exchanges or mergers or

acquisitions [Das and Teng, 2000]. They are preferred over mergers and acquisitions especially when not all the resources of a target company are valuable to the acquirer: non-desired resources can just be bypassed. Thus, in the previously described circumstances, strategic alliances provide more precise and effective means of accessing the critical competence and knowledge than the other possible forms of corporate arrangements [Das and Teng, 2000].

The effectiveness of strategic alliances from the perspective of new product development and cross-border knowledge transfer is debated in the literature. Kotabe and Swan [1995] examined the impact of cooperating firms, firm size, industry, strategic linkages, temporal aspects and nationality on innovativeness of new product development. Along with other results, the authors concluded that small single firms with cross-industry cooperation and horizontal linkages indicated more innovative products [Kotabe and Swan, 1995]. Another study by Almeida et al. [2002] implied superiority of MNCs compared to alliances and markets in facilitating the flow of knowledge across the borders. This may result from the MNC's ability to use flexibly different mechanisms to transfer, integrate and develop technical knowledge.

Prahalad's and Hamel's [1990] view at a firm as "a portfolio of core competences" provided an alternative to the prevailing view of a firm as a set of product-market entities in the early 1990s. According to this view inter-firm competition is essentially about acquisition of new skills, not a race of new product introductions. Further, global competitiveness is seen as "a function of the firm's pace, efficiency, and extent of knowledge accumulation". Hamel [1991] considers the classic 'competitive strategy' paradigm by Porter (1980) incomplete in a sense that it focuses only on the very late stage of product-market positioning, which is only the culmination point of long-term skill-building. Dyer and Singh [1999] expand Porter's competitive advantage of a firm to alliance level and identify four different sources of interorganizational competitive advantage: relation-specific assets, complementary resources and capabilities, effective governance and interfirm knowledge sharing routines – the last being more of an interest in this thesis. Knowledge sharing routines refer to those deliberately developed inter-firm processes aimed at facilitating knowledge exchanges between alliance partners [Dyer and Singh, 1999].

Dyer and Singh [1999] examine two dominating views about the source of competitive advantage, industry structure (by Porter) and resource-based view. In the former, 'supernormal' returns are explained by the firm's membership in the industry whereas in the latter, the unique resources held by the firm are the distinguishing factor. By referring to the earlier research implying that productivity gains in the value chain are possible if participants are willing to

make relation-specific investments and combine resources in novel ways, Dyer and Singh [1999] propose that idiosyncratic interfirm linkages may be a source of relational rents and competitive advantage.

Strategic alliances have great potential benefits, but have high probability of failure: Duysters et al. [1999] refer to great number of research where failure rate has been found to be around 60% - some being more or less pessimistic than this number. Bleeke and Ernst [1993] studied cross-border alliances and found that although two thirds of cross-border alliances encountered serious managerial and financial problems, most of them could overcome those. One third of the sample ended up in a total failure (for both partners).

Reasons for failure of strategic alliances are many: hidden agendas, tension between collaboration and competition (high-ratio of private to common benefits), asymmetrical relationship, i.e. big differences in size of the companies and further, their bargaining power [Duysters *et al.*, 1999].

3.5. Strategic alliances and technology-life-cycle models

Roberts and Liu [2001] present the technology-life-cycle model of alliances and acquisitions that bases on 'Utterback model of the technology life cycle' with its three stages: (1) Fluid phase, (2) Transitional phase and (3) Mature phase, with one more added later, (4) discontinuities phase.

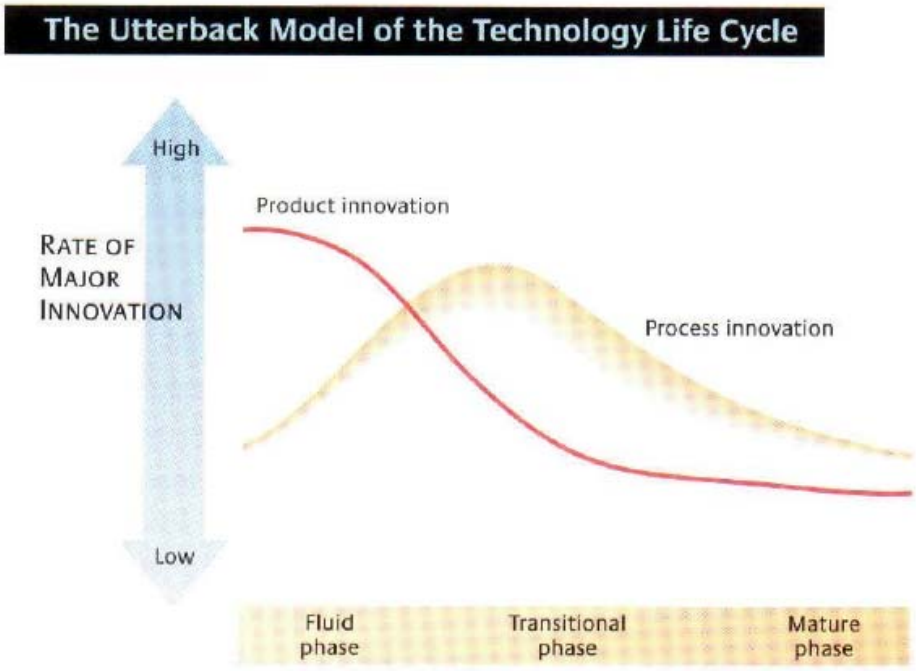

Figure 12. Utterback model of the Technology Life Cycle

Although the work of Roberts and Liu [2001] is published in a more business-oriented journal[3], I have introduced it here since it raises an interesting proposition about strategic decisions in different phases of technological maturity.

In the *fluid phase*, pioneering products, such as a compact disc (CD), enter the market. In the emergence of a novel technology, organizations may be confused to which of them to invest and commit their R&D resources. The characteristics of the fluid phase include low barriers to entry, low brand loyalty (functionality and quality focus), high profit markets (less direct competition) and low bargaining power of suppliers. The authors propose that the managers should pursue 'aggressive outward-licensing strategies', to support adoption of their technology. Marketing alliances may help reaching customers quickly in this stage. Additionally, alliances for establishing standards are common in the fluid phase. Well-established technology companies may acquire start-up companies with potentially mutual benefits: resource leverage for the acquired company and gaining access to competitive technologies for the acquirer [Roberts and Liu, 2001].

The emergence of *dominant design* causes the shift from the fluid phase to the transitional stage [Roberts and Liu, 2001]. Now, the focus shifts to enhancing the dominant technology, which decreases market and technology uncertainty and shortens design cycles. Other characteristics of the phase are rapid growth of demand, rise of the customer expectations (quality and timely delivery) and lowered barriers to entry. In this stage, companies collaborate to improve the dominant design and develop extensions, such as features or applications for the platform. Companies of approximately same size and with sufficient technological competencies join their resources in the form of R&D contract. Even those companies who were initially on the 'losing' side of the standard race have to adopt the prevailing platform quickly to increase market share and revenue growth. The companies riding on the wave of possessing the dominant technology improve their stock valuation and thus, may be able to buy smaller players with complementary technologies or relevant customer base [Roberts and Liu, 2001].

In the *mature phase*, availability of products around the dominant design increases significantly. The emphasis of R&D shifts from products to process innovation. In this stage, R&D alliances are used for sharing costs and risks. The authors speculate that acquisitions may be used instead of alliances when the partner is a direct competitor and exclusive rights to the proprietary

[3] MIT Sloan Management Review, 2001, VOL 43; PART 1, pages 26-35

technology are desired. In the mature stage, manufacturing joint ventures are used to control costs while marketing alliances are for targeting the latent market and expanding into new geographical markets. Non-core operations of the companies may be divested to improve profitability. In general, the mature stage is the platform for making wide variety of strategic decisions such as making equity investments and acquisitions, forming alliances for R&D, marketing and manufacturing [Roberts and Liu, 2001].

The *phase of discontinuities* is entered when existing technologies are rendered obsolete by the introduction of novel technologies. New markets develop decreasing the demand for old market products. Barriers to entry have been practically removed and new players can enter the markets easily. In this stage, quick actions of the 'first player' can result in 'near-monopoly rents'. Financially stronger companies may acquire financially weaker competitors and thus strengthen their competitive position [Roberts and Liu, 2001].

Roberts and Liu [2001] propose that the decision of whether to engage in an alliance or acquire (Figure 13) depends - in addition to company-specific competencies - on market development and the competitive position of the firm compared to its rivals. Alliances tend to be favored when technology is becoming better defined and competitive pressure increases (mature stage), but less so in the discontinuities phase in which consolidation of the companies decreases the number of the companies. Mergers and acquisitions are favored over alliances in transitional stage in which companies need to enhance their technology portfolios [Roberts and Liu, 2001].

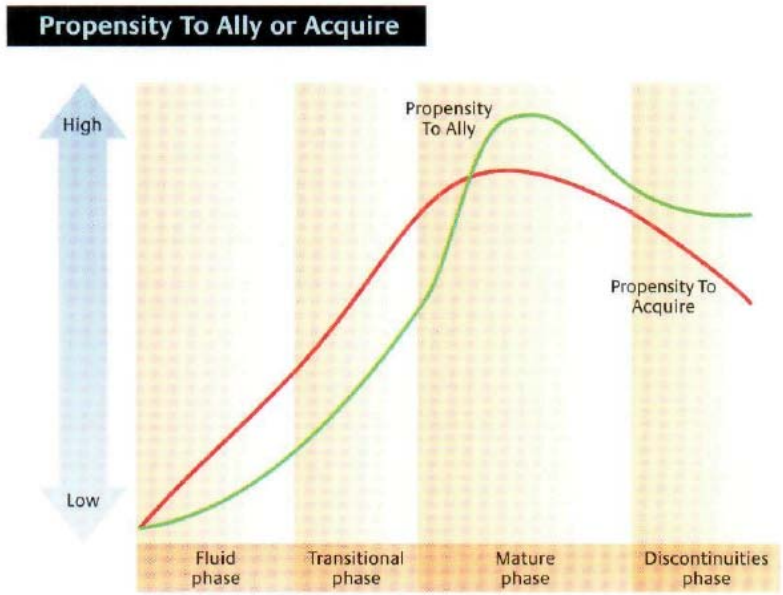

Figure 13. Propensity to ally or acquire [Roberts and Liu, 2001].

3.6. Prospective strategic alliance -analysis

This sub-chapter introduces terms and cognitive tools for researchers and managers to analyze a prospective strategic alliance. Whereas the previous literature review of strategic alliances was theoretical in its nature, here we converge with practice. The considerations are the following:

1. Strategic alliance potential evaluation (alliance pay-off potential vs. alliance challenge)
2. Innovation potential of a strategic alliance
3. Strategic management choices in alliance context

3.6.1. Strategic alliance potential evaluation

In the following, I am presenting an analysis of *strategic alliance potential* (Figure 14). The best expected outcome for a particular alliance is when the alliance pay-off potential is high, but the alliance challenge is low, i.e. when the 'circles' depicted inside the diagonal tubes (in Figure 14) are in the opposite corners. I propose that *alliance pay-off potential* could be evaluated as a factor of the three: (1) business potential, (2) competence development potential and (3) innovation potential.

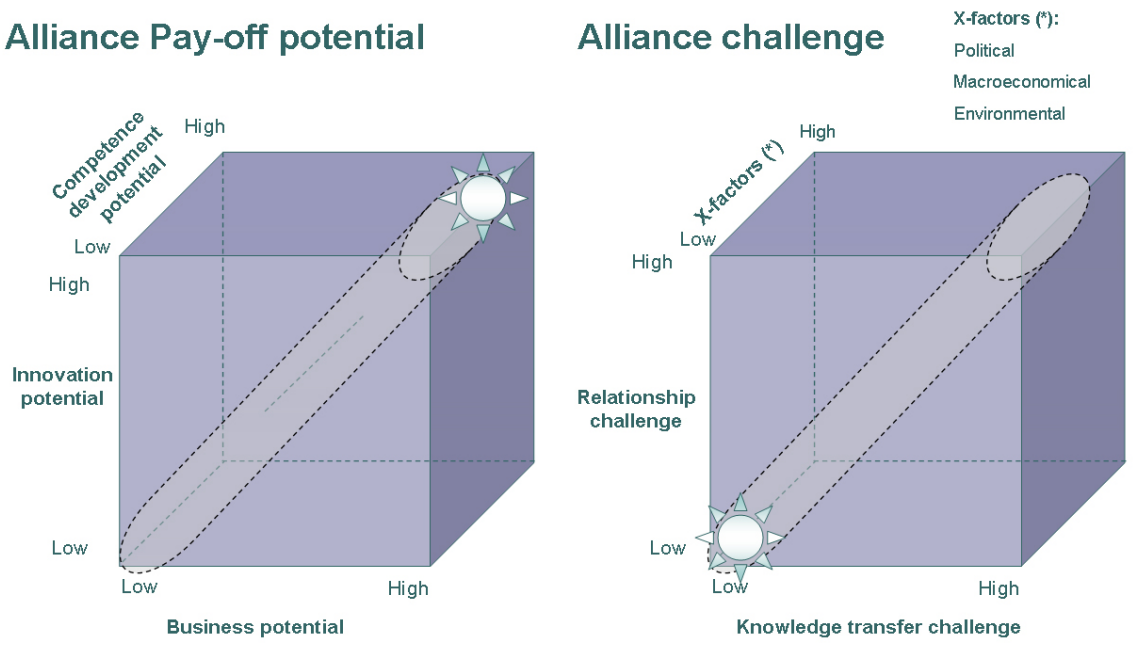

Figure 14. Alliance pay-off potential weighted against alliance challenge.

Business potential refers to potential commercial gains of engaging in a strategic alliance and is a "taken for granted" motivation for companies. Access

to complementary competencies through an alliance without learning objectives to fulfill certain short-term objectives is a pure business motivation. *Competence development* refers to use of strategic alliances as means of learning, knowledge transfer preceding and leading to the development of one's own capabilities (see Inkpen, 1998; Hamel 1991, Das and Teng, 2000, Dyer and Singh [1999]). Innovation is discussed in conjunction with strategic alliances by e.g. Narula and Hagedoorn [1999], Hagedoorn and Duysters [2002] and in populistic business literature by von Hippel [2001].

To put it very simply: the managers of the companies have to weight the alliance pay-off potential against the alliance challenge. If the alliance pay-off potential is not significantly greater than the alliance challenge, it is waste of time, effort and money to engage in such an alliance.

The *alliance challenge* consists of (1) knowledge transfer challenge, (2) relationship challenge and (3) X-factors (Figure 14). Knowledge transfer challenge which is the main interest of this thesis, is highly interconnected with the relationship challenge and further influences the innovation and competence development potential.

I define *relationship challenge* as "the total sum of the potential uncertainty deriving from (a) the relationship of the alliance managers of two organizations, (b) the relationship between the organizations as whole and (c) bi-lateral relations of the two countries in the case of a cross-border alliance". This definition is derived through enumerating all the different levels on which two organizations can relate to each other and identifying the most critical ones of all of these.

The *X-factors* include economic and political changes and instabilities and environmental catastrophes such as earthquakes, floods, etc. The X-factors, although having a drastic impact on business in a foreign country, are not dealt in greater detail in this thesis.

3.6.2. Innovation potential

Innovation is defined as when new knowledge is developed in order to find a solution for a specific problem defined earlier [Nonaka, 1994]. My view is that strategic alliances are excellent tools for accelerating innovation since emerging of novel ideas occurs particularly in conditions in which two formerly separate knowledge networks are brought together. In the case of strategic alliances, a sufficient amount of links ('linking' persons) between the firms support this.

I propose that *innovation potential* of cross-border strategic R&D alliances is the product of (1) industry support factor, (2) alliance support factor and (3) the novelty factor (Figure 15).

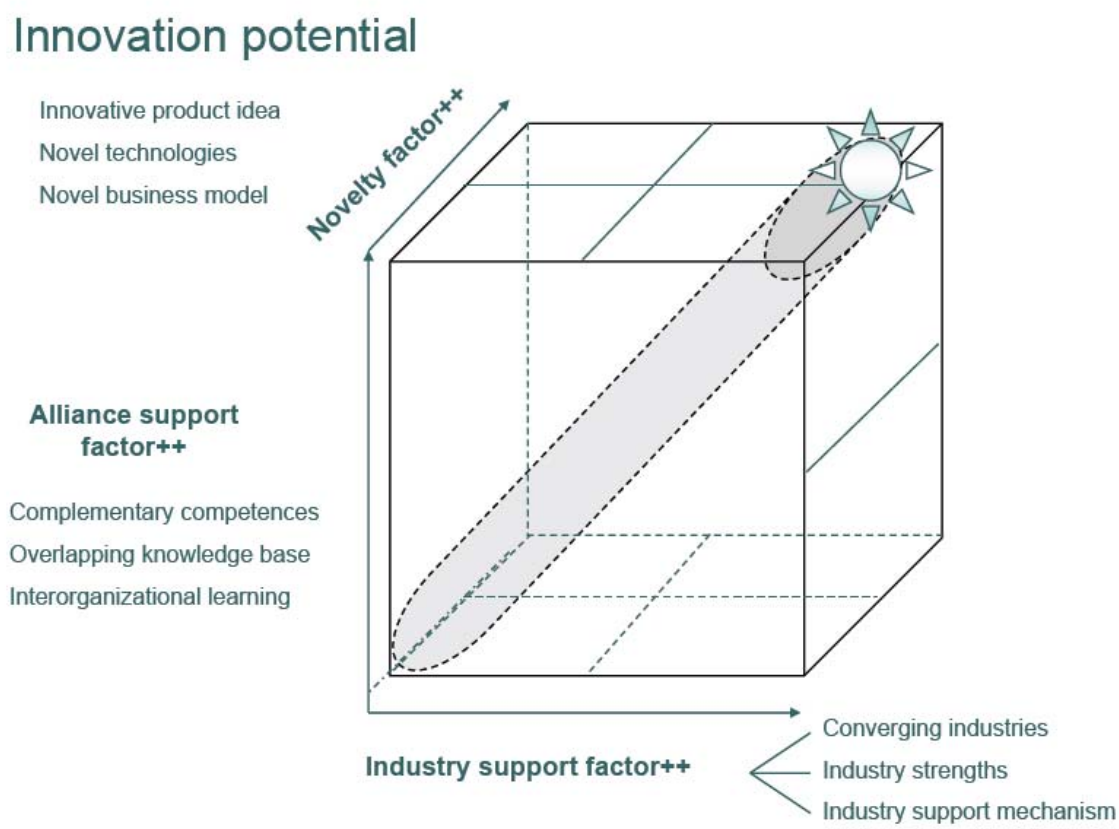

Figure 15. Innovation potential.

The diagonal tube of Figure 15 (connecting the opposite corners) depicts the whole spectrum of innovation potential from the lowest degree to the highest degree. The cubicle could be converted to a matrix with weight points for the different factors and an overall score could be calculated. This could provide some practical value for the alliance managers evaluating different alliance options.

I propose that *industry support factors* (Figure 15) consist of converging industries, industry strengths and industry support mechanisms. The factor is the greatest, when the alliance partners hail from *converging industries* that have *industry-specific strengths* and *institutional support mechanisms* for innovations.

Alliance support factors include *complementary* competences of the firms with the precondition that there is *common knowledge foundation* on which to build. The ability of alliance partners to learn not only on their own, but develop processes that span both organizations and thus enable development of interorganizational learning, is critical in joint-innovation.

The novelty factor is the third component: *innovative product idea* implemented with *novel technologies* and utilizing a *novel business model* yields theoretically the highest novelty factor.

3.6.3. Strategic management choices

Figure 16 illustrates the critical strategic management choices when considering a prospective strategic alliance. X-axis and Y-axis together form a face of 'Strategic potential'. The upper face (with dashed line) corresponds to the Alliance form with its own X-axis (equity-contract ratio) and Y-axis (intertwining processes). The information of the cubicle of Strategic management choices (Figure 16) is further clarified by Figure 17 and Figure 18 (Front-face and upper-face). However, I have decided to synthesize the whole set of decisions in one single 3D-cubicle, because in my opinion a strategic decision has to take into account all the factors and interdependencies between them. The 3D-cubicle as a concrete model is perfectly suitable for weighing different choices against each other and evaluating their impacts on the whole.

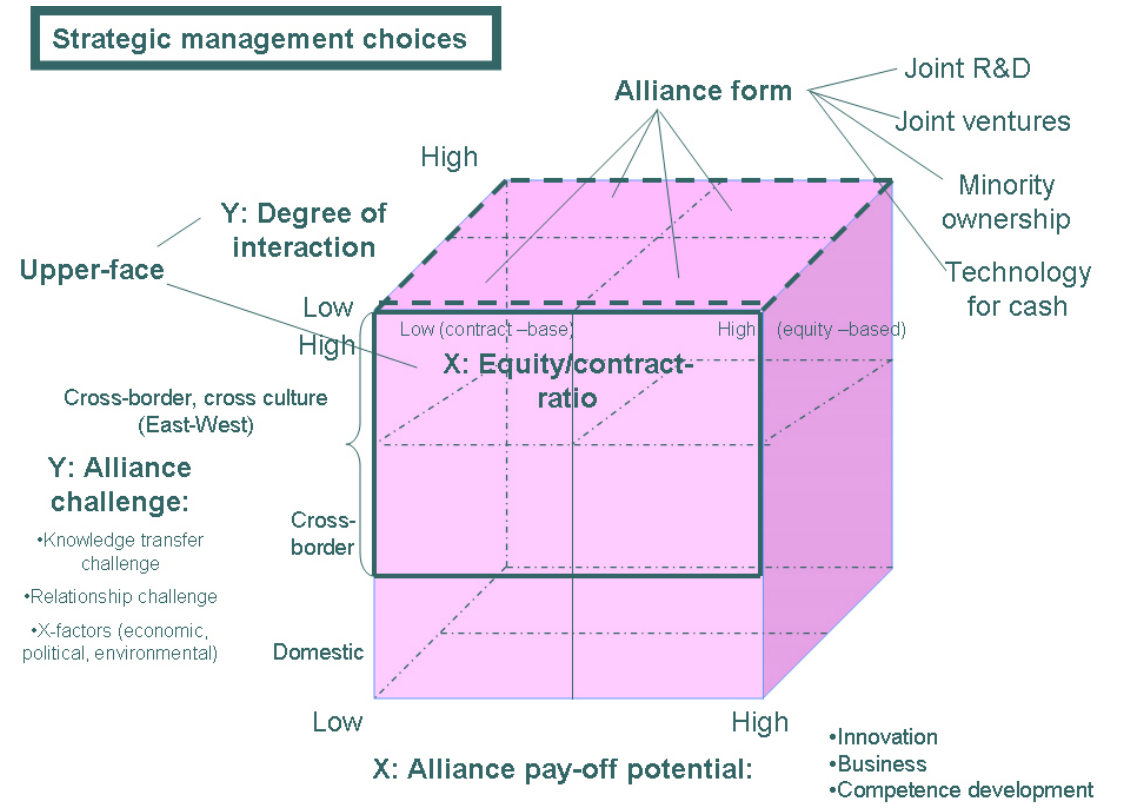

Figure 16. Strategic management considerations for strategic alliance choices.

Side-face X-axis: Alliance pay-off potential

On the X-axis is Alliance pay-off potential which consists of the three factors identified earlier: business potential, competence development potential and innovation potential. Innovation potential was depicted in a sub-cubicle of its own previously.

Side-face Y-Axis: Alliance challenge

The Y-axis forms alliance challenge consisting of knowledge transfer challenge, relationship challenge and X-factors. Knowledge transfer challenge is a product of the following: general properties of knowledge ("knowledge challenge") in the particular alliance, ontology challenge and culture challenge. Cross-border aspect – when present – is embedded in Y-axis: it raises one additional level of 'crossing boundaries'. Theoretically, the domestic level is the basic case to which cross-border, and cross-border / cross-culture interaction of alliance partners raise an additional layer of complexity.

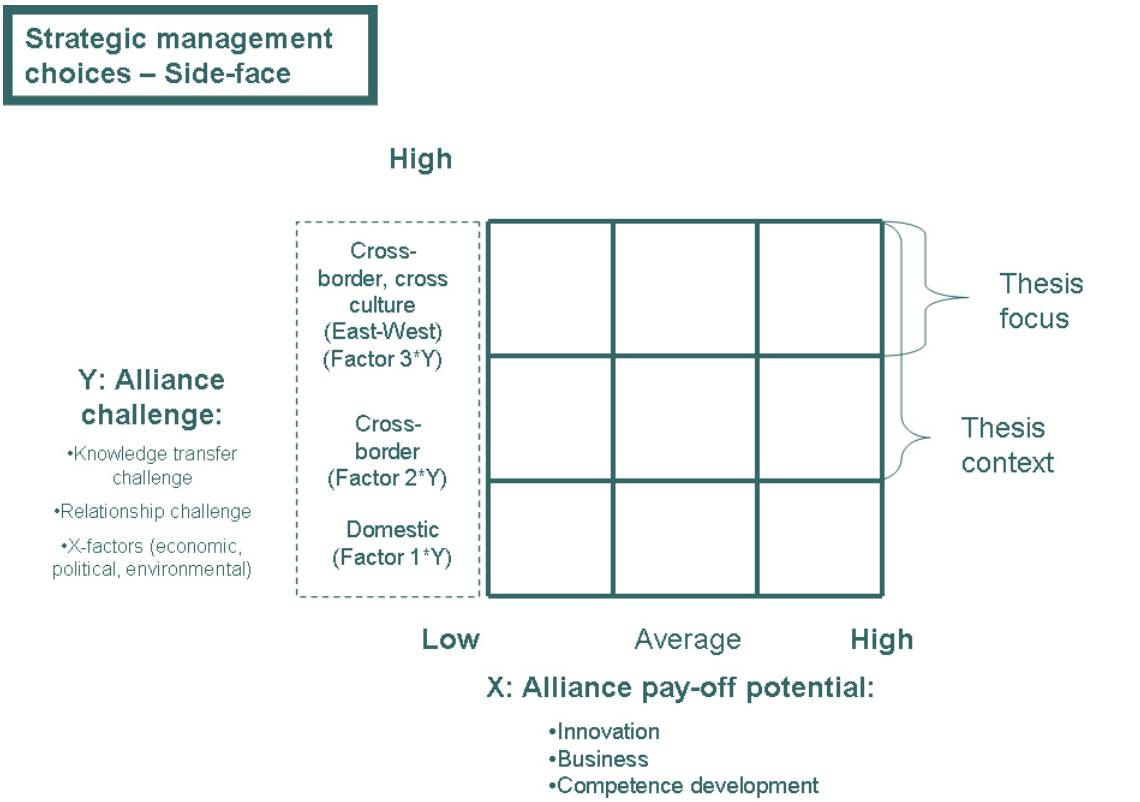

Figure 17. Alliance challenge vs. alliance pay-off potential

Upper-face: Alliance form and its properties (X- and Y-axis)

Upper-face (Figure 18) of the cubicle relates but is partly independent from the side face of Strategic potential since the X-axis of the upper face is defined anew. The upper-face has two properties: *equity-contract –ratio* on X-axis refers to the degree that equity is used to commit partners to the alliance instead of contractual binding. Issues related to equity vs. contractual were presented in "Typology of Strategic Alliances" -chapter.

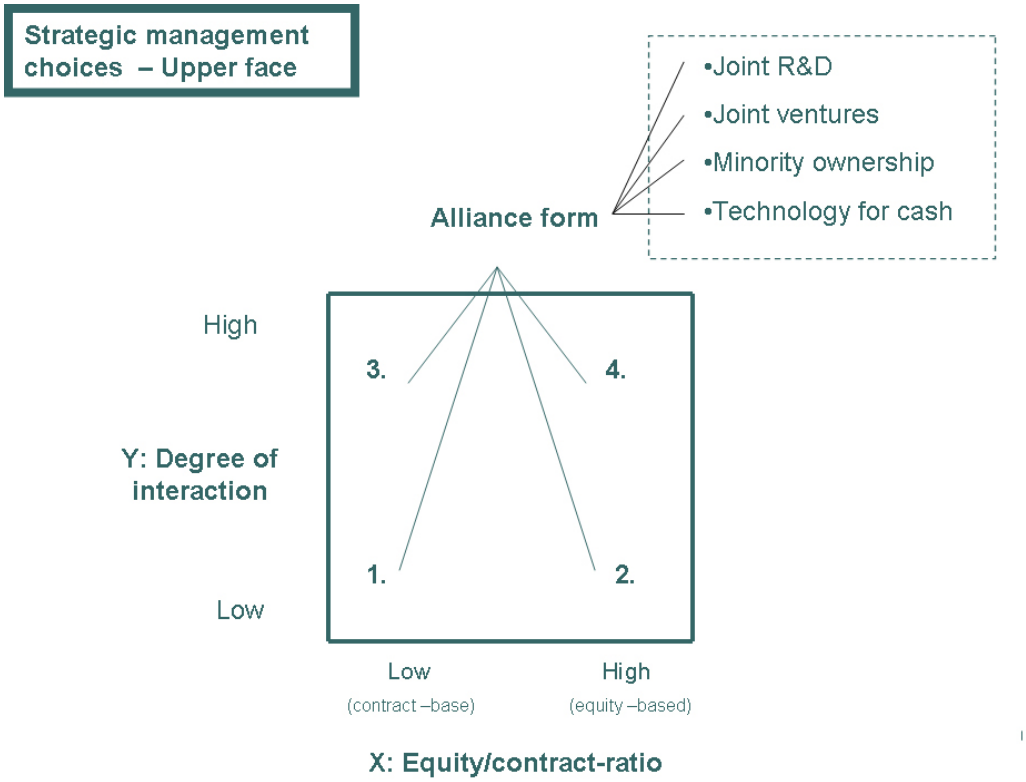

Figure 18. Chosen equity / contract -ratio vs. appropriate degree of interaction.

The *degree of interaction* on the Y-axis refers to the depth and breadth of alliance interaction and need for intertwining processes: in R&D alliance the partners engage in deeper interaction than in some other form of an alliance, such as joint-product development arrangement that aims at resource leverage through the other partner. The breadth of the interaction is narrow if the collaboration area is only a small part of the partner's operations and broad if it is a major part of the operations or production. The degree of interaction is referred to in "Typology of Strategic Alliances" -subchapter and Ontological dimension -chapter.

In Figure 18, the four different alliance types can be placed in different positions in regard to the two dimensions. In general, joint R&D alliances are contract –based coupled with a high degree of interaction. The same applies to joint ventures, but now with equity commitment being more important than contractual. Minority ownership alliances can be a mix of equity and contractual binding while degree of interaction varies depending from the case. 'Technology for cash' –arrangements tend to be contractual with a low degree of needed interaction. Thus, it is not possible to state that one alliance type can be positioned always in a certain quadrant of Figure 18, although we can speculate the general tendencies.

4. Epistemological dimension - foundations for knowledge transfer

A review of the academic literature discussing data, information and knowledge shows that conceptual clarity is lacking in the domain. The distinctions between data, information and knowledge are often inadequate. A vast majority of knowledge management related articles have adopted the fashionable 'tacit knowledge' term, but have not gone beneath the surface to examine what tacit knowledge in reality is. This chapter, if not being exhaustive treatment on the subject, tries to overcome both the above mentioned pitfalls and contribute solid 'knowledge foundations' for this thesis.

4.1. Data, information, knowledge

According to Wilson [2002], knowledge involves three mental processes, namely comprehension, understanding and learning. The author distinguishes between the messages that carry information (oral, written, graphic, gestural, etc.) and knowledge that is the result of assimilation, understanding, comprehending and incorporating into knowledge structures. Because of these mental processes on knowledge receiver's part, it is unlikely that the knowledge constructed by receiver would be an identical carbon copy of the sender [Wilson, 2002]. Choo [2005] proposes that transformation of information into knowledge involves two complementary processes: (1) "structuring" of data and information that imposes or reveals order and pattern and (2) the human "acting", sense making, on data and information. Now, we follow the chain from signals, data and information to knowledge according to Choo [2006] (Figure 19).

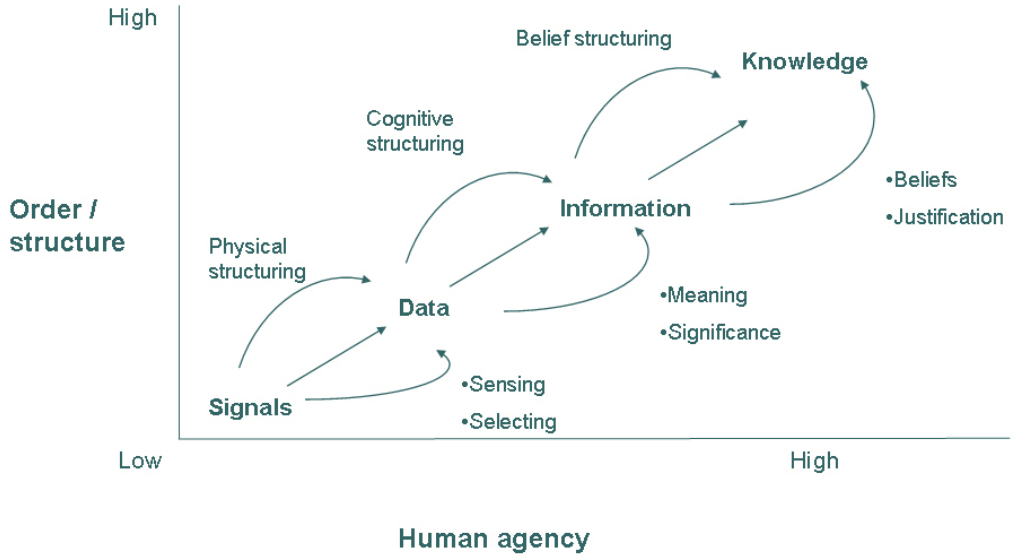

Figure 19. Data, information and knowledge [Choo, 2005].

Humans are continuously bombarded by a vast amount of signals; sights, sounds and other sensory stimuli. Only a small portion of these is analyzed further consciously. Structuring of signals is physical: the process of punctuating signals into data is influenced by observer's past experiences and beliefs of what signals to expect [Choo, 2005].

Data, according to Choo [2006], are 'facts and messages observed by an individual or group' and may be elements of larger physical systems, such as books. Data is further processed by 'cognitive structuring', that is, assigning meaning and significance to the facts and messages. Schemas and mental models of the actor influence what meanings are constructed by the actor. Next, information may be transformed into knowledge through "belief structuring", that is, forming justified true beliefs about the phenomena [Choo, 2005]. In Nonaka's [1994] words: "information is flow of messages, while knowledge is created and organized by the very flow of information, anchored on the commitment and beliefs of its holder".

Choo's [2006] presentation (Figure 19) of how signals and data form the basis for information and knowledge may be over simplified[4]. For example, the model implies that the degree of order and structure increases with each step when progressing towards more sophisticated levels from data to knowledge. According to Choo [2006], the degree of order and structure is higher in the case of data if compared to a stream of signals, but does this still apply with the pairs of information and data; or knowledge and information? Is there

[4] A remark raised by Hannu Kangassalo in a thesis discussion.

somehow more structure in knowledge compared to data? Choo's [2006] model clearly lacks in completeness and coherence implying the need to refer to other authors.

De Long and Fahey [2000] distinguish between human knowledge, social knowledge and structured knowledge - a distinction also included in the model of cross-border knowledge transfer by Bhagat et al. [2002]. *Human* knowledge is what an individual knows (factual knowledge, skills knowledge), comprises of explicit and tacit knowledge, and is expressed by skills or may be of abstract, conceptual nature. *Social* knowledge is embedded in relationships among individuals or within groups, is largely tacit and composed of cultural norms. *Structured* knowledge is embedded in organizational context: in systems, processes, rules and routines of an organization.

Zander and Kogut [1995] characterize knowledge in a firm at levels of individual, group and organization by using five constructs presented in the following. High degree of c*odifiability* of knowledge is the case when the barriers to encoding knowledge are low. Whether the employees of the firm can be trained or not in regard to particular knowledge is a question of 'teachability' – training of an individual itself can occur through the work (as an apprentice) or outside the work place - in schools and training institutes. *Complexity* of knowledge is the case especially when knowledge is drawn from multiple competencies that are distinct from each other. *System dependence* refers to the dependence on different professionals for utilizing capability for production. The last structure, *Product observability,* points to the characteristics of the product that make it vulnerable for imitation by a competitor utilizing, for example, reverse engineering.

It seems that many characteristics of tacit knowledge are inbuilt in Zander's and Kogut's [1995] model of five constructs, but in a distributed manner: for example 'Codifiability' covers some aspects of tacit knowledge while 'teachability' some other. Thus, it may be better to consider 'tacitness' as a higher level 'umbrella' concept compared to those separate constructs of Zander and Kogut.

Zander's and Kogut's [1995] major conclusion from their study is that the extent to that knowledge can be codified and taught ('Codifiability', 'Teachability',) are important factors in determining how transfer of manufacturing capabilities will succeed. The third influencing factor is the threat of market pre-emption that hails from the nature of industry competition.

4.2. Tacit knowledge and its criticism

Epistemology is concerned with such questions as: what is knowledge in its very essence? How is it different from information or data? Two kinds of knowledge are distinguished from each other in epistemology: tacit and explicit knowledge. This distinction was introduced by Michael Polanyi [1966] in his book 'Tacit Dimension'. In mid-90s, Nonaka and Takeuchi [1995] published their theory of Organizational Knowledge Creation that bases on the concept of tacit knowledge in its very foundations. Nonaka and Takeuchi [1995] view tacit and explicit knowledge as distinct knowledge types that can be converted to each other through four modes of conversion.

Explicit knowledge is transmittable in formal language. If all information of the firm would be such, the transfer of knowledge would be very easy: exchange of a pile of documents would be enough [Polanyi, 1966].

Nonaka's and Takeuchi's theory of organizational knowledge creation is a master work of its own despite the fact that the authors have adopted the concept of 'tacit knowledge' in a different meaning than what the original inventor of the term, Michael Polanyi, meant [Virtanen, 2006]. This weakness in Nonaka's and Takeuchi's theory has been criticized by Tsoukas [2001] and Wilson [2002]. Tsoukas [2001] points out that Nonaka's and Takeuchi's interpretation of tacit knowledge has gone astray when limiting it to consist of 'what can be articulated'. Tsoukas [2001] sees tacit and explicit knowledge as 'two sides of the same coin' implying that even 'the most explicit kind of knowledge is underlain by tacit knowledge'.

Tsoukas [2001] states critically: "Organizational knowledge is much talked about but little understood". According to the author, the difficulties rise from a 'double failure': firstly, understanding the 'generation and utilization of knowledge we need a theory of organization' and secondly, for understanding 'organizational knowledge we need a theory of organization'. He criticizes Davenport's and Prusak's definition of knowledge [1998] for trying to include too many things in the concept, referring to 'values', 'experiences' and 'context' in the Davenport's and Prusak's definition: "Knowledge is a flux mix of framed experiences, contextual information and expert insights that provides a framework for evaluating and incorporating new experiences and information". Tsoukas [2001] proposes himself the following definition: "Knowledge is the individual capability to draw distinction, within a domain of action, based on an appreciation of context or theory, or both".

Zander and Kogut [1995] do not seem to be big supporters of 'tacitness' concept: "It would be nonsensical to believe that there is a single dimension called tacitness". Based on the improved definition of 'tacit knowledge' that

acknowledges conscious and unconscious content of skills, I would like to argue against Zander and Kogut by saying that 'tacitness' is a useful attribute for describing the 'unconscious vs. conscious' ratio of a certain skill.

Cook and Brown [1999] distinguish between "epistemology of possession" and "epistemology of practice". The former refers to traditional understanding of knowledge that is dominating the discussion related to organizational knowledge, intellectual capital and knowledge work. The latter in its possession-centric view of knowledge neglects knowing as an action: knowing found in individual and group practice.

4.3. Understanding tacit knowledge

If we want to stick to the definition by Polanyi [1966], we cannot overcome the fact that purely tacit knowledge does not exist. I would argue that the content that is fully in the unconscious of the human mind is not knowledge, but something else, to say, just 'unstructured content'. One important property of knowledge is subject's awareness of it: If there is no awareness by an individual in regard to particular knowledge, it is said that "the person does not know" [Polanyi, 1966]. Tacit knowledge is better understood as knowledge that forms out of conscious and unconscious content (Figure 20).

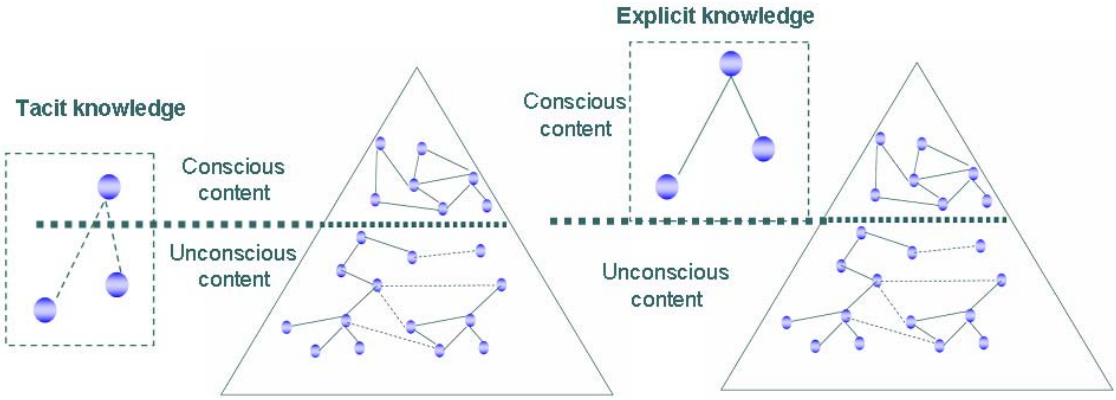

Figure 20. The tacit and explicit knowledge and their relation to conscious and unconscious content.

In the following Figure 21, I am building on the previous understanding of the nature of tacit and explicit knowledge and depicting a "working" model for knowledge transfer process between individuals. The model may be over-simplifying and incomplete in numerous ways, but is presented here to fill the gap of individual level knowledge transfer since it lays obviously the

foundations for organizational knowledge transfer. In the model, I distinguish three parts: (1) knowledge articulation (knowledge sender), (2) in parallel - (a) transfer of explicit part of the knowledge (optional) and (b) socialization process, (3) Trial-and-error or "groping in the dark".

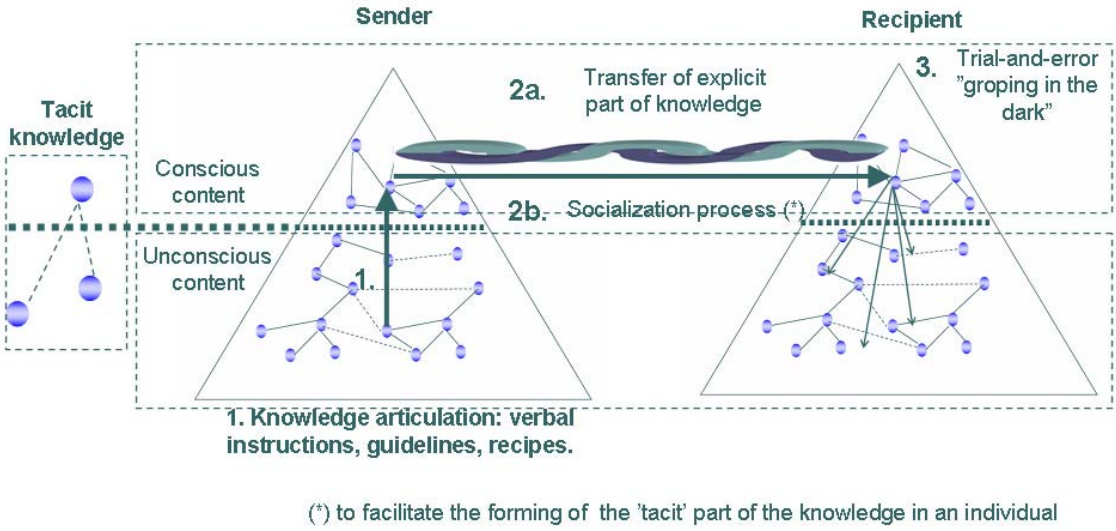

Figure 21. Tacit knowledge transfer process.

It is clear that there is no way to transfer the subconscious content of the tacit knowledge directly to another person's subconsciousness, but the recipient must through trial-and-error create the necessary neural connections to link the conscious content of the knowledge (explicit knowledge) and the unconscious content of the knowledge (implicit). An analogue for this process of trial-and-error is a hand groping in the dark for lost items.

In the first stage, the knowledge sender has to articulate to herself, what is the essence of the knowledge, what are the explicit linguistic instructions that would help the knowledge recipient to learn the corresponding skill. The better the knowledge holder succeeds in this process of producing verbal instruction, guidelines or recipes, the easier the actual process of knowledge transfer will be.

It may be that knowledge holder cannot even describe the skill in verbal terms, but can only show "how to do". In this case the visual observation instead of auditory instructions provides the means to grab into the essence of the skills knowledge.

In the second stage, the knowledge is transferred through intertwining the transfer of explicit part of the knowledge (instructions, recipe) and the socialization process.

4.4. Other dimensions of knowledge

Along with discussing tacit vs. explicit nature of the knowledge, several other properties of knowledge - relevant to knowledge transfer - are identified in the literature (Figure 22). Garud and Nayyar [1994] and Winter [1987] distinguish two other dimensions - *simplicity vs. complexity* and *independent vs. systemic* knowledge - that are adopted by Bhagat et al. [2002] and included also in this thesis as a part of the epistemological dimension of 'Knowledge transfer cubicle'. *Complex knowledge* is characterized by causal uncertainties that results in greater amount of factual information to be transferred compared to 'simple' knowledge that can be captured with less information [Bhagat *et al.,* 2002]. Thus, complexity of knowledge is directly influencing its transfer. The other dimension, referring to independency vs. 'systemicity' of knowledge [Garud and Nayyar, 1994] points to the fact that *independent knowledge* can be described by itself, whereas *systemic knowledge* must be described in relation to existing body of knowledge [Bhagat *et al.,* 2002].

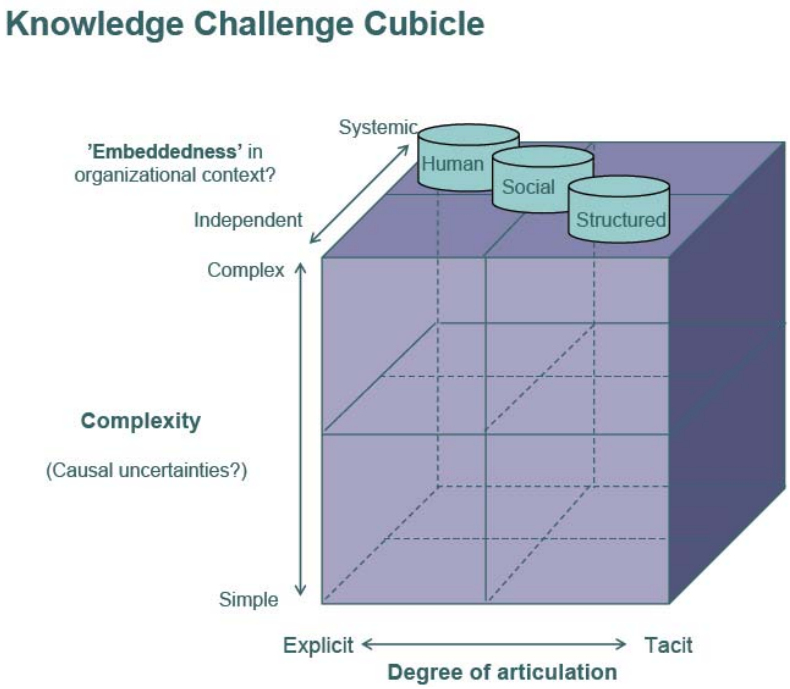

Figure 22. Knowledge challenge cubicle (adopted from Bhagat et al. [2002]).

4.5. Knowledge-based theory of the firm

Grant's [1996] knowledge-based theory of the firm is a continuum to the series of earlier theories that have aimed at explaining 'firm' from different angles. Grant [1996] gathers essential issues in regard to knowledge that are relevant in the process of value creation within the firm: transferability, capacity for aggregation and appropriability. "Tacitness" of knowledge is closely related to its transferability since the tacit part of the knowledge needs to be brought to the surface before it can be communicated further as shown above (Figure 21). While discussing knowledge transferability, firstly one should distinguish to what extent the knowledge in question is tacit. This can be examined by a simple test: if the knowledge responds better to questions starting with 'how' instead of 'what', the knowledge is categorized as 'tacit'. Purely tacit knowledge is as rare as purely explicit knowledge: even the most tacit knowledge has a part that can be communicated explicitly. Similarly, even the most explicit knowledge contains tacit assumptions that we cannot get rid of as long as we deal with human agents.

Knowledge's potential for aggregation has an impact on how efficiently knowledge can be transferred. Aggregation is made more efficient by using common language and statistical means of presenting information. Idiosyncratic knowledge, such as capabilities of managers is spread throughout the organization and cannot be aggregated at one single point as easily as information regarding company's cash balances [Grant, 1996]. However, nowadays modern knowledge management systems enable 'centralization' of scattered knowledge and thus alleviate the previous problem.

When a resource owner receives a return corresponding to the value created by one's resource, it is said that knowledge is *appropriable*. Tacit knowledge has limitations in regard of appropriability since it is not easily transferred. Explicit knowledge is neither problem-free since once acquired it can be sold without losing it. Even marketing that particular explicit knowledge exposes it to potential buyers. Drawing from the previous limitations of tacit and explicit knowledge, it can be stated that knowledge is weakly appropriable in the market [Grant, 1996].

Grant [1996] presents coordination mechanisms by Ouchi (1979)[5]: market, bureaucratic and clan mechanisms; and different types of interdependence

[5] W. G. Ouchi, A conceptual framework for the design of organizational control mechanisms, Management Science 25, 833-848.

identified by Thompson (1967)[6]: pooled, sequential, reciprocal and - in addition - team interdependence by Van De Ven et al. (1976)[7]. Drawing together from these Grant perceives four principal mechanisms for integrating specialized knowledge. *First*, for an employee to be able to perform one's job one might need some knowledge from another employee. Instead of trying to transfer tacit knowledge from one person to another, a sufficient compromise can be formulating the essence of the tacit knowledge in the form of rules and directives. *Secondly*, sequencing can be an efficient way to organize specialists' independent work for the purpose of integrating their specialist knowledge without engaging in excessive communication and coordination. Whether sequencing is applicable depends on the product, physical inputs and production technology. *Thirdly*, in the absence of rules and directives, organizational routines support 'complex patterns of interactions' among the employees. These interactions may be characterized by a high level of simultaneity and highly varied sequences of interaction. *Fourthly*, when more personal and interactive forms of knowledge integration are needed, all the previous three are insufficient; instead group problem solving and decision making is utilized.

4.6. Prior research on knowledge transfer

Literature is quite well available for knowledge transfer in strategic alliances. Szulanski presents [2000] a process model for knowledge transfer (intrafirm). Bhagat et al. [2002] introduce a model for cross-border knowledge transfer emphasizing cultural context (Figure 23). Abou-Zeid [2005] conceptualizes inter-organizational transfer as four-stage process including the phases of initialization, inter-relation, implementation and internalization.

Initialization occurs when the prospective recipient firm acknowledges a certain knowledge gap, identifies a firm with corresponding knowledge and tries to convince the intended source firm for knowledge transfer. Activities of the initialization phase involve identifying the type of knowledge to be transferred, predicting the expected outcome, evaluating potential source and the method for knowledge acquisition [Abou-Zeid, 2005].

Inter-relation phase starts the dialogue between the source and recipient firms in regard to the following issues: what knowledge is to be transferred, when and who exactly are the participants in transaction along with identification and solving problems deriving from potential incompatibility of

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[6] J. D. Thompson, Organizations in Action, McGraw-Hill, New York, 1967.

[7] A. H Van De Ven, A. L. Delbecq and R. Koenig, Determinants of coordination modes within organizations, American sociological review 41, 322-338.

the firms (language, coding schemes and cultural conventions) [Abou-Zeid, 2005].

In i*mplementation* of knowledge transfer, a selected group of managers and expert employees in the domain of transferred knowledge, unpack the newly acquired knowledge, reinterpret it and share the tacit knowledge about their observations [Abou-Zeid, 2005].

In the phase of *internalization*, the knowledge acquired achieves 'taken-for-granted' –status after the receiver has gained satisfactory results and the use of the particular knowledge has become routinized [Abou-Zeid, 2005].

Simonin [1999] points out that even when there is an abundance of research related to knowledge transfer, very few are linking the intrinsic nature and dimensionalities of knowledge to its transferability.

Bhagat et al. [2002] note that the effectiveness of cross-border transfer of organizational knowledge is facilitated by the capabilities of transferring, and the recipient organization. Different institutional mechanisms, such as licensing or patent-related intellectual property rights may be used to facilitate the knowledge transfer [Bhagat *et al.,* 2002].

Simonin's 'Knowledge ambiguity' –concept synthesizes many of the epistemological, ontological and organizational challenges acknowledged in this thesis. Knowledge ambiguity is proposed to be contributed by the following antecedents: tacitness, specificity, complexity, experience, partner protectiveness and both - cultural and organizational distance [Simonin, 1999]. The three foremost are included commonly by other authors as well (e.g. Parise and Henderson [2001]). Tacitness is already a familiar term from the previous chapters, but few others may be introduced briefly here.

The model by Simonin [1999] includes also so called moderating effects that include collaborative know-how, learning capacity and alliance duration. Author's earlier empirical research [1997] resulted in a conclusion that distinct form of collaborative know-how is developed through past experience and this will benefit in future alliances. In practice, this is expressed through the adoption of such procedures that enhance information gathering, interpretation and diffusion. *Learning capacity* consists of intent to learn and 'receptivity' of the learning firm together with transparency of the knowledge holder; it determines to large extent the learning outcome. Alliance duration is another moderating factor in knowledge transfer: based on literature sources, Simonin gathers together changes – none of which are really surprising - that occur during maturation of the alliance. These include cultural rapprochement

(Meschi[8]), strengthened trust [Gulati, 1995] and gaining more in-depth view of partner's expertise and idiosyncrasies [Simonin, 1999]. The increasing level of trust is a favorable direction, but in practice cannot be taken for granted. Trust is dealt later in conjunction with the representation of the Innovation Tube.

Asset specificity refers to 'durable investments that are undertaken in support of particular transactions'. *Complexity* is a function of 'interdependent technologies, routines, individual and resources linked to a particular knowledge': greater complexity contributes to increased ambiguity. *Organizational distance* refers to differences in organizational culture, business practices and institutional heritage [Simonin, 1999].

Simonin [1999] conducted a large scale empirical study with a sample of 147 companies (complete answers out of all 192 respondents and out of 1000 approached companies) to investigate the significance of the proposed antecedents of knowledge ambiguity. The questionnaire included specific questions about the alliance partner, collaborative objectives and experience, and other knowledge transfer related issues. The conclusion from the research is that knowledge ambiguity can be considered as an important factor in knowledge transfer and it acts as a full mediator of several hypothetically proposed antecedents, including tacitness, experience, complexity, and cultural and organizational distance. Surprisingly, specificity and partner protectiveness were not found significant.

In the context of the moderating effects of alliance duration, impact of ambiguity and tacitness are found to be lasting. Some differences were found between young and older alliances: In the case of older alliances - the effects of prior experience and complexity on ambiguity will vanish eventually. In regard to younger alliances, cultural and organizational distance disappears [Simonin, 1999]. However, total disappearance of the organizational distance is unlikely as long as organizations collaborate on the alliance contract level, not being merged into one organizational unit. Also, if the firms hail from drastically different cultures, I would be very doubtful whether cultural gap can ever be totally bypassed. Despite this, the gap might be narrowed to the extent that it ceases to have any major impact on organizational collaboration.

[8] Meschi, P., Longevity and cultural differences of international joint ventures: Toward timebased cultural management'. Human Relations, 50, 2 (1997), 211–227.

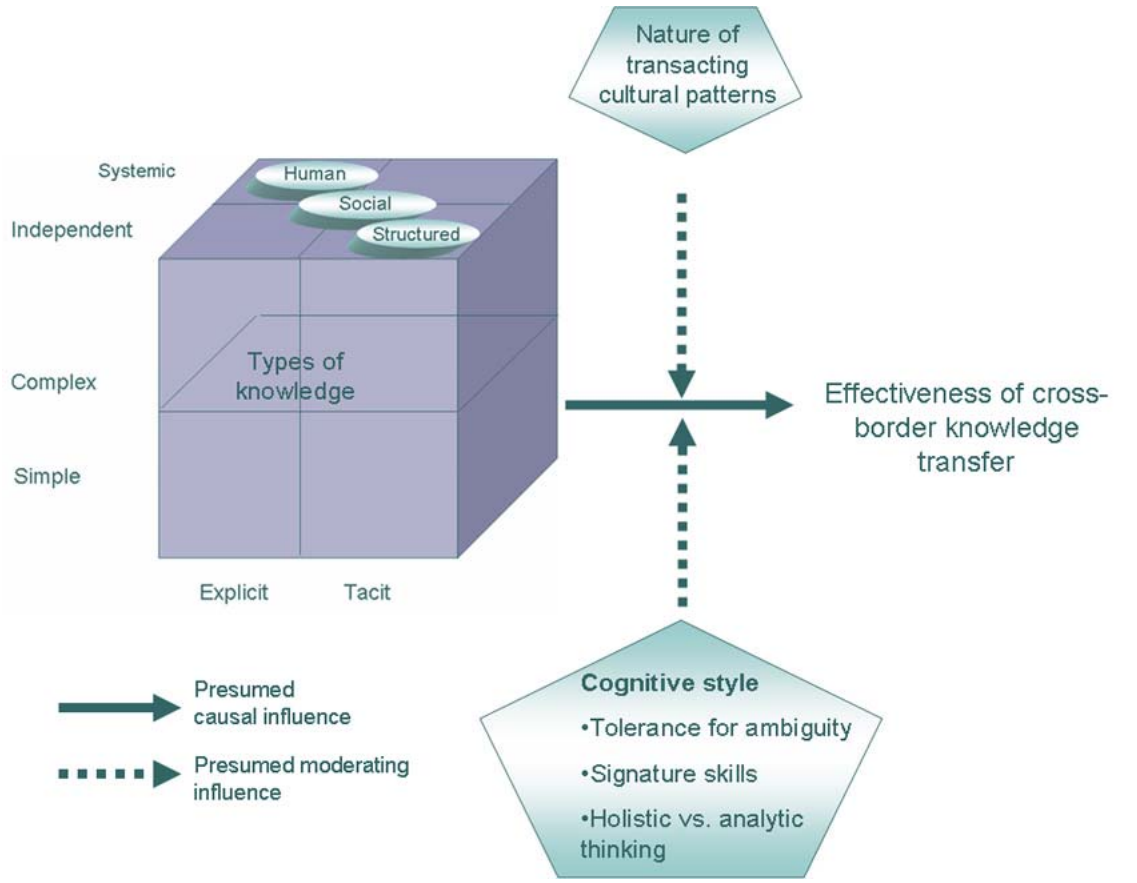

Figure 23. Model of cross-border knowledge transfer by Bhagat et al. [2002].

Davenport and Prusak [1998] have two interesting notions in regard to knowledge transfer: *velocity* refers to the speed that knowledge traverses through an organization while *viscosity* points to the richness or thickness of knowledge. Corporate information systems speed up the velocity of knowledge, but the impact of knowledge viscosity is more difficult to control since it is a product of cognitive and organizational factors and influenced by the mode of transfer.

Szulanski [2000] presents a process model of knowledge transfer. Earlier [1996], the author had given a following definition for knowledge transfer process: "....a process in which an organization recreates and maintains a complex, causally ambiguous set of routines in a new setting". Stickyness refers to perceived difficulties in that process. The author [2000] explores 'stickyness' parallel to the four generally acknowledged stages of knowledge transfer: initiation, implementation, ramp-up and integration. *Initiation stickyness* refers to the difficulties to recognize an opportunity for transfer and acting upon this. An opportunity for transfer is at hand when a knowledge 'gap' is recognized and knowledge to fill this gap is identified in the organization. *Implementation*

stickiness refers to challenges to bridging the communications gap between the source and the recipient, and to fill the recipient's technical gap. Knowledge transfer may interrupt the source from its primary mission. It may also disrupt the recipient's operations because of retraining or reassigning personnel, acquiring new personnel or modifying the infrastructure.

Ramp-up stickiness may be experienced when the recipient begins to use acquired knowledge: the challenge is to identify and resolve obstacles to be able to match or exceed the expectations for post-transfer performance. *Integration stickiness* may be expressed through abandoning the new practices when facing any difficulties: final integration of knowledge fails and this leads to reversal to the former 'status quo' [Szulanski, 2000].

4.7. Knowledge in a software company

In this sub-chapter, different types of knowledge in a software company are identified and analyzed in regard how difficult such knowledge is to transfer from a strategic alliance partner to another. The latter examination is conducted in regard to the three aspects of knowledge: degree of articulation, complexity and embeddedness in organizational context (presented in Figure 22 earlier).

Software development involves crystallization of domain knowledge into a language that can be read and executed by a computer. This process is directional: progressing through application domain knowledge to software architecture, algorithmic design and finally into programming language statements [Robillard, 1999]. Software development practices may vary from a company to another, depending on commitments on certain process maturity standards (SEI-CMM, ISO-9000) or decisions to engage in an agile software development approach. However, the majority of software engineering knowledge is presumably utilized all through the industry without a great variety while the industries for which the software is developed might raise highly unique challenges. This implies that software engineering knowledge could be characterized as highly articulated (explicit), structured and independent from the organizational context.

The depth and breadth of application domain knowledge as the differentiating factor among the software companies is one important point of consideration when evaluating prospective strategic alliance partners. Application domain knowledge can be less articulated, varying from simple to rather complex and being less structured.

4.7.1. Software business knowledge

Understanding the nature of software business requires examining how the industry is structured. Messerschmitt and Szyperski [2004] propose following

partitioning for the software industry (Figure 24). *Industry consultants* play an important role in crystallization of vertical industry domain knowledge or horizontal business application needs into software requirements and features. *Application software suppliers* implement the software, market the software for multiple end-user organizations and specialize in certain technical competences and processes for maximizing operational efficiency and quality of software. *Infrastructure software supplier* provides software for application developers and operators.

Several independent software suppliers may team-up with one infrastructure software supplier. *System integrators* acquire and integrate software of several vendors, install and test the interoperability and functionality of the newly combined system. System integration may require implementation of custom modules and middleware bridging the portfolio of the software components. While system integrators concentrate on technical aspects, *business consultants* facilitate the adaptation of software in a particular firm addressing the special organizational issues and needs [Messerschmitt and Szyperski, 2004].

Two kinds of service providers should be distinguished from each other in software industry: *application service providers* that license and operate applications and *infrastructure service provider* purchases and operates the hardware and software infrastructure. *Information content suppliers* process and aggregate information to correspond to the needs of customers [Messerschmitt and Szyperski, 2004].

Strategic alliances of this thesis context are assumed to be formed between application software suppliers that conduct research and development activities jointly. Software business knowledge is prerequisite for a software company to operate successfully as a part of the software eco-system. The transfer of software business knowledge between the alliance partners occurs informally and as a side-product in a R&D alliance. Such knowledge is characterized as less-articulated, rather simple (not complex as technological knowledge) and possessed by humans (not structured, nor codified).

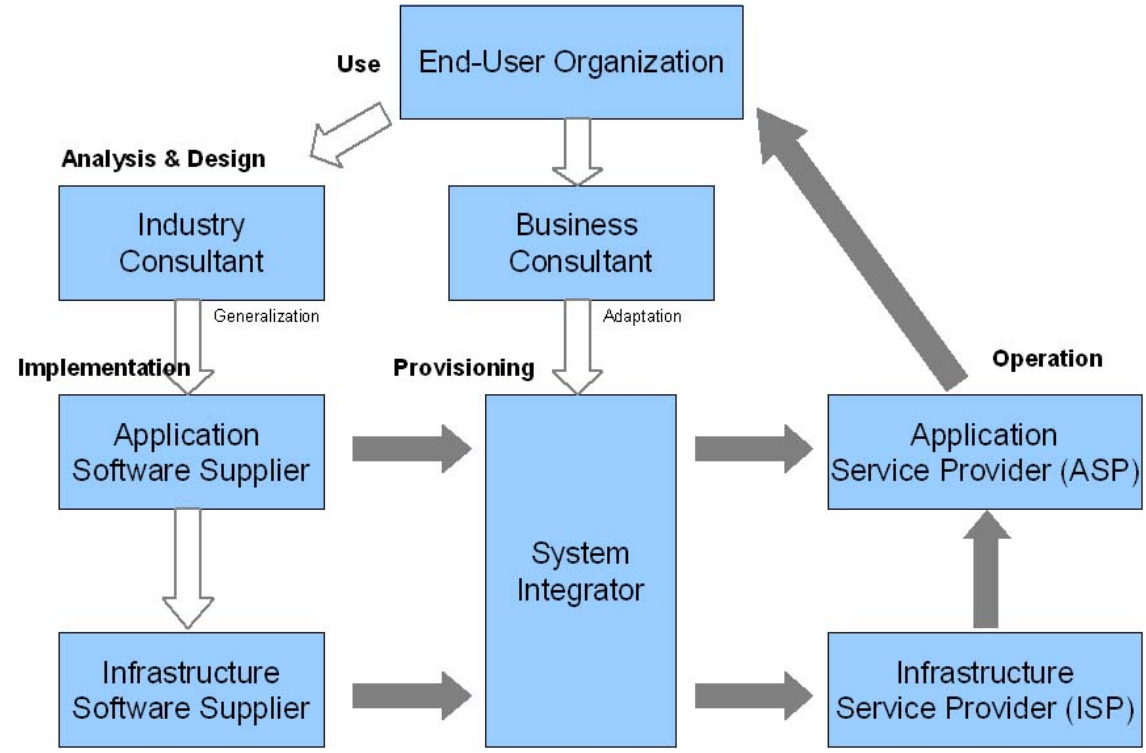

Figure 24. Software value chain [Messerschmitt and Szyperski, 2004].

4.7.2. Software development process knowledge

Procedural knowledge is used while interacting with our environment, for example, during activities, such as walking, talking and using a computer application. Procedural knowledge is acquired through practice, and although a skill may be difficult to learn and describe; it is rarely forgotten. *Declarative knowledge* is factual knowledge concerned with the properties of objects, persons or events and their relationships. Declarative knowledge can be further divided in *topic knowledge* that refers to the definitions of words in a dictionary and *episodic knowledge* concerned with an individual's experiences with knowledge [Robillard, 1999].

In software development context, episodic knowledge develops while working with different design diagrams (data-flow diagrams, ER-graphs), defining objects from specification requirements and documenting programs. Both, topic and episodic knowledge are needed in software development. Novice programmers may not have sufficient episodic knowledge of the application domain and this may result in well-designed, but inappropriately functioning software or unnecessarily complex design [Robillard, 1999].

Software development knowledge on process level can be defined by process maturity standards (such as SEI-CMM), thus being structured well-articulated knowledge.

4.7.3. Software technologies knowledge

Small and medium size software companies need to focus on certain technologies and platforms in which they develop strong competences. The need to focus on limited range of competences is one of the key drivers for strategic alliances formation: specialization implies narrower competence portfolio which raises the need to access complementary competences while engaging in ventures exploring novel ideas.

Software technologies knowledge is well-structured, independent from the organizational context and well-articulated. Complexity of technological knowledge poses the greatest challenge for its transfer; the absorptive capacity of an individual or a company may not be at a sufficient level to absorb certain technological knowledge. Challenges with emerging technologies may be that documentation is not adequate or complete.

4.7.4. Market knowledge

One of the reasons to engage in a strategic alliance with an over-seas partner may be the market knowledge of the targeted geographic region that the partner is familiar with. A suitable alliance partner with deep understanding of the local market conditions and access to distribution and sales channels ease the entry to a foreign country significantly. Market knowledge may be less articulated (tacit), varying from simple to highly complex, largely embedded in organizational context and less-structured.

4.7.5. Alliance competence know-how

Strategic alliance partners may have a varying degree of exposure to strategic partnering. The other partner may not have engaged in strategic R&D partnering while for the other one it is a regular practice. The more experienced partner may have adopted best practices and supporting systems that the inexperienced partner is not aware of. In such a case, transfer of alliance competence know-how between the alliance partners could be needed to achieve equilibrium. Alliance competence know-how is likely to be highly embedded in organizational context, often less articulated and emphasizing human and social forms over structured ones.

4.8. Summary

Chapter Four built on the distinction between data, information and knowledge, as well as the dichotomy of tacit and explicit knowledge. Criticism of tacit knowledge concept (as understood by Nonaka and Takeuchi [1994]) was raised as an important issue. The working model for transfer of 'Skills' knowledge and knowledge-based theory of the firm laid down the foundations

for reviewing prior research on inter-organizational knowledge transfer. Finally, different types of knowledge in a software company were described and analyzed in regard to the three dimensions of knowledge by Bhagat et al. [2002].

5. Ontological dimension – crossing boundaries

This chapter contributes the 'Ontological thread' to the Skein of Alliance Learning that forms the core of the Knowledge Transfer and Alliance Learning -model presented in Chapter Seven. The chapter is started by describing what ontology is as understood in the traditional sense. Then, Nonaka's and Takeuchi's [1994] *ontological dimension* –concept is adopted in this thesis to be used as an umbrella concept for all organizational learning related issues not belonging to the two other dimensions of epistemology and culture. This chapter deals mostly with the *ontology of information*, i.e. the formation and processing of information and knowledge in organizational context.

5.1. Ontology vs. ontological dimension

The word 'ontology' may be used with different meanings depending on the context. In philosophy, ontology is the field of study of 'things that exist' [Chandrasekaran *et al.,* 1999] or in other words: ontology is the theory of items of all kinds. These items can be concrete or abstract, existent or non-existent, real or ideal [Poli, 2002]. In artificial intelligence it refers commonly to representation of vocabulary in a particular domain [Chandrasekaran *et al.,* 1999].

Domain ontology (a term by Guarino, 1998) is concerned with special kinds of items (e.g. ontology of mathematics or law) on a certain level of specificity, from very general to more specific (e.g. ontology of analytical geometry). Nevertheless, ontology looks after universal structures in the case of both, general ontology and domain-dependent ontology; the latter being concerned with categorically closed collection of items [Poli, 2002].

Information can be categorized into ontological vs. *non-ontological* and ontological vs. *quasi-ontological* information. Non-ontological category includes *semiotic* and *semantic* information. Quasi-ontological information is kind of meta-data describing who has made the categorization; where, when and how. Further, *descriptive* ontology concerns with the collection of information about a wide variety of items in the world and the specific domain under analysis. *Formal* ontology distills, codifies and organizes the results of descriptive ontology. Categories of formal ontology are described by terms such as thing, process, matter, form, whole and parts. *Formalized* ontology conducts formal codification for the constructs that were descriptively acquired and formally purified [Poli, 2002]. The use of epistemological concepts such as belief, 'knowledge' in its different forms (knowledge, uncertain knowledge, wrong

knowledge, etc) indicates that we deal with epistemological information, not ontological [Poli, 1999].

In regard to the structure of ontology, Poli [2002] discusses the problem topics of "*substance*" and "*determinations*". The theory of substance comprises of the sub-theories addressing *the theory of particulars, the levels of reality* and *the wholes and their parts*. The theory of particulars counterattacks the logic-driven thinking leading to the perception of the world as the "world of individuals". Poli [2002] points out that the logical concept of *individual* should be replaced by an ontological one that is richer in terms of descriptive and categorical ontology.

In regard to the theory of *levels of reality,* three ontological strata of the real world can be distinguished: the *material*, the *psychological* and the *social*. However, categorical and existential dependencies exist among the three: a psychological item or event requires a physical object as its existential bearer; without a person there will be no correlative psychological states [Poli, 2002].

In regard to the theory of *wholes and their parts,* Poli [2002] distinguishes between three kinds of wholes: *aggregates*, *wholes* in the proper sense and *systems*. The difference of aggregates and wholes is the following: the former consists of *proximate parts* and the latter, of parts which *fit* together. Dynamic exchange between the whole and its parts is the distinguishing feature of a *system*. Every whole is separated from its environment by a boundary which separates the *interior* and *exterior* of the whole [Poli, 2002].

Matter and form are correlated since "any form may be the matter of a higher form, and any matter may be the form of a lower matter". Discontinuity in the matter-form dependence exists when shifting from the organic to the mental plane, for example, atoms or cells are clearly not the matter of mind. *Social stratum* is the level of communication and complex social phenomena and customs, economic and legal realities, history, language, science and technology (as summarized by Poli's [2002] based on Hartmann (1935) and Husserl (1989)).

Ontologies are critical in knowledge sharing [Chandrasekaran *et al.,* 1999] which may give a hint why Nonaka [1994] has chosen to use the term in his theory. The word 'ontology' may be misleading for those who associate it only with its better known etymological meaning in philosophy. In this thesis I have adopted the idea of the 'ontological dimension' from Nonaka [1994]: ontological dimension to knowledge creation is concerned with social interaction between individuals that create, share and develop knowledge (Figure 25).

However, I use the term 'ontological dimension' even in broader meaning in a sense that I consider it to include learning on different levels, crossing "ontological" boundaries of an individual, team and organization; and the

properties of the previous ontological entities that may influence knowledge transfer. To my understanding, even culture can be perceived as an entity on ontological dimension when the focus is on *crossing cultural boundaries* not the characteristics or 'deep structures" of the culture (see Figure 27). When we discuss 'cultural boundaries' we implicitly assume culture as an ontological entity with well-defined borders which is often not the case in practice. By defining ontological dimension this way, the three dimensions together cover 360 degrees of the phenomenon under study, that is, knowledge transfer in cross-border strategic alliances.

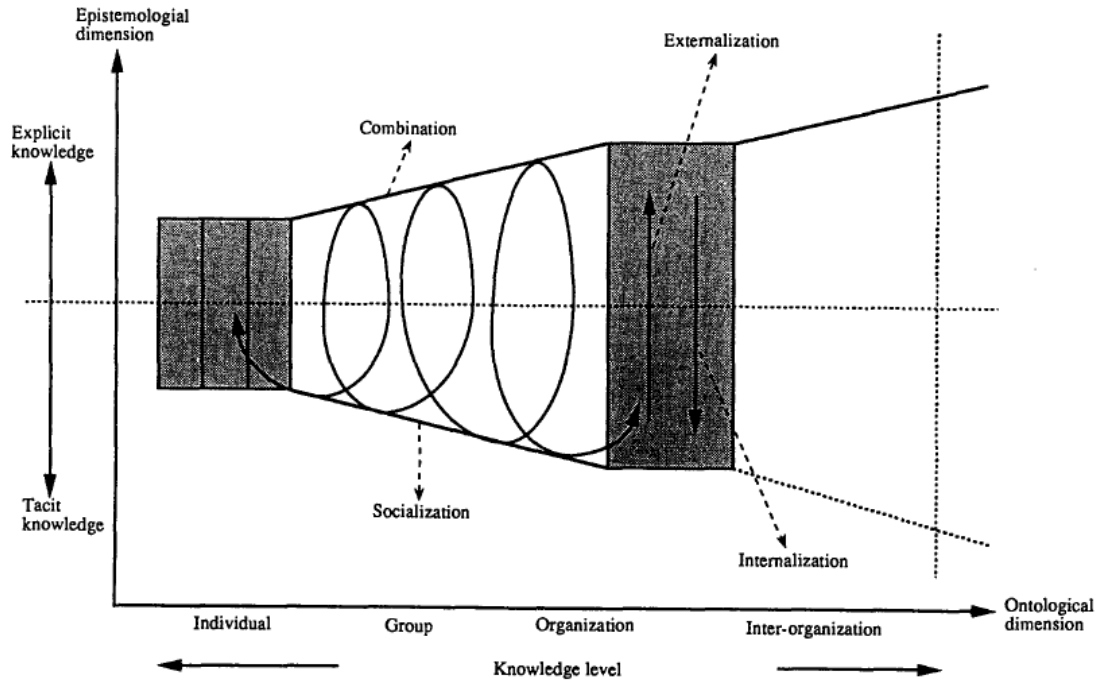

Figure 25. Spiral of organizational knowledge creation [Nonaka, 1994].

Nonaka [1994] emphasizes that interaction between individuals is in critical role in developing ideas which originate to one individual. He refers to the groups which contribute to the development of knowledge by '*communities of interaction*'. In the case of strategic alliances – focus of this thesis - the interaction spans evidently across organizational boundaries. Other, lower levels of possible interaction are individual, group and organization level as shown in Figure 25 and Figure 26; the latter being further development of the former.

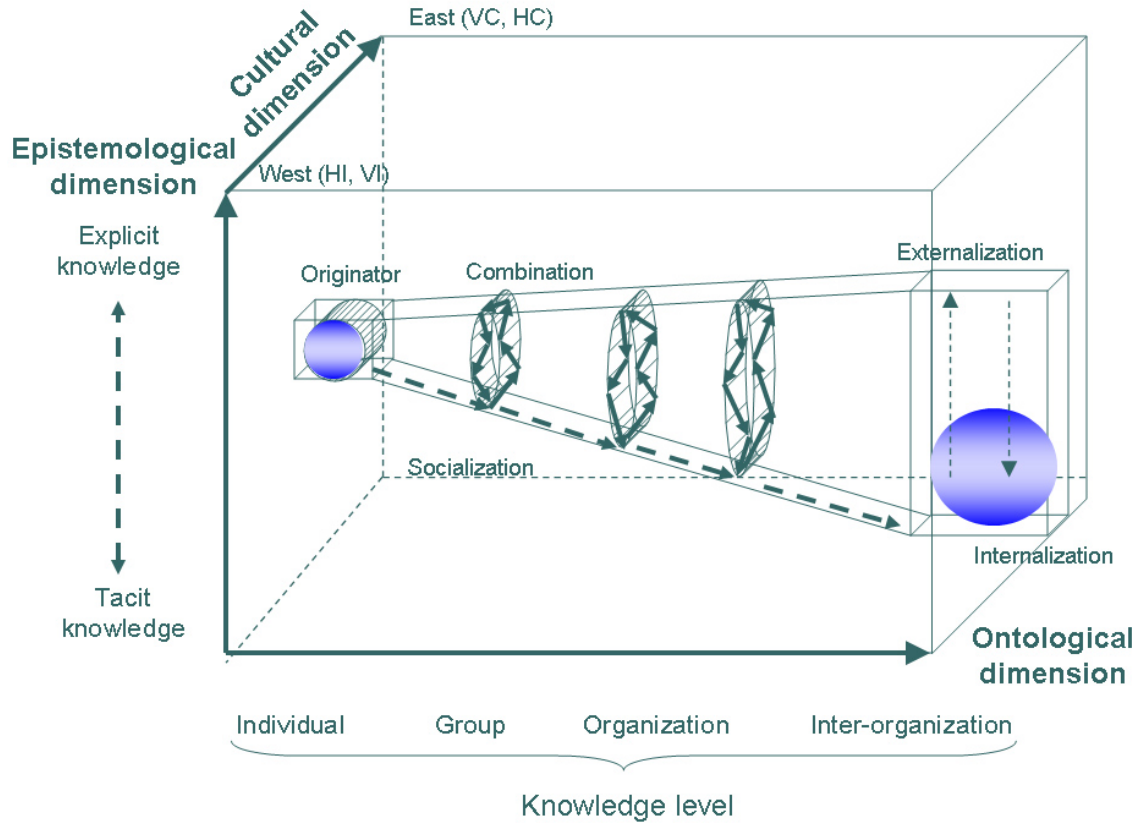

Figure 26. Spiral of Organizational knowledge creation adopted to East-West cultural context.

In strategic alliances two distinct ways of acquiring skills should be distinguished from each other: a company can gain access to relevant skills by licensing, 'subcontracting' or by utilizing partner's employees for specific goals. On the other hand, the company may decide to opt to internalize desired skills. Hamel [1991] coins terms *quasi-internalization* and *de facto internalization*, respectively. The previous distinction is relevant since only internalized skills can be utilized outside of the boundaries of the contract confining the business relationship. Grant and Baden-Fuller [2004] argue that the value of alliances over firms and markets lies in accessing knowledge and thus acquiring knowledge should not necessarily be seen as an ultimate goal of an alliance. When strategic alliances are used to pursue those strategic objectives that they are endogenously most suitable for, we have taken one step towards genuine alliance thinking as depicted in Figure 8 earlier.

In Figure 27, I have depicted three major levels of ontological dimension that contribute to knowledge transfer challenge: (1) team level, (2) inter-organizational level and (3) cross-border level. From the knowledge transfer aspect, the team level is the platform for knowledge transfer between the

individuals. The latter two levels build on the top of the team level both raising one more source of uncertainty and complexity to the team level interaction.

In a single-organization context, only the first level of ontological challenge, the team level, is present. Suitable conditions for knowledge creation in teams were discussed in the chapter of Epistemological dimension (based on Nonaka's work [1994]).

When two organizations collaborate within a single-culture context, the two ontological dimensions are present: team and inter-organizational level. In this case, different corporate cultures discussed in the chapter of Cultural dimension (based on Schein [1992]) may raise difficulties or misunderstandings in the team level interaction.

In cross-border context, all the three ontological dimensions are present. The interacting ontological entities examined, Culture A and Culture B, are recognized as contributing to the ontological challenge, but are not analyzed in qualitative terms in this context focusing on the ontological dimension.

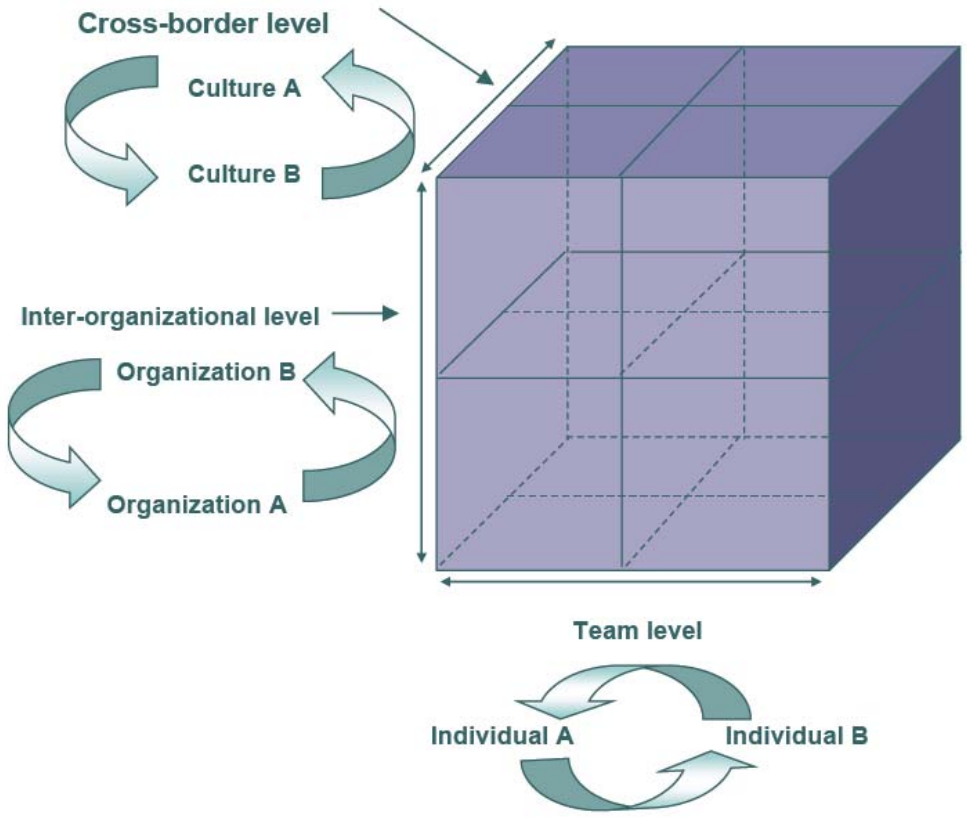

Figure 27. Ontological challenge - crossing boundaries.

5.2. Interorganizational learning

The dynamics of interorganizational learning raises many challenges for alliance practice and interesting research themes. Strong desire of

internalizations of partner's skills coupled with concurrent international expansion goals most likely result in inflammable partner relations [Hamel, 1991].

The prerequisite for interorganizational knowledge creation is both partners' ability to learn. One part of organization's learning ability is absorptive capacity – a concept introduced by Cohen and Levinthal [1990]. The definition of absorptive capacity according to authors consists of three parts: (1) recognition of the novel information outside the firm, (2) assimilation of information and (3) application of information for commercial purpose.

Cohen and Levinthal [1990] ground their concept of absorptive capacity by starting from the examination of individual's cognitive structures. The authors point to research suggesting that prior experiences influence future cognitive tasks, such as learning and problem solving. On organizational level, the absorptive capacity depends on persons in "gatekeeping" or "boundary-spanning" roles, i.e. those persons who stand at the interface of the firm and its environment or between the subunits of the firm. Lane and Lubatkin [1998] expand Cohen's and Levinthal's firm-specific absorptive capacity concept to company dyad -level by arguing that "the ability of a firm to learn from another firm is jointly determined by the relative characteristics of the student and the teacher firm" [Lane and Lubatkin, 1998]. Lane's and Lubatkin's [1998] contribution of 'relative absorptive capacity' -concept is another instance of the perceived shift to 'alliance thinking' from a firm-centric thinking.

Dyer and Singh [1999] recognize that Cohen's and Dyer's concept of absorptive capacity does not take into account that the degree of absorptive capacity varies depending on the partner. Further elaborated, partner-specific absorptive capacity by previous authors acknowledges the significance of overlapping knowledge bases and interaction routines that maximize sociotechnical interaction. Absorptive capacity of a firm will improve over time, because only after 'getting to know' each other, partners really learn how to communicate with each other and find easier critical expertise in the partner company [Dyer and Singh, 1999].

In the empirical study of Hamel's [1991], it was found that the managers had several concerns regarding asymmetric learning in the alliance: concern over the intent of partners (on axis collaborative vs. competitive), transparency (referring to 'openness') and receptivity (referring to the firm's ability to absorb skills from the partner). Hamel considers [1991] the three previous factors together as 'prospective determinants' of interorganizational learning outcome. Based on several case studies Inkpen [1998] offers explanations why learning in alliances fails: undervaluation of alliance knowledge, nature of knowledge

made learning difficult and the parent corporate culture did not support alliance learning. Inkpen's [1998] 'alliance knowledge' includes different perspectives: (1) knowledge about how to design and manage alliances, (2) knowledge that the partner wishes to gain access to, but needs not to internalize and (3) knowledge that a partner can use to enhance its own performance (e.g. strategy and operations).

Hamel's [1991] theory of inter-partner learning consists of core propositions that are briefly characterized in the following. In the case of *competitive collaboration,* partners may view strategic alliances as transitional devices aiming at internalization of partner's skills. Termination of a learning alliance should not be considered necessarily as a failure, but more as a statement that the learning goals of the alliance have been achieved. From the perspective of "well-being" of a relationship, it is beneficial if partners' motivation for value gaining from the relationship is of slightly differing nature, for example one organization may aim at short term economic benefits while the other one in learning skills for long-term benefit. This division of value motivations will lessen the need to engage in time-consuming value-sharing discussions [Hamel, 1991].

Learning and bargaining power are in relation to each other since successful learning may result in making the initial bargain obsolete and thus potentially leading to unilateral dependence. Because of natural avoidance of this kind of one-side dependence, partner may view the alliance as a race-to-learn; as stated by a manager in Hamel's study: "If they learn what we know before we learn what they know, we become redundant".

The objectives of an alliance partner, intent, may be internalization, resource concentration or substitution. Asymmetry in either transparency or receptivity results in asymmetric learning. *Transparency* is influenced, not only by protectiveness of employees, but through design of organizational interfaces and the structure of joint tasks. *Receptivity* is constrained by the skills and absorptiveness of receptors among others [Hamel, 1991].

Interorganizational learning occurs when existing knowledge is transferred from one partner to another or when completely new knowledge is developed jointly. In interorganizational learning, transparency of knowledge 'holder' and receptivity of knowledge 'absorber' must be present in order to transfer knowledge and learn jointly. Interorganizational learning is essentially: "a joint outcome of the interacting organizations' choices and abilities to be more or less transparent and receptive" [Larsson *et al.*, 1998].

5.3. Strategies for interorganizational learning

Larsson et al. [1998] acknowledge 'interorganizational learning dilemma': being a "good" partner paves the way for possible exploitation by another, opportunistic partner. Evidently, collective knowledge development in this kind of strategic alliance will not be successful at all.

Larsson et al. [1998] gather from literature factors that contribute to the '*interorganizational learning dilemma*' by creating barriers to receptivity and transparency that are the core enablers of collaboration strategy. Receptivity can be constrained by availability of 'organizational slack' which – according to the introducers [Cyert and March, 1963] of the term - serves as a means to reduce goal conflict. In addition, strong intent to learn and adoption of 'a student' attitude contributes to receptivity. Transparency is not achieved only by removing the obstacles for accessing knowledge, because the knowledge itself can be tacit, "sticky" or socially embedded – slightly varying concepts from different researchers. The previous factors are perceived mostly as partner-specific motivational and ability barriers, [Larsson *et al.*, 1998].

Individual strategies for interorganizational learning include *collaborating, competing, compromising, accommodating* and *avoiding* [Larsson *et al.*, 1998] (Table 2).

Table 2. Interorganizational learning outcomes [Larsson, 1998].

Organization B's learning strategy ->	**Avoidance**	**Accommodation**	**Compromise**	**Competition**	**Collaboration**
Organization A's learning strategy:					
Collaboration		B-> A +c -> a	b -> a a -> b + c -> a&b	A->B +c -> b	B -> A A -> B + C -> A&B
Competition		B -> A +c -> a	b -> a		B -> A + c -> a
Compromise		b -> a	b -> a a -> b + c -> a & b	a -> b	b -> a a -> b + c -> a & b
Accommodation			a -> b	A -> B + c -> b	A -> B + c -> b
Avoidance					

Sample legend:
A -> B : High transfer of existing knowledge from A to B
b -> a : moderate transfer of existing knowledge from B to A
+ c -> a&b : moderate creation of new knowledge c that is appropriated by both A and B

The best alliance outcome, i.e. greater amount of new knowledge is created when both organizations are using '*collaboration*' strategy. Any other combinations of individual strategies will result in less knowledge transferred from one partner to another and thus less new knowledge created. Assumption here is the notion by Larsson et al. (influenced by Schumpeter, 1943) in which the potential for new knowledge created through collaboration is proposed to be "a function of the total amount of knowledge that is disclosed and absorbed among the organizations".

Larsson et al. [1998] recognize the dynamic fluctuation of chosen individual learning strategies. The shift occurs often towards decreased transparency and receptivity through adoption of competition or avoidance strategies.

Compromise strategy is suggested by Larsson et al. [1998] as a possible solution to the interorganizational learning dilemma. Weakness of the compromise strategy is that not all learning potential can be realized through it, because of avoidance of competitive vulnerability in the case of total transparency. Two organizations adopting accommodating strategies may not accomplish great overall results, but the alliance itself can be relatively stable. A combination of "collaborative – competitive" strategies is unlikely to be long-lasting since the exploited collaborative partner will sooner or later adopt a competitive strategy too resulting in exacerbated relations [Larsson *et al.,* 1998].

5.4. Organizational knowledge creation

The organizational learning perspective of the previous sub-chapters emphasizes absorption of existing knowledge. We should not restrict to this, but also examine how completely new knowledge is created in a partnership. Organizational knowledge creation is in its essence a dynamic process, in which tacit and explicit knowledge are in perpetual, never-ending, dialogue [Nonaka, 1994]. This process and its peculiarities are presented in the following. In this review, necessary remarks are raised to 'update' the theory to "cross-culture, cross-organization" -context.

Nonaka [1994] considers individual commitment as one of the crucial components in promoting the creation of new knowledge in an organization. Commitment itself is induced by three factors that Nonaka has named "intention", "autonomy" and environmental "fluctuation". *Intention* has two facets: how individuals form their approach to the world and, on the other hand, how they make sense of their environment. Intention plays a role in how the value of information and knowledge is perceived and created. *Autonomy* applies to levels of individual, group and organization. Autonomy of individuals in organization may induce unexpected opportunities and provides

greater flexibility to acquire, relate and interpret information. Autonomy increases individual's self-motivation to create new knowledge. *Environmental fluctuation* refers to intervention of external world – in the form of chaos and discontinuity – in individual process of knowledge creation. Because of ambiguity, redundancy, and randomness in organization, new patterns of thinking may arise and individuals recreate their own systems of knowledge [Nonaka, 1994].

When two organizations collaborate with each other to create new knowledge, this involves the establishment of cross-organizational teams. Individuals as representatives of different national and corporate cultures may express varying degrees of intention and autonomy. Based on Hofstede [2005] and Bhagat et al. [2002] it could be hypothesized that employees of an individualistic culture intrinsically expect greater personal autonomy.

5.4.1. Knowledge conversion

Nonaka [1994] presents the ACT[9] model by Anderson (1983[10]) as one model of knowledge conversion. Nonaka considers as the limitation of ACT model the fact that transformation of knowledge is seen as a unidirectional process from declarative to procedural knowledge. Also he acknowledges that this might be because the ACT model is more concerned with maturation than creation of knowledge [Nonaka, 1994].

Nonaka [1994] responds to the previous deficiency by presenting his own model for knowledge conversion that includes four different quadrants: socialization, combination, externalization and internalization (Figure 28).

[9] ACT stands for 'Adaptive Control of Thought'. Later, the model in its updated form was named ACT-R, the "R" standing for 'rational' (source: Wikipedia).

[10] J. R. Anderson, The Architecture of Cognition, Cambridge, MA: Harvard University Press, 1983.

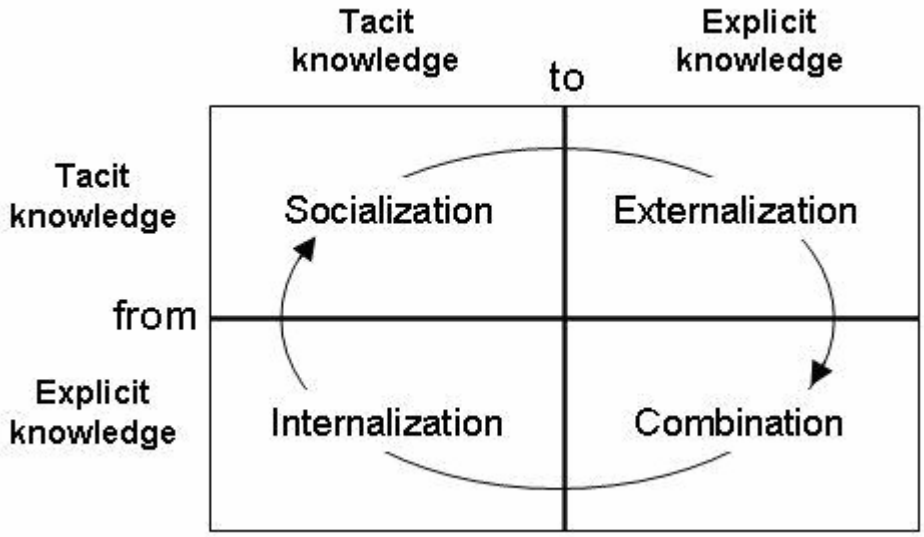

Figure 28. Knowledge conversion [Nonaka, 1994].

The knowledge conversion model of Nonaka [1994] is accommodated to the cross-border context in Figure 29. In the following we review the original model along with relevant updates to suite the alliance context.

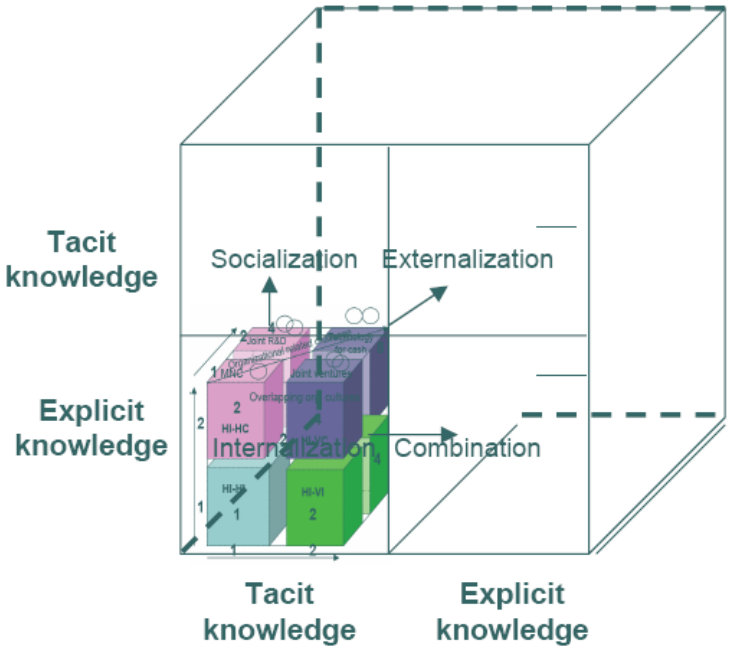

Figure 29. Knowledge conversion model including internal cubicle of 'Culture-based challenge').

Socialization –process is the mechanism to convert knowledge "tacit-to-tacit". Language is not always needed in socialization process, but shared experience of knowledge "sender" and "receiver" is relevant. Some shared

experience is a precondition for successful knowledge conversion in this mode [Nonaka, 1994]. In cross-border alliance context, the cultural background mediates the socialization process, thus raising potential conflicts as introduced previously: individualism-collectivism –conflict and horizontalness-verticalness –conflict.

Combination involves social interaction in order to combine explicit bits of knowledge held by different individuals. Information can be sorted and reorganized, for example, with the assistance of computer applications. Information itself can be collected through face-to-face conversations, teleconferences, e-mail, phone or any combination of these [Nonaka, 1994]. In cross-border context, combination frequently involves gathering information through IT mediated communication, thus resulting in greater vulnerability for misunderstandings.

Externalization is a process where tacit knowledge is converted into explicit knowledge. This can be achieved through using metaphors or analogies that capture the essence of knowledge content to be transferred. Tacit and explicit knowledge should be considered complementary, not substitutive, to each other [Nonaka, 1994]. In the chapter of Cultural dimension, it was hinted that the approach to tacit knowledge may vary depending on cultural background: employees of a collectivistic culture being more sensitive to tacit knowledge in some cases [Möller and Svahn, 2003]. Further, the authors [2003] propose that 'collectivists' tend to excel in understanding complex, tacit and systemic knowledge whereas 'individualistics' – often Europeans – tend to analyze technology more concretely, including different documents and artifacts (technology reports, licensing documents, etc.).

Internalization is a reverse process to externalization in which explicit knowledge is converted back to tacit knowledge. In a sense, internalization resembles most the traditional form of learning of all knowledge creation modes [Nonaka, 1994]. Based on Möller's and Svahn's [2003] statement above, it could be hypothesized that 'individualistics' could develop their technological competence relying more on 'learning through internalization', i.e. independent study of explicit documents and source code that their partner has exposed to them.

Nonaka's [1994] knowledge conversion cycle can be criticized as being over-simplistic: the knowledge conversion is depicted as a closed cycle without inputs or outputs, but from where do novel ideas and knowledge emerge from[11]?

[11] Note by Hannu Kangassalo.

5.4.2. Concept of 'Ba'

Nonaka et al. [2001] define '*ba*' as "a platform where knowledge is created, shared, and exploited". Ba provides a medium for the knowledge concentration of an organization; it collects the applied knowledge of the domain and integrates it. The authors emphasize the role of interaction between individuals and the environment in the context of ba.

The Japanese word 'ba' means roughly "place", but according to the authors it refers not necessarily to a physical space, but to a specific 'time-space nexus' that can be physical, virtual, mental or some combination of these. Participating in a ba gives an opportunity for the individual to transcend one's own perspective that may be limited in many ways [Nonaka *et al.*, 2001].

Knowledge is an integral part of a ba and if separated from ba, it turns to be bare information. The authors categorize four different types of ba: originating, dialoguing, systematizing and exercising; each supporting a particular mode of knowledge conversion between tacit and explicit knowledge. *Originating ba* begins the cycle of knowledge creation, being a face-to-face interaction medium for sharing feelings, emotions, experience and mental models [Nonaka *et al.*, 2001].

Dialoguing ba - if compared to the originating ba - is a more conscious outcome of selecting a mix of people with specific knowledge and capabilities for a project team. Dialogue enables the conversion of individual's mental models and skills to common terms and concepts, i.e. the conversion of tacit knowledge to explicit knowledge facilitated by the abundant use of metaphors [Nonaka *et al.*, 2001].

Systematizing ba is associated with the combination phase of knowledge conversion. Prevailing mode of interaction is virtual, in contrast to being physical. Thus, the collaborative information technology plays a key role in combining new explicit knowledge with existing knowledge base after the concepts have been justified throughout the organization [Nonaka *et al.*, 2001].

Exercising ba supports the internalization phase of knowledge conversion (from explicit to tacit knowledge). Learning occurs by continuous self-refinement during on-the-job training (peripheral and active participation) supported by senior mentors and colleagues [Nonaka *et al.*, 2001].

5.4.3. Towards interorganizational knowledge creation

In the following, Nonaka's work [1994] is accommodated to the strategic alliance context. Nonaka's [1994] description of organizational knowledge creation process is used as the foundation for extended *interorganizational*

context. Additional remarks are raised basing on the chapter "Cultural dimension".

First, total quality of an individual's tacit knowledge is raised through continual interaction with explicit knowledge, i.e. reflection between experience and rationality (*the stage of enlargement of an individual's knowledge,)*. Next, a *self-organized team* is built for sharing tacit knowledge [Nonaka, 1994]. In the cross-border alliance context, teams can be formed from the employee pools of the two organizations, adding the cross-cultural dimension to knowledge conversion as shown earlier (Figure 29).

In Nonaka's single-organization context, a self-organized team consists of employees across functional boundaries of the organization including core members who assure reasonable 'redundancy' of information by having prior work experience from different functions. Team should interact not only within the team, but with relevant stakeholders, such as suppliers and customers to ensure creative dialogue in which tacit knowledge can be communicated and shared. Links connecting individuals within – and outside - the organization provide access to valuable resources when special kinds of expertise is needed to solve a particular problem [Nonaka, 1994].

Precondition for *sharing knowledge* in a self-organized team is building mutual trust among the members. Trust starts to build up, when team members share their original experiences [Nonaka, 1994]. In the cross-border alliance context, the trust needs special attention as building trust may require more time because of the cultural distance. Shared experience is the foundation for raising *common perspectives* that are the shared part of team members' tacit knowledge repositories. Prevailing mode of knowledge conversion in this stage is evidently *socialization* [Nonaka, 1994].

In *conceptualization*[12], the perspective that the team has come up with, is articulated through continuous dialogue. The prevailing knowledge conversion mode at hand is externalization. At this stage, transformation from team-specific tacit perspectives to more universally understood explicit concepts is achieved. The quality of dialogue can be improved through using dialectic, such as contradiction and paradox. Dialogue should leave plenty of space for revision, negation and constructive criticism [Nonaka, 1994]. In the alliance context, the cultural remarks on *externalization* (knowledge conversion) previously apply to the conceptualization stage.

[12] The conceptualization term by Nonaka is not interchangeable with the one used by Nicole Guarino (as defined in his paper Formal Ontology and Information Systems).

Crystallization of team's newly developed abstract concepts into products, systems or services is the challenge ahead next. Essentially, crystallization is a collective social process in which *internalization* is the dominant mode of knowledge conversion. Redundancy of information in organization enables experts to take an initiative when they are in position of knowledge leadership, i.e. when they have crucial information and knowledge needed in the task at hand [Nonaka, 1994].

After knowledge has traversed all its way through being shared, conceptualized and crystallized, it must still go through the process of *justification* in which final convergence and screening occurs. In this stage, questions regarding knowledge quality and value to organization are raised. Business criteria for evaluating knowledge can include cost, profit margin and utility regarding organization's interests. Middle and top management will make the decision about evaluation criteria that may include business criteria along with other value premises, such as aesthetics of the product. Evaluation criteria should be consistent with organization's higher-order value systems. Finally, justified knowledge is integrated to become a part of organization's whole knowledge network [Nonaka, 1994].

Nonaka [1994] emphasizes the circular, never-ending nature of organizational knowledge creation process that has many interfaces with environment including customers, competitors and suppliers. The way 'outsiders' react to the product by their 'bodily' actions – decisions to purchase or not to purchase, the ways they use the product (often unexpected) – will give important feedback to the organization. This feedback forms the basis for the future iterations of knowledge creating cycles.

5.4.4. Management of knowledge creation process

Nonaka [1994] raises some important considerations regarding the management of organizational knowledge creation (shortly: OKC-process). *Redundancy* in organization refers to deliberated overlapping of not only information but also business activities and responsibilities. At a quick glance, this kind of overlapping could be assumed to increase inefficiency and disorder in organization, but according to Nonaka it is highly beneficial in different ways: it can speed up concept creation, reduce the impact of managerial hierarchy, build mutual trust (through eliminating cheating) and simply connect individuals that otherwise would not have much in common in regard to field of expertise.

Environmental fluctuation contributes to the development of c*reative chaos* in the organization. An organization may face a crisis triggered by changes in the

technology or market environment. Similar sense of crisis may be generated intentionally as well *by* the top management to avoid stagnation.

As a third concept in the management of the OKC –process, Nonaka raises '*requisite variety*' (original concept by Ashby, 1956): which refers to matching the degree of diversity within and outside the organization and leads to increased efficiency.

5.5. Summary

The previous chapter of Epistemology described knowledge mostly in static context, while this chapter of Ontological dimension built on top of this by immersing into dynamics of interorganizational learning and innovation in alliance context. Necessary remarks were made to expand Nonaka's and Takeuchi's [1995] theory to the thesis inter-organizational context. Now we proceed even further, adding one more layer, culture, on the top of cumulated understanding of the previous chapters.

6. Cultural dimension

This chapter explores how culture can influence knowledge transfer between strategic alliance partners hailing from different cultural orientations. Culture here is inspected from the three points of views culture as containing different levels, culture as manifested in communication and social interaction and culture as seen through different dimensions of Hofstede [2005].

6.1. Levels of culture

In this chapter the influence of culture on knowledge transfer is recognized to occur in different levels (Table 3), such as national culture [Hofstede, 2005; Bhagat *et al.,* 2002], organizational (corporate) and occupational culture [Schein, 1992]. More recently, Karahanna et al. [2005] have coined the term 'supranational' for pointing to the cultural differences that cross national boundaries (or exist in more than one nation). Regional, ethnic and linguistic subcultures belong to the level of supranational [Karahanna *et al.,* 2005]. Religion could be thought as fitting the definition of supranational culture as well.

Schein [1992] defines the culture of a group as follows: "A pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems". The definition stresses "shared, taken-for-granted" assumptions of the group members. Schein's [1992] acknowledges that any social group with a 'stable membership' and shared learning history has developed a culture of its own.

Table 3. Levels of culture [Karahanna *et al.*, 2005].

Level	Definition
Supranational	Cultural differences that cross national boundaries (or more than in one nation): • Regional • Ethnic • Linguistic
National	Collective properties that are ascribed to citizens of countries (Hofstede, 1984[13])
Professional	Loyalty towards employing organization vs. industry (Gouldner, 1957[14])
Organizational	Social and normative glue that holds organizations together (Siehl & Martin, 1990[15]).
Group	Cultural differences in collective units smaller than an organization.

6.2. Cultural considerations

Hall and Hall [1989] acknowledge concerns over messages, context, time and action chains in cross-cultural situations. If we examine the speed with which a particular message can be decoded, we can distinguish between *fast* and *slow messages*: for example, prose vs. poetry, headlines vs. books, cartoon vs. etchings and manners vs. culture [Hall and Hall, 1989]. Further, the author [1989] divides between *high* and *low context* cultures in which context points to the information that surrounds an event: "A high context (HC) communication or message is one in which most of the information is already in the person, while very little is in the coded, explicit, transmitted part of the message". In a

[13] G. Hofstede, *Culture's consequences: International differences in work-related values*, Sage Press: Beverly Hills, CA, 1984.

[14] Goulder, A. W, Cosmopolitans and locals: Towards an analysis of latent social roles. *Adminstrative Science Quaterly* **2 (**1957), 281-306.

[15] Siehl, C., Martin, J., Organizational culture: A key to financial performance? In: *Organizational climate and culture*, ed. by B. Schneider, Jossey-Bass: San Francisco, 1990.

low context (LC) communications, the majority of the information is carried in the explicit code. Hall and Hall [1989] describe in the following way a common conflicting scenario between high and low context people: "High-context people are apt to become impatient and irritated when low-context people insist on giving them information they don't need. Conversely, low-context people are at a loss when high-context people do not provide enough information. Thus, one of the major challenges in inter-cultural communication is to find the appropriate level of *contexting* for each and every situation [Hall and Hall, 1989].

Understanding of s*pace* and *time* varies in different cultures. In regard to the former, Hall and Hall [1989] point to *territoriality* that refers to people's tendency to emphasize the ownership, to label places or goods as "mine". Similarly, the space is used as communicating power, office location and size as examples. Respect for each person's *personal space* varies from culture to culture: Northern Europeans tend to keep more distance than their Southern counterparts [Hall and Hall, 1989].

In regard to *time*, in *monochronic* cultures time is experienced in a linear way; and people prefer conducting activities "one thing at a time". For the previous purpose, available time is segmented, scheduled and compartmentalized. Approach to time is almost as if it would be a tangible item in regard to the used vocabulary: time can be "spent", "saved", "lost", etc. On the other hand, *polychronic* time is depicted as a non-linear time-continuum with simultaneous occurrence of events and emphasized involvement of people. Polychronic time is much less tangible than its monochronic counterpart [Hall and Hall, 1989].

In low-context cultures (U.S., Germany, etc), the flow of information is more constrained since information tends to be more focused, compartmentalized and controlled. In high-context cultures, the spatial involvement of employees and emphasis on interpersonal relations encourages free flow of information [Hall and Hall, 1989].

By *action-chains* Hall and Hall [1989] refer to a sequence of events in which one or several people participate and contribute for achieving a desired goal. Action chains of employees may be interrupted by meetings or communications by phone or e-mail to the extent that normal work flows are severely hindered. The authors [1989] propose that monochronic, low-context cultures are particularly sensitive to interruption of action chains compared to high-context cultures.

6.3. Dimensions of culture

Figure 30 shows the index values of the five dimensions identified by Hofstede [2005]: power distance, individualism-collectivism, masculinity, uncertainty avoidance and time orientation. Bhagat et al. [2002] acknowledge that the previous five dimensions are not the only ones of significance by referring to other dimensions examined in the literature: particularism vs. universalism, abstractive vs. associative, tightness vs. looseness and uncertainty avoidance, among others. However, Hofstede's [2005] dimensions of culture deserve to be reviewed more in detail, as follows.

	PD index		Individualism index		Masculinity index		Uncertainty avoidance index		LTO index	
	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Arab countries	7	80	26/27	38	23	53	27	68		
Australia	41	36	2	90	16	61	37	51	15	31
Bangladesh									11	40
Brazil	14	69	26/27	38	27	49	21//22	76	6	65
Canada	39	39	4/5	80	24	52	21/42	48	20	23
China									1	118
France	15/16	68	10/11	71	35/36	43	10/15	86		
Germany FR	*42/44*	*35*	*15*	*67*	*9/10*	*66*	*29*	*65*	*14*	*31*
Great Britain	*42/44*	*35*	*3*	*89*	*9/10*	*66*	*47/48*	*35*	*18*	*25*
Greece	*27/28*	*60*	*30*	*35*	*18/19*	*57*	*1*	*112*		
Guatemala	2/3	95	53	6	43	37	3	101		
Hong Kong	15/16	68	37	25	18/19	57	49/50	29	2	96
India	10/11	77	21	48	20/21	56	45	40	7	61
Netherlands	40	38	4/5	80	51	14	35	53	10	44
Pakistan	32	55	47/48	14	25/26	50	24/25	70	23	0
Philippines	4	94	31	32	11/12	64	44	44	21	19
Poland									13	32
Singapore	13	74	39/41	20	28	48	53	8	9	48
South Africa	35/36	49	16	65	13/14	63	39/40	49		
South Korea	27/28	60	43	18	41	39	16/17	85	5	75
Sweden	47/48	31	10/11	71	53	5	49/50	29	12	33
Taiwan	29/30	58	44	17	32/33	45	26	69	3	87
Thailand	21/23	64	39/41	20	44	34	30	64	8	56
USA	38	40	1	91	15	62	43	46	17	29

Source: Hofstede cited in Marcus and Gould (2000, p. 45)

Table I.
Hofstede's dimensions of culture

Figure 30. The dimensions of culture [Hofstede, 2005].

6.3.1. Power distance

Hofstede [2005] defines power distance as "the extent to which the less powerful members of institutions and organization within a country expect and accept that power is distributed unequally". The distinguishing feature of this definition is that the viewing angle is the value system of those that possess less power, not vice versa. This contrasts to the usual approach in which the distribution of power is described as seen from the leaders' perspective. The power distance index (PDI) is useful for evaluating differences in dependence relationships between countries. In "less-power-distant" countries

subordinate's dependence on bosses is lower and the interaction between the two is consultative.

Power distance could be a potential challenge in inter-organizational knowledge transfer in this thesis context. Organizational culture in India is characterized by greater power distance: India possesses a score of 77 (10th/11th) compared to Finland's 33 (46th). It could be hypothesized that in less-power-distant cultures, the flow of information and knowledge would be more unconstrained between different levels of hierarchy.

6.3.2. Individualism – collectivism

Individualism-collectivism dimension is considered as the "deep structure" of a culture by Bhagat et al. [2002] who follows in this regard in the footsteps of e.g. Hofstede [2005].

Individualism and collectivism are expressed through completely different social patterns of behavior. Individualists emphasize their own preferences, needs, rights and contracts, and these are major motivators as well [Bhagat *et al.,* 2002]. In cultures expressing individualism the ties between individuals are loose and the individual is in the first place concerned about the interest of himself/herself and the immediate family. In collective cultures, people are socialized from a very early age into cohesive in-groups that protect them, but expect unquestioning loyalty [Hofstede, 2005].

For example, it could be hypothesized that in individualistic cultures employees may feel more comfortable sharing knowledge with persons all through the organization regardless of the position, whereas in collectivistic cultures the vertical flow of knowledge may be constrained. However, Bhagat et al. [2002] contradict this by stating that individualists maintain relatively loose linkages to other individuals and consider themselves independent of collectives. Further, the more extensive communication in a collective culture is supported by Bhagat et al. [2002] who state that collectivists maintain close linkages to other individuals and possibly belong to several different collectives.

Bhagat et al. [2002] summarize perceived differences in regard to individualism - collectivism –axis (Kagitcibasi, Triandis, etc): these cultural orientations influence not only behavior, but essentially the way of thinking: the way how the body of information (or knowledge) is processed, interpreted and utilized. Individualists think of 'self' as independent of the social environment whereas collectivists accept the interdependence with other actors. Collectivists' approach to information is once again different from individualists': contextual clues are searched for instead of just considering the information as it is, detached from the context. Collectivists value much higher

information about organizational, history, patterns of obligations and norms. Individualists focus on knowledge concerning personal attributes: personality, beliefs and attitudes towards 'things' and people [Bhagat *et al.*, 2002].

In a cultural context, Möller and Svahn [2003] generalize – with admitted exaggeration – that employees of collective culture are more sensitive to relatively tacit knowledge (e.g. organizational history and norms) and also towards systemic and embedded knowledge. Employees of individualistic culture tend to focus more on those explicit attributes of knowledge phenomena. Individualistics communicate without inhibitions with other employees throughout the organization – even interorganizationally - whereas collectivists prefer to communicate with people who belong to their own group or unit [Möller and Svahn, 2003].

To summarize, it could be said that individualism-collectivism degree of a culture influences knowledge transfer *directly* when the members of the cultures in knowledge exchange possess differing approaches to information, its processing and communication; and *indirectly* since individualists and collectivists tend to have their own 'culture-rooted' preferences over forming social ties and interaction within the organization.

6.3.3. Masculinity-femininity

Hofstede's [2005] definition of a masculine society is following: "...emotional gender roles are clearly distinct: men are supposed to be assertive, tough, and focused on material success, whereas women are supposed to be more modest, tender, and concerned with the quality of life". Similarly, the definition of a feminine society: "...emotional gender roles overlap: both men and women are supposed to be modest, tender, and concerned with the quality of life". Masculinity-femininity dimension is not related to national wealth since rich and poor countries seem to divide arbitrarily to the groups of masculine and feminine countries. Neither is there a relation with the two dimensions of masculinity-femininity and individualism-collectivism [Hofstede, 2005]. In regard to Masculinity Index, Finland (MAI 26, 47th) is among one of the feminine ones while India scales in the mid-range with MAI 56 (20/21st) [Hofstede, 2005].

Masculinity-femininity degree of a culture shows up in the organizational culture by imposing implicit rules of how people on different levels of hierarchy are supposed to deal with each other. For example, a manager from a masculine culture may need to maintain an image of 'all-knowingness', decisiveness and giving instructions, but not engaging in a dialogue with a subordinate. This may result in problems and blocks for the information flows

in cross-border strategic alliances in which managers of masculine culture may be set up for an employee from a feminine culture and vice versa.

6.3.4. Time-orientation

The fourth dimension of Geert Hofstede [2005] is labelled as *long-term versus short-term orientation*. According to the author, *long-term orientation* shows up in traits such as perseverance and thrift that align the person for future rewards. Similarly, in *short-term orientation* the virtues related to the past and present, such as respect for tradition and preservation of "face" are important. The highest rankings in Long-Term Orientation Index are occupied by East-Asian countries: China, Hong Kong, Taiwan and Japan.

Differences in time-orientation may influence knowledge transfer in cross-border strategic alliances since the organization of long-term time orientation may expect building strong relational capital and trust before it opens its knowledge taps. This can be interpreted as withholding the knowledge assets by the organization with the short-term time orientation.

6.3.5. Avoidance of uncertainty

Hofstede [2005] defines the fifth dimension of his famous IBM study, *uncertainty avoidance,* as "... the extent to which a member of a culture feels threatened by ambiguous or unknown situation". The roots of the term trace back to the work of American sociologist James G. March and his colleagues who observed uncertainty avoidance in American organizations. Hofstede [2005] discovered the dimension as a by-product while working with the questions related to stress in work that were supposed to map a completely other dimension, power distance. The basis for the discovery of the new dimensions was that he found out that some nationalities scored consistently less stressed-out regardless of the occupational status when compared to other countries.

Figure 31 shows Uncertainty Avoidance Index -values mapped against the individualism-collectivism –dimension. Finland groups together with German-speaking countries (German, Switzerland, Austrian) while seemingly being more strongly an uncertainty avoiding country than its Scandinavian neighbours, Sweden and Norway, for example. In strongly uncertainty avoiding, individualist countries rules are explicitly declared and stressed while in strongly uncertainty avoiding, collectivist countries, rules are implicit and rooted in tradition [Hofstede, 2005].

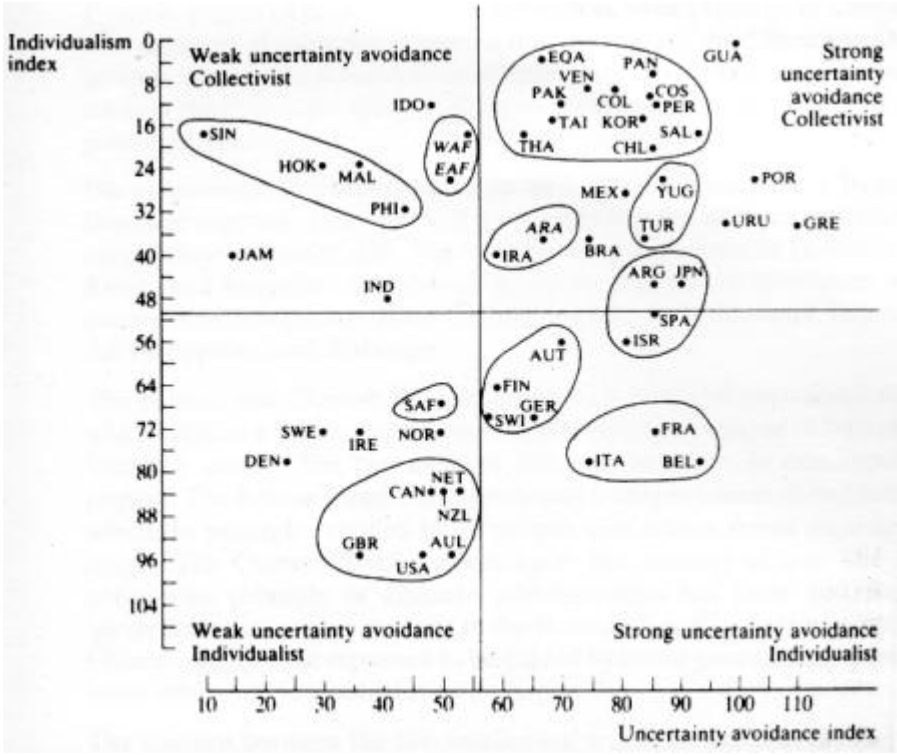

Figure 31. Uncertainty avoidance related to individualism-collectivism.

In regard to UAI values Finland is positioned in the middle in regard to uncertainty avoidance and marginally below the middle in regard to individualism-collectivism.

Hofstede [2005] generalizes that weak uncertainty avoidance cultures are good at basic innovations, but lack in developing these into new products or services. Implementation of new products is very much a detail-oriented process in which strong uncertainty avoiding countries seem to perform better. Thus it could be thought that synergy could be achieved in collaboration of companies from innovating and implementing cultures. In this regard, the Finnish-Asian collaboration of this thesis context does not particularly stand out as particularly synergetic since Asian countries (India, China) and Nordic countries can all be found in the lower part of the table. The influence of uncertainty avoidance on the knowledge transfer between the alliance partners is supposedly subtle.

6.4. Synthesis: culture-based knowledge transfer challenge

In addition to Hofstede's [2005] individualism-collectivism dimension, Bhagat et al. [2002] distinguish between *horizontalness* and *verticalness* of a culture. The difference between *verticals* and *horizontals* is: the former pay attention to differing status and consider it appropriate to stand out of the mass; *horizontals* perceive the status differences between people to be very minor and do not

strive for striking out of the crowd [Bhagat *et al.*, 2002]. In the following synthesis, the horizontal vs. vertical distinction is included as one of the significant contributors of culture-based challenges to the knowledge transfer.

Figure 32 depicts the proposed culture-based knowledge transfer challenge of strategic alliances. The perspective of the figure is *horizontal-individualistic* culture (HI). The side face depicts national culture and the upper face organizational culture.

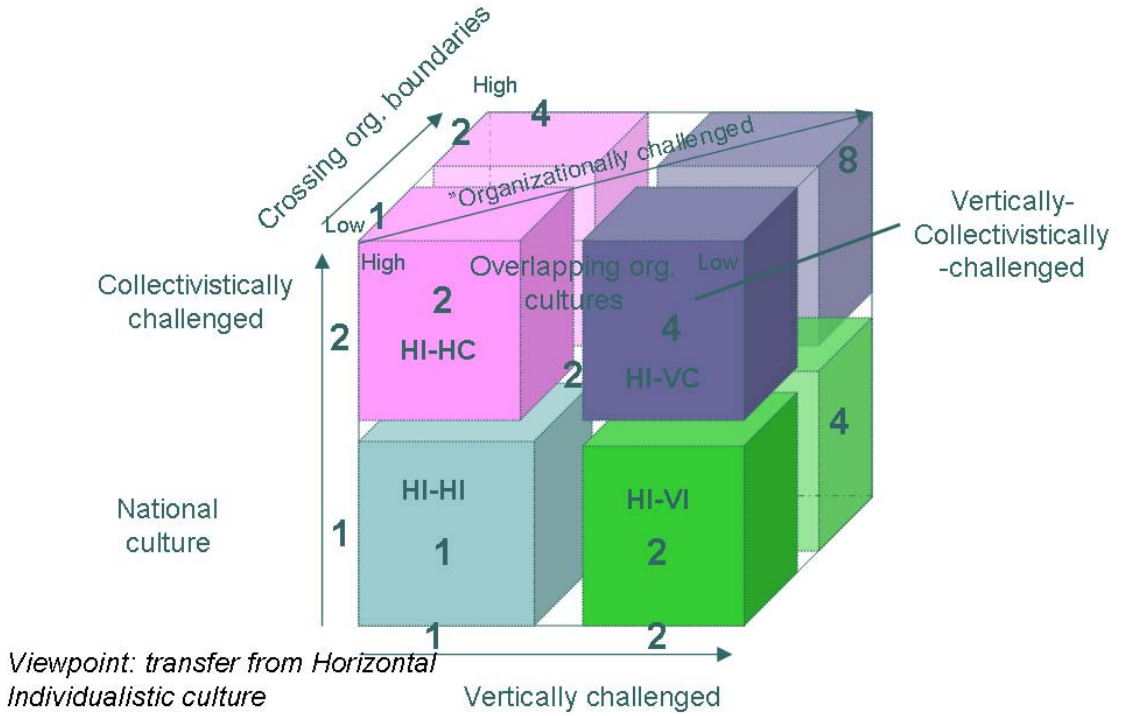

Figure 32. Culture based knowledge transfer challenge.

6.4.1. Side face (X- and Y-Axis): national culture

The X- and Y-axis of the side face depicts the challenge derived from the *national culture*. Abbreviations used in the figure are HI: Horizontal-individualistic, HC: horizontal-collectivistic, VC: vertical-collectivistic and VI: vertical-individualistic. There are four possible scenarios presented in the following:

1. Case HI-HI: The knowledge exchange participants (sender and receiver) are both from the same or similar cultures, for example domestic strategic alliances of Finnish companies or a Finnish-Swedish alliance
2. Case HI-VI or 'vertically challenged': a Finnish company allies with an American company

3. Case HI-HC or 'collectivistically challenged': a Finnish company allies with a Japanese company (Japan according to Hofstede [2005] is a horizontal culture unlike China and India)
4. Case HI-VC or 'collectivistically, vertically challenged': a Finnish company allies with a Chinese or Indian company

I have selected as the Y-axis collectivism-individualism instead of power distance, because these two seem to partly correlate with each other. As Hofstede [2005] states: "large-power distance countries are also likely to be more collectivist, and small-power-distance countries to be more individualist".

6.4.2. Upper-face (X- and Y-Axis): organizational culture

The upper face presents the cultural challenge tracing back to *organizational culture*. The X-axis of the upper face "*overlapping organizational cultures*" (OOC) refers to the extent that the organizational entity of examination (MNC, joint venture, etc) has to deal with two identifiable organizational cultures that are distinct from each other. The Y-axis of the upper face "*crossing organizational boundaries*" (COB) refers to the degree of interaction between the organizations involved in the business arrangement, ranging from a need to act seemingly as one organization in contrast to keeping the organizational activities distinctly separate. It should be noted that circles in the upper-face "MNC", "Joint R&D", etc., do not map to the dimensions of the national culture.

I distinguish between the following cases:

1. Case X-OOC(-), Y-COB(-), e.g. MNC with "mono-culture": The boundaries of a multinational company may span over several countries and cultures, however, the corporate culture may have common denominators imposed from top to bottom in different geographic regions. By default, it could be thought that the corporate culture of a MNC is one and same within the company although this may be not very common in practice.
2. Case X-OOC(+), Y-COB(-): organizational cultures are different from each other; the need to interact with each other is low, e.g. technology for cash -arrangements.
3. Case X-OOC(-), Y-COB(+): organizations need to interact highly with each other while there is no major difference in organizational cultures of the partners

4. Case X-OOC(+), Y-COB(+): organizational cultures are very different from each other while the organizations need to interact highly, for example cross-industry R&D alliances

6.5. Summary

Cultural factors play an important role in strategic alliances that cross not only national borders, but also East-West axis. For example, countries such as Finland and India (or China), are perceived as relevantly distant culturally from each other as perceived through the different cultural dimensions.

Along with many challenges of cross-border knowledge transfer and sharing, business partners committed to a long-term relationship may develop unique and novel ways of interorganizational knowledge creation. Partners from different cultures can learn from each other new approaches and viewpoints to problem solving [Möller and Svahn, 2003]. Partners from different geographical regions may hold unique complementary competences or market expertise and bringing these together can result in innovative new products and services. The evaluation of strategic alliance partners must include the identification of cultural challenges rising from different cultural contexts (Figure 32), and these challenges have to be weighed against the potential gains from the alliance.

7. Integrative framework

This chapter aims at integrating the threads of epistemology (Chapter Four), ontology (Chapter Five) and culture (Chapter Six) into the Skein of Alliance Learning. The very same chapters contribute the three dimensions of the Knowledge Challenge Cubicle (Figure 34). The Challenge and Support cubicles are inputs for the Knowledge Transfer Outcome (Figure 36). Further, the latter contributes to the Y-axis of the actual 4-Tier Tube –model of the next sub-chapter 7.2. Other significant contributors to the 4-Tier Tube –model are March [1991] and Larsson et al. [1998]. The previous chains of influences and contributions are summarized in Figure 33.

The 4-Tier Tube -model of knowledge transfer and alliance learning in software R&D context is abstracted carefully based on the theoretical review of this thesis and the consequent conceptual development of this chapter.

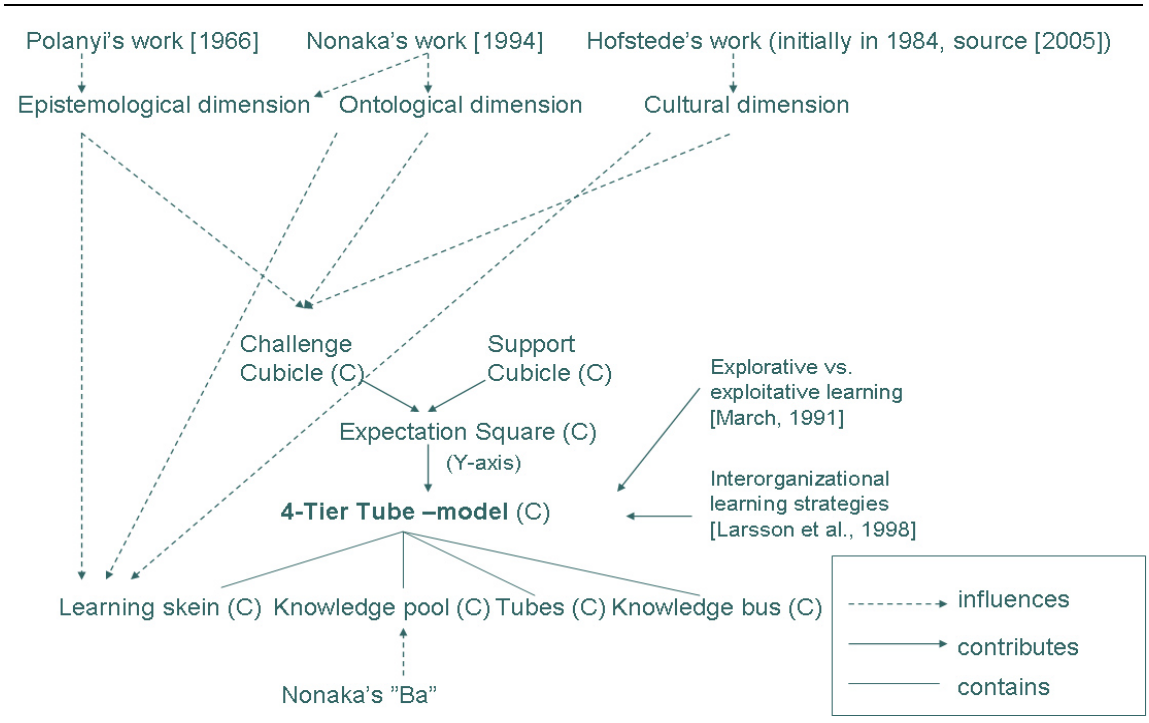

Figure 33. The heritage and contribution (C's in figure) of the thesis.

7.1. Cubicles for Knowledge Transfer

Next I will analyze the knowledge transfer *challenge* and *support* through the use of cubicles as cognitive tools (Figure 34 and Figure 35).

7.1.1. Knowledge Transfer Challenge Cubicle

Knowledge Transfer Challenge Diagonal (Figure 34) connects the opposite corners of the cubicle. It depicts the whole spectrum of knowledge transfer challenge, from the lowest degree to the highest degree.

In Figure 34 I introduce two constructs *"individualism-collectivism –conflict"* and *"horizontalness-verticalness –conflict"* that together predict "rough" *cultural compatibility* (the diagonal of the 'ceiling') in knowledge transfer context.

By *"horizontalness-verticalness –conflict"* (shortly, *HV-conflict*) I refer to all those challenges in interorganizational exchange of knowledge that trace back to horizontal-vertical cultural orientations, i.e. the other partner representing a horizontal culture, while the other one a vertical culture. The degree of HV-conflict bases on index values of Hofstede [2005].

By the term *"individualism-collectivism –conflict"* I refer to all those challenges in interorganizational knowledge transfer that trace back to different cultural orientations on the axis of individualism-collectivism.

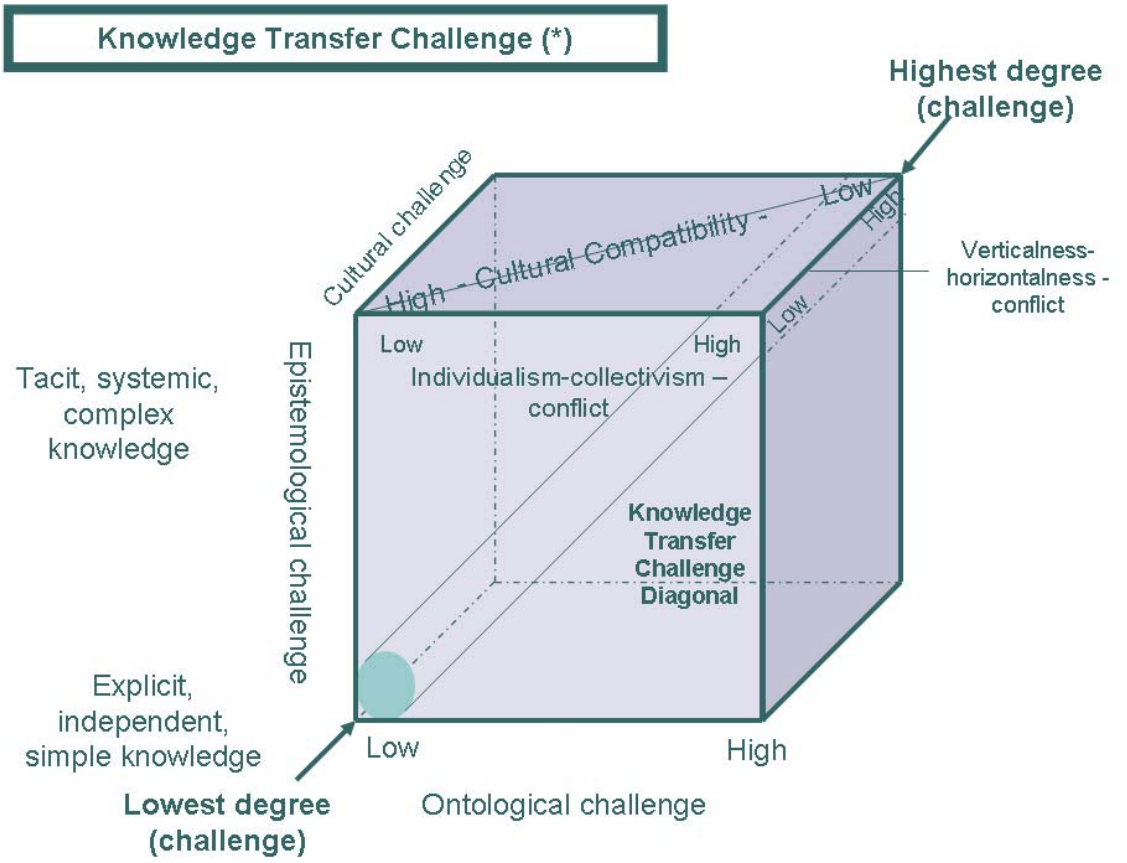

Figure 34. Knowledge Transfer Challenge Cubicle.

The major contributors to the epistemological dimension were Polanyi [1966], Zander and Kogut [1995], Nonaka [1994] and Tsoukas [2001]. The

ontological dimension was based on the works by Nonaka and Takeuchi [1995], Cohen and Levinthal [1990], Dyer and Singh [1999] and Larsson [1998] among others. Finally, the cultural dimension followed in the footsteps of Hofstede [2005], Schein [1992] and Bhagat et al. [2002].

7.1.2. Knowledge Transfer Support Cubicle

In the cubicle of Knowledge Transfer Support (Figure 35) I have identified (1) evolutionary factors, (2) relational factors and (3) supporting systems.

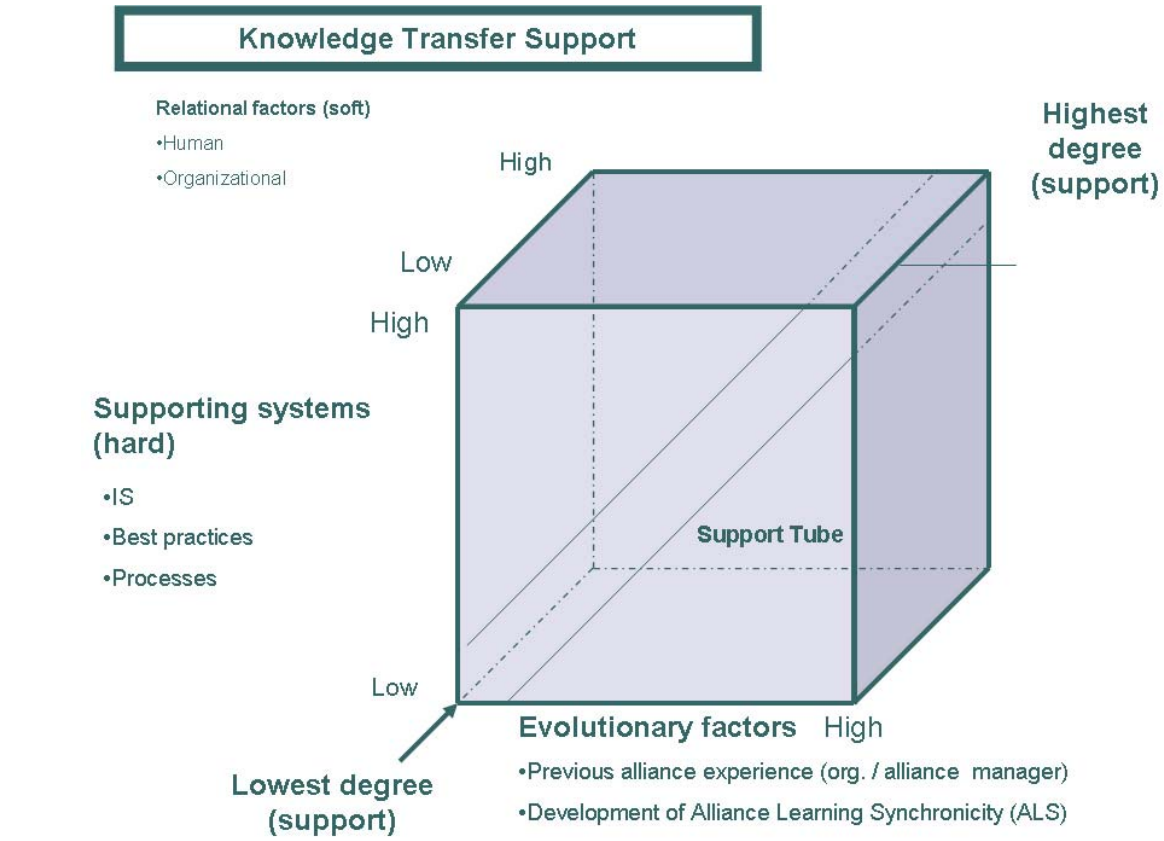

Figure 35. Knowledge Transfer Support Cubicle.

E*volutionary factors* evolve over time, namely *alliance experience* of an organization as whole and specifically, of alliance managers.

I propose that Alliance Learning Synchronicity (ALS) consists of the three factors: relative absorptive-transparency capacity [Lane and Lubatkin, 1998], partner learning strategy match [Larsson, 1998] and *knowledge transfer balance* (presented later in detail).

The development of ALS occurs when partners adjust to each other's communication and learning styles, and develop 'transparency-absorptive capacity' –synchronization over time. In regard to transparency, Hamel's [1991] research was referred to earlier. Cohen and Levinthal [1990] were the

introducers of 'absorptive capacity'. Lane's and Lubatkin's [1998] relative absorptive capacity resembles 'Alliance Learning Synchronicity' -concept, but has the learning firm as the focal point.

By relational factors I refer to issues concerned with the alliance relationship, such as trust in individual and organizational level. Development of personal ties is emphasized especially in collectivistic cultures [Hofstede, 2005; Bhagat *et al.,* 2002].

Supporting systems refer to (1) information systems in use for facilitating the partner interaction, (2) best practices adopted by the partner companies and (3) cross-border software development process maturity.

I further label relational factors as '*soft*' and supporting systems as '*hard*'. The common denominator for 'hard' supporting systems is explicit codification: crystallization of domain knowledge into software, documenting best practices or process flows. Having been designed and implemented, 'hard' support factors are relatively static ("hardwired") compared to 'soft' support factors that cause dynamic fluctuation in an alliance relationship.

7.1.3. Knowledge Transfer Outcome

As a product of the previous 3D-models, it is possible to estimate the knowledge transfer outcome expectation at any given time during an alliance life-cycle and hypothesize a cumulative knowledge transfer outcome (Figure 36).

A case study could be conducted by selecting case companies in regard to different expectations of realized cumulative knowledge transfer outcome. The highest knowledge transfer outcome expectation is when knowledge transfer challenge is moderate or low and supporting mechanisms exist for facilitating information flows and knowledge exchange.

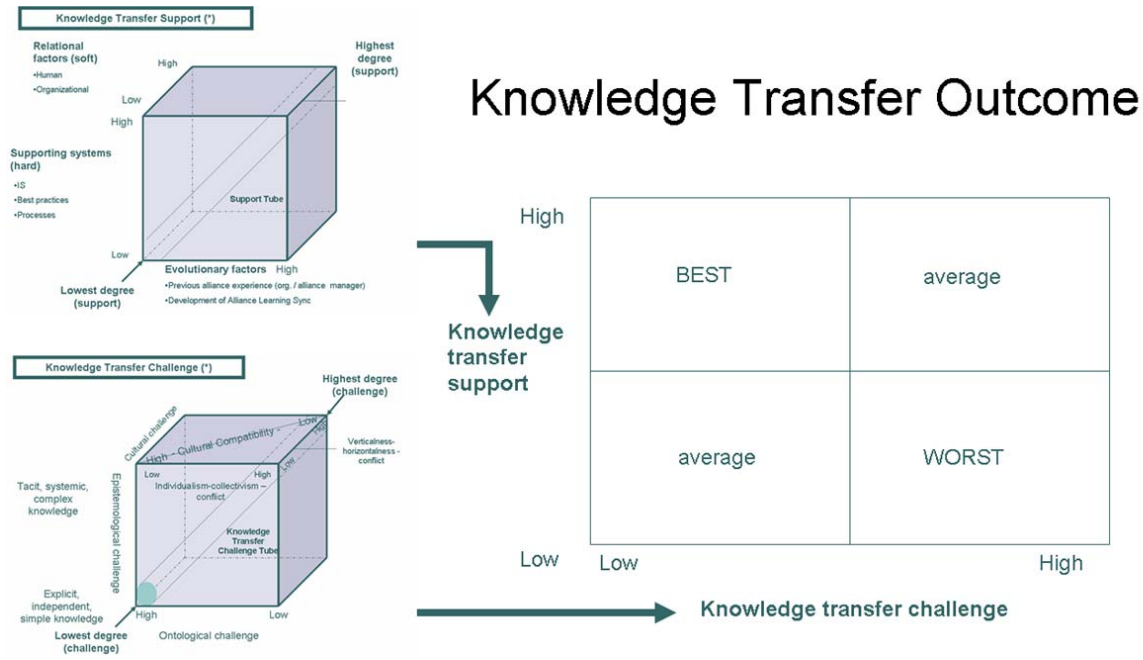

Figure 36. Knowledge Transfer Outcome.

7.2. 4-Tier Tube –model for Knowledge Transfer and Alliance Learning

Based on the previously presented three dimensions of interorganizational learning, a model for knowledge transfer in cross-border R&D alliances of software companies will be introduced: 4-Tier Tube –model (simplified in Figure 37, full in Figure 38). The 4-Tier Tube –model in its essence is designed to be a *tool for strategic thinking*. On a higher level, the model helps to perceive the connection between knowledge transfer and attainment of strategic objectives.

The 4-Tier Tube consists of four nested tubes: Innovation Tube, Strategic Alliance –tube (SA-tube), Information System –tube (IS-tube) and Strategic management –tube (SM-tube). The SA-tube folds the Innovation Tube and firms F-1 and F-2. The *skein* of alliance learning around *Knowledge Bus* twines further inside the Innovation Tube.

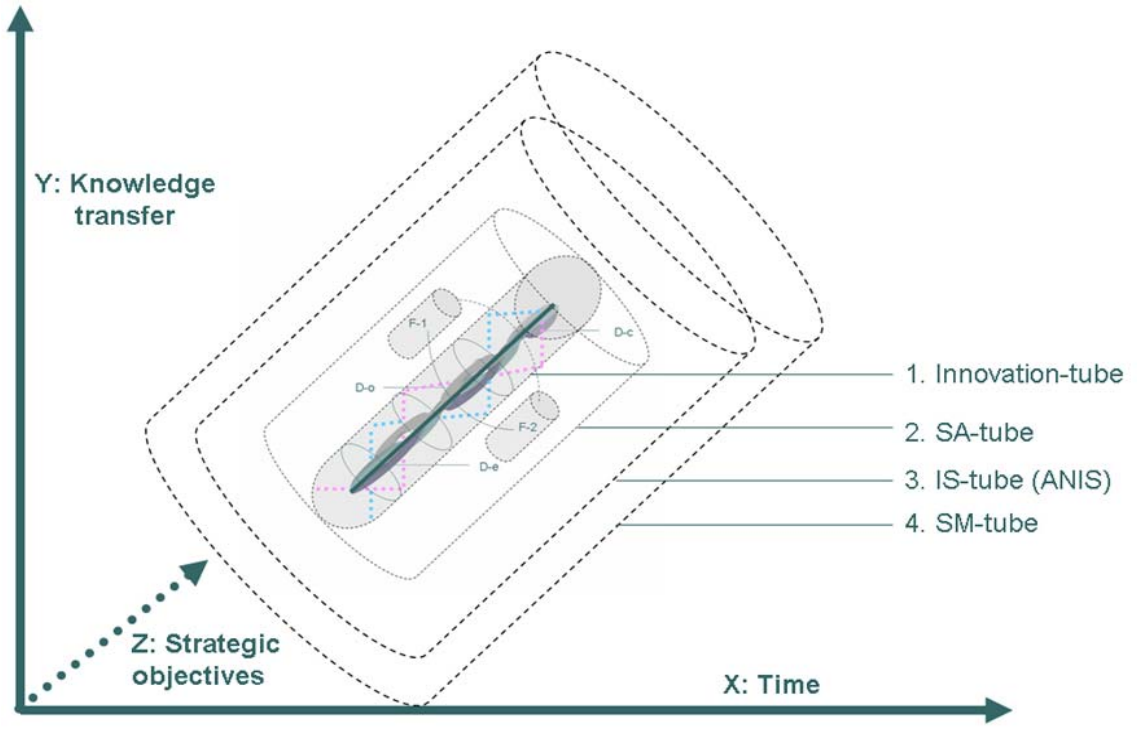

Figure 37. The 4-Tier Tube in three dimensions.

The X-axis stands for *time,* Y-axis for dynamic *knowledge transfer* (influenced by the Challenge and Support factors of Figure 36)) and Z-axis for attainment of *strategic objectives*. Strategic objectives belong to the categories of alliance pay-off potential presented earlier (Figure 14): business potential, innovation potential and competence development potential.

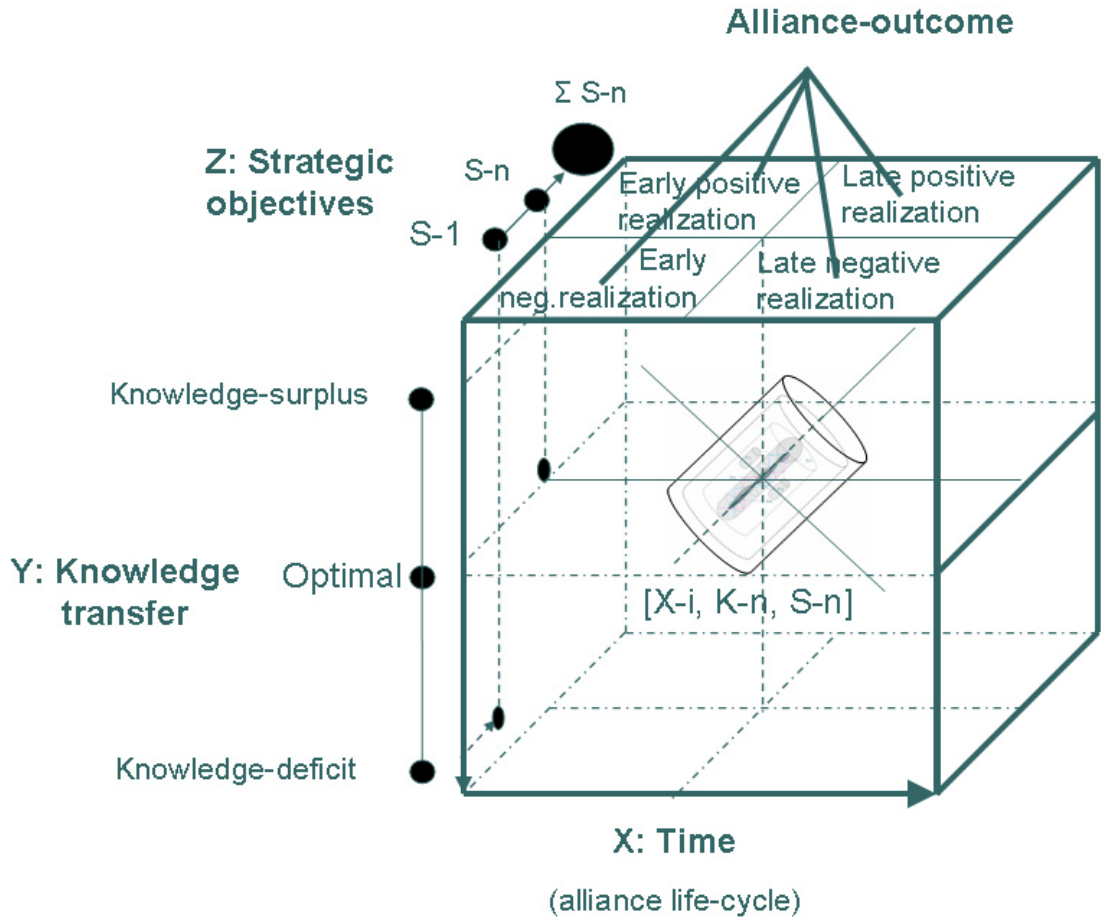

Figure 38. The 4-Tier Tube -model.

7.2.1. Dynamics of the 4-Tier Tube -model

The 4-Tier Tube can be thought of as a shuttle that is steered towards strategic objectives (S-1 … S-n) on the level of the SA-tube (decision making layer), but the direction of which is influenced by several layers of the 4-Tier Tube, most importantly by the knowledge fed to the Knowledge Bus (described in detail in the respective sub-chapter) in the core of the learning skein.

In Figure 38, the 4-Tier Tube is depicted in a 45 degrees angle that corresponds to middle point on Y-axis, i.e. optimal rate of knowledge feed relative to the objectives. Greater than 45 degrees (up to 90 degrees; perpendicular) direction of 4-Tier Tube implies *knowledge-surplus*, i.e. partners share knowledge more than what can be utilized in the alliance or knowledge sharing occurs before necessary maturity level of an alliance. This knowledge can be such that sharing of it is not related to the strategic objectives of an alliance, but furthermore, the exposure of this knowledge can be seen as losing valuable assets which the partner outside the alliance relationship may take advantage of.

Less than 45 degrees direction of the Tube implies *knowledge-deficiency*, i.e. knowledge is not fed by the partners appropriately to correspond to the needs of the phase and its strategic objectives. The lack of trust is a common reason for guarding the knowledge assets from the partner. As the knowledge transfer rate varies, the 4-Tier Tube moves back and forth on Y-dimension while simultaneously adjusting its own angle. *Optimal knowledge transfer* is defined as when the following conditions are present:

- Proper timing for sharing certain knowledge assets: not too early, neither too late
- Right allocation of resources for knowledge transfer: avoiding 'wastefulness' of resources or lack of resources
- Appropriate (knowledge) targets and involved persons for knowledge transfer

During the alliance life cycle, the 4-Tier Tube traverses from the origin towards the right periphery on X-dimension and towards the back wall of the cubicle on Z-dimension as the alliance objectives are met one by one. Besides the tube having a certain angle at any given time X-i, it has a certain position [X-i, K-n, S-n] determined by the very central point of the Tube.

In the upper face are depicted the four possible outcomes of the 4-Tier Tube model (the product of two dimensions: time and the reach of strategic objectives):

1. Early positive realization (+)
2. Early negative realization (-)
3. Late positive realization (+)
4. Late negative realization (-)

Figure 39 is the cross-section of the 4-Tier Tube. The details of the diagram will be clarified gradually as the discourse proceeds (e.g. Figure 40 and Figure 41 depict the content of the innermost tube which is not very clear in this picture).

For now it is enough to perceive the overall structure of the model along with its different *tubes* and corresponding *modes.* The direction of a Tube implies the assigned value of the mode of the respective layer. At any given time, all the modes are in use (in contrast to being exclusive to each other): they indicate the current, prevailing mode for each tube.

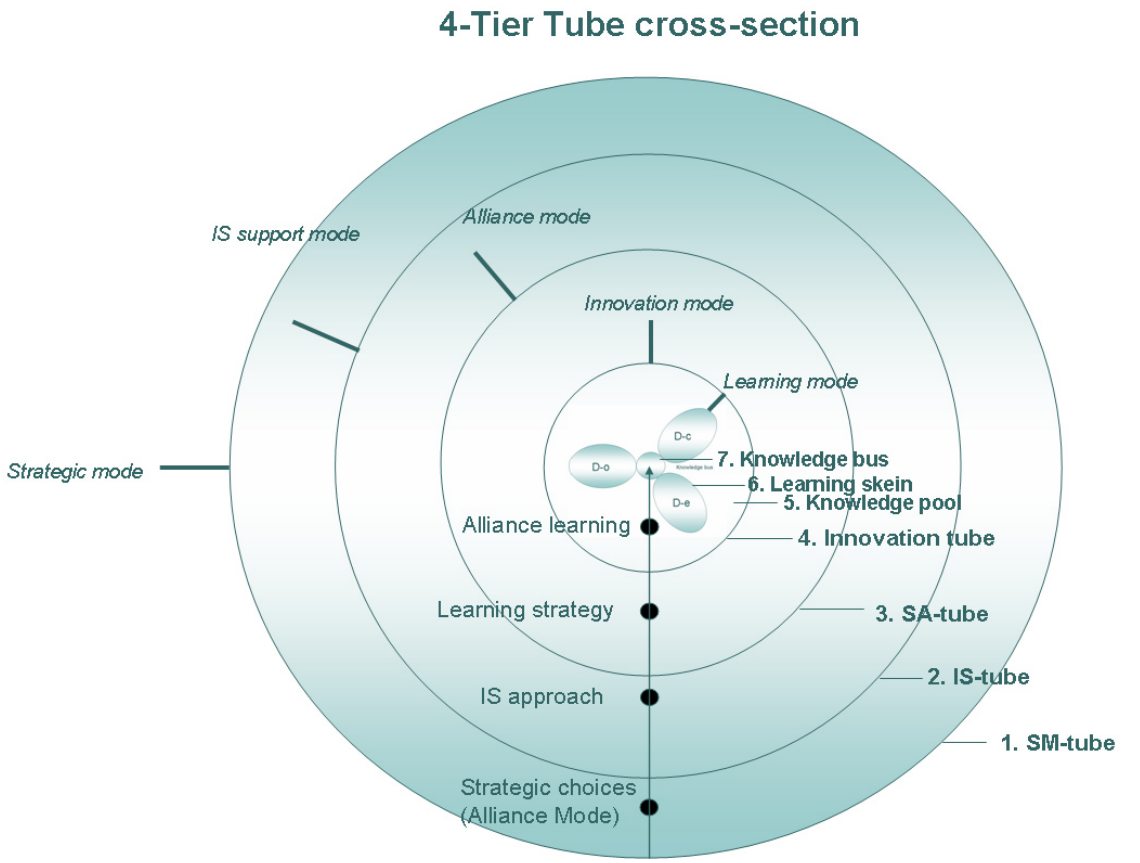

Figure 39. 4-Tier Tube cross-section.

The layer of Strategic Management Tube (SM-tube) is a pre-alliance level in a sense that only on this level the decision of whether to engage in an alliance or some other organizational arrangement is made. The strategic objectives that can be achieved through strategic partnering could potentially be reached through an acquisition, organic growth or an outsourcing arrangement. In 4-Tier Tube, the SM-tube is locked by default in the alliance mode.

The layer of Information System Tube is concerned with different IS related decisions of a strategic alliance, such as how IT / IS can support four important aspects of an alliance in a balanced manner: knowledge transfer, alliance learning, innovation and alliance decisions (corresponding to the four Tubes folded by the IS-tube).

The layer of Strategic Alliance Tube (SA-tube) is concerned with different decisions on strategic alliance level, for example, strategic learning positions (Figure 45 later).

The layer of Innovation Tube is concerned with decisions having impact on the innovative capabilities of a strategic alliance, such as alliance learning (Figure 43) that is a prerequisite for joint-innovation.

The order of the SA –tube and IS –tube could be thought as being reverse to what I have depicted in the 4-Tier Tube –model. However, later on I have visualized how information system is a cohesive belt that supports the strategic alliance on different levels. As IS-tube folds the SA-tube and the rest of the tubes, this highlights the crucial importance of an appropriate information system that answers the needs of all the inner layers of the model.

Modal and positional coding

To understand the next few subchapters, it is important to acknowledge how the 4-Tier Tube –model is interpreted. In the 4-Tier Tube –model there are two possible alternatives for codifying information:

1. Modal coding
2. Positional coding

The direction of a tube (or learning skein) implies the mode: for example, the direction of the learning skein inside the Innovation Tube implies the current learning mode of a particular alliance (*modal coding)*. The modes of the 4-Tier Tube –model are depicted in Figure 39: (1) learning mode, (2) innovation mode, (3) alliance mode, (4) IS support mode and (5) strategic mode. Each of the modes is assigned a value at any given time. Possible values for the modes are called 'flags' and are presented later.

Secondly, the position of an entity inside the tube may codify information: for example, the positions of entities, firms F-1 and F-2, inside a tube depict the chosen strategy in relation to the other. The entity can also be the strategic alliance as whole or an inner tube. These all are examples of *positional coding*. Modal and positional coding are presented both in Figure 53 of Appendix I.

The 4-Tier Tube –model is evolving dynamically: at any given time the status of the 4-Tier Tube can be determined by checking the flags of the modes and the entity positions (the combinatory product of these is the number of all the possible states of the model).

In the following, the 4-Tier Tube –model is described starting from the very core and gradually progressing towards outer layers. I call this approach *systemic layering*. Each of the nested tubes represents a unique domain of interest that is described in the following sections.

7.2.2. Innovation Tube

The strategic management chapter of this thesis sheds light on the motivation of strategic alliance use. Figure 40 depicts how a business driver (1A) brings together the complementary competences (2A) and pooled resources (2B) of the

partners for the purpose of innovating jointly. Alternatively, there can be an idea of a software product for which there is no any identifiable business driver: it emerges just out of the blue and may even radically change a business logic of an industry.

When the partners have agreed with the software product idea and elaborated it further together, they shift into the contracting stage. If the two organizations decide to proceed further, the actual alliance learning stage begins. Overly simplifying, Innovation Tube can be thought as a black box that converts the inputs of knowledge, complementary competences and pooled resources into outputs of software products.

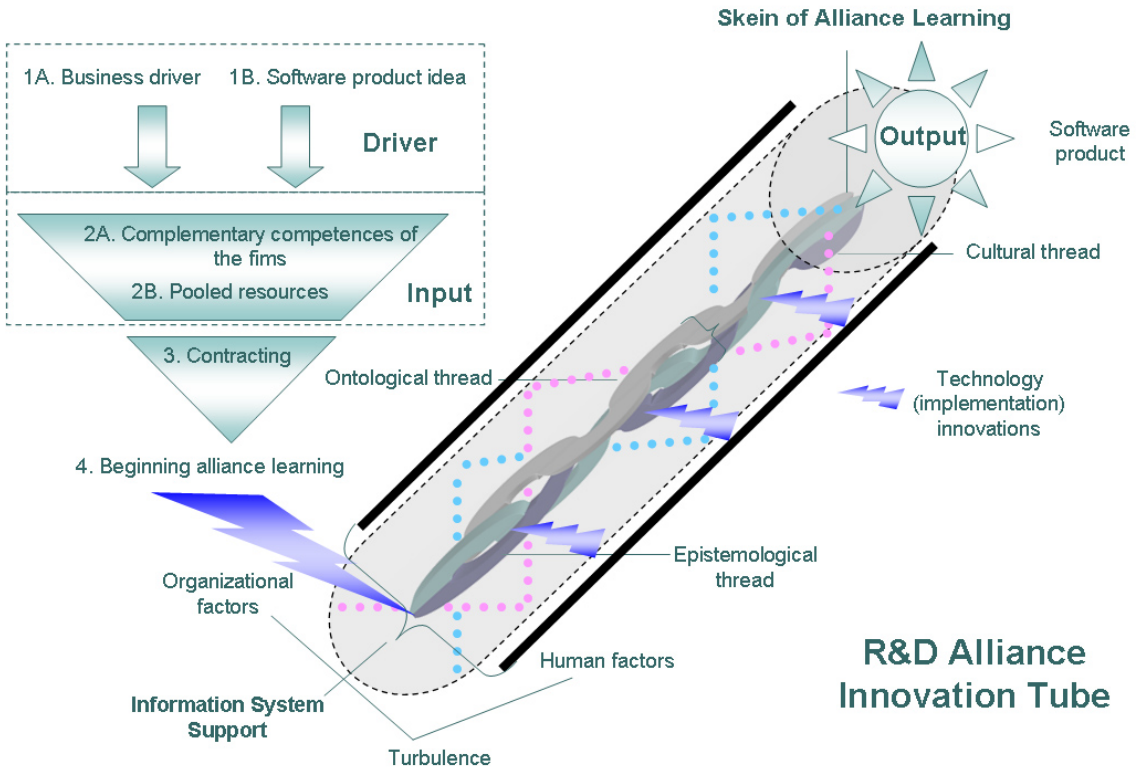

Figure 40. Innovation Tube and the Skein of Alliance Learning (across cultures).

If we go beyond the 'black box' metaphor and shift to the core of the Innovation Tube – we perceive the intertwining skein consisting of epistemology, ontology and culture threads. The cultural thread of the skein is relatively static in the alliance relationship: The cultural dyad is determined when alliance partners have engaged in the alliance. Evidently, the national cultures of the partners will remain same all through the relationship. However, a special negotiated culture, alliance culture, may be developed through long-term interaction of partners [Spekman *et al.*, 2000]. As alliance

learning skein twines further, one of the threads may be in turns more in the 'surface' than others, i.e. the knowledge transfer challenge of the particular phase manifests more through one dimension than others[16].

Similarly, the general quality and properties of knowledge transferred in the alliance is determined to a high extent according to strategic collaboration area. For example, in technology R&D alliances it is more likely that the knowledge transferred is technological, not marketing knowledge. The model does not imply that technological alliances are restricted to transferring only technological knowledge, but by definition that is the most common form of knowledge exchanged.

The inner core – the Skein of Alliance Learning - evolves on limited range as depicted in the picture and as shown in examples. The interorganizational knowledge transfer and learning is supported by the inter-organizational information systems in use.

Turbulence factors

Turbulence factors within the Innovation Tube include human and organizational factors, and communication gaps resulting from cultural differences and differing cognitive styles.

Interorganizational trust is needed for supporting knowledge transfer and protecting the alliance from a wide variety of turbulence factors that in the most severe cases threaten the stability of the partnership. Two dimensions can be distinguished in regard to trust: *structural* or 'calculative' and *behavioural* 'pure' trust. The former is based on rational motivation such as potential gains and reputation effects, the latter on optimistic expectations of partner behaviour. Calculative trust is often in a greater role in strategic alliances [Larsson *et al.*, 1998].

Larsson et al. [1998] define interorganizational trust as "...the mutual confidence among the members of two or more organizations in the forbearance of opportunistic exploitation of one organization by another based on both calculation and good intentions".

Long-term time orientation of the alliance has a positive influence to the development of interorganizational trust along with prior related interaction. Prior experience with the same partner can pave the way for communicating tacit knowledge more clearly, since partners are familiar with each other and their respective communication styles. Long-term orientation coupled with

[16] However, the order of the three threads in the Figure 40 (from left to right: epistemology, ontology, culture) is arbitrary.

interorganizational trust and collective awareness are effective safeguards in conjunction with collaborative learning strategies [Larsson *et al.,* 1998].

Strategic alliances are paradoxical in a sense that all through its life cycle there exists a tension between learning from the other partner and protecting the firm's own core assets or capabilities. Kale et al. [2000] investigate this dilemma on the backdrop of relational capital and its role in strategic alliances. Kale et al. [2000] consider mutual trust, respect and friendship at the individual level to be included in the concept of relational capital. The authors [2000] also argue that relational capital significantly impacts the firm's ability to balance between learning and protecting (so called "dual objectives").

Finally, knowledge transfer between organizations traces back to individuals; cognitive styles of whom are in critical mediating role in the interorganizational learning process. In the model of Bhagat et al. [2002] (Figure 32) three elements of cognitive styles contribute to knowledge transfer outcome: tolerance for ambiguity, signature skills and holistic vs. analytical thinking. Individuals characterized by high tolerance for ambiguity deal more effectively with knowledge that is tacit, complex and systemic. Bhagat et al. [2002] propose that horizontal individualists belong to this group.

Knowledge Bus and Knowledge Pool

The dimensions of alliance learning are referred to here in short by D-e (epistemological dimension), D-o (ontological dimension) and D-c (cultural dimension). In the core of the learning skein, I have depicted *Knowledge Bus* (Figure 41) which is shown in detail in Figure 42.

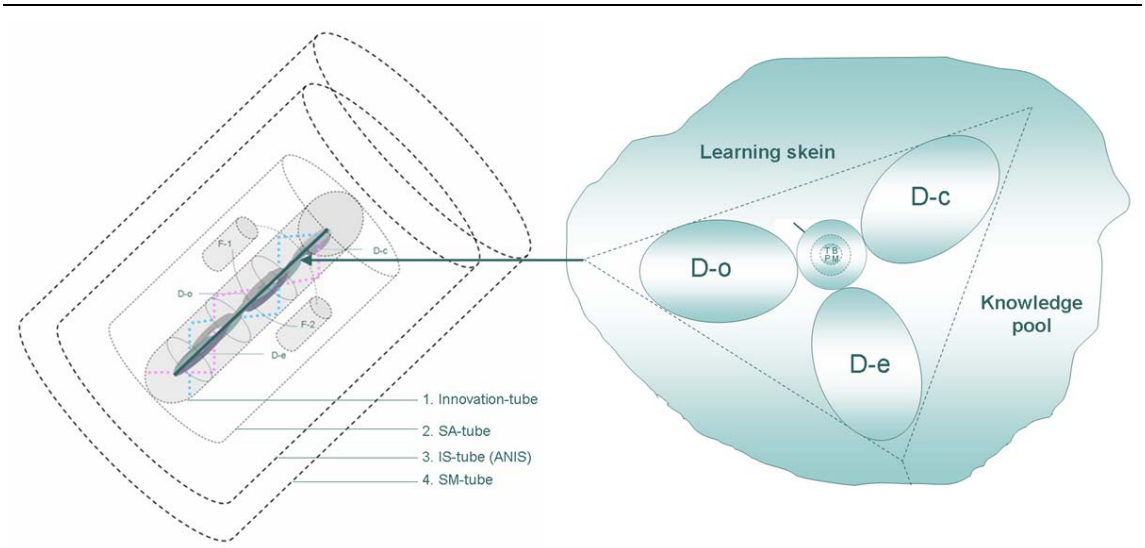

Figure 41. A zoom to the cross-section of the learning skein.

The learning skein is situated within the *Knowledge Pool* which is the venue for developing and nurturing deep expertise in the area of R&D collaboration. Here we come close or even converge with the concept of 'Ba' from Nonaka et al. [2001] that was reviewed earlier.

Knowledge transferred to the Knowledge Bus is the 'fuel' of alliance learning. As long as the alliance partners transfer knowledge to the Knowledge Bus, the learning skein keeps twining further approaching the learning objectives. Figure 42 zooms into Knowledge Bus to provide a view to the very innermost core of the 4-Tier Tube model.

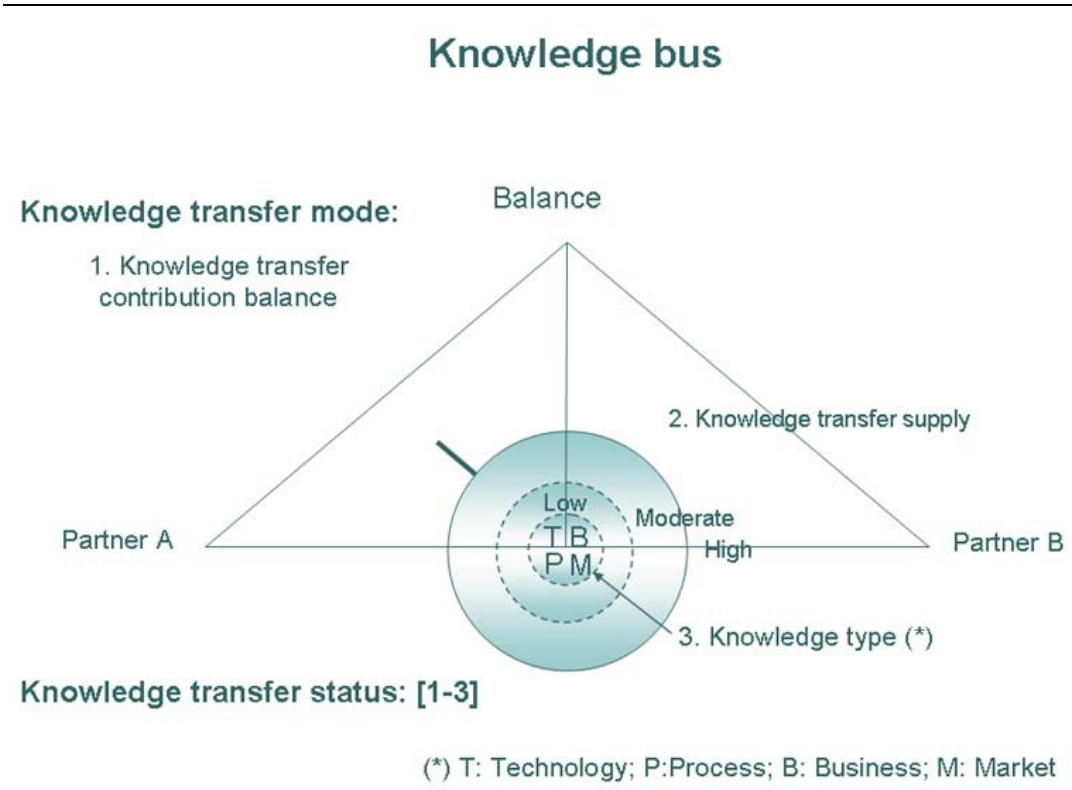

Figure 42. Knowledge Bus.

Knowledge transfer mode is assigned to *knowledge transfer balance* which implies at any given time, the possible asymmetry in regard to knowledge transfer, i.e. the other partner contributing more than the other. The value assigned to the knowledge transfer mode is thus one of the three: *Partner A-dominant, Partner B-dominant* or b*alance*. *Knowledge transfer supply* implies how much knowledge is contributed to the Knowledge Bus at any given time and can be categorized into *high, moderate* and *low* as visualized as the sizes of the circles in Figure 42. The content of the Knowledge Bus at any given time consists of one or more *knowledge types:* technology, process, business, and

market knowledge. The knowledge 'portfolio' depends on the alliance type and its objectives, alliance phase and project phase.

Knowledge transfer status of a particular alliance is determined based on the three variables introduced above: knowledge transfer mode [balance, Partner A-dominant, Partner B-dominant], knowledge transfer supply [high, moderate, low] and knowledge type [technology, process, business, market].

Alliance Learning Mode

Figure 43 depicts the Alliance learning mode as a product of the two: Alliance Learning Synchronicity [Low, High] described earlier and learning phase (explorative vs. exploitative phase). The alliance learning mode (depicted by the direction of the learning skein) at any given time points to one of the four quadrants (modal coding of the 4 Tier Tube –model).

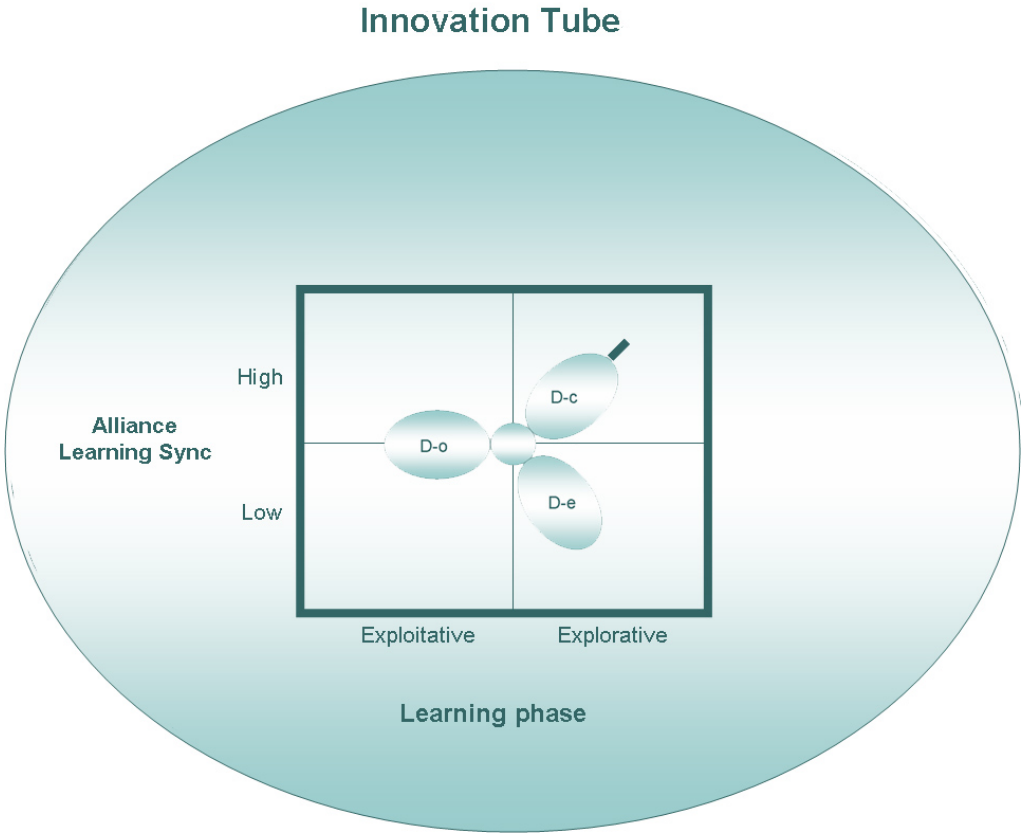

Figure 43. Alliance Learning Mode.

March [1991] lists activities commonly associated with the explorative phase of learning: "search, variation, risk taking, experimentation, play, flexibility, discovery, innovation". Similarly, the exploitative phase of learning is characterized by "refinement, choice, production, efficiency, selection, implementation, execution" [March, 1991]. Further, March [1991] states that

maintaining the balance between exploration and exploitation is critical for the survival and prosperity of a system. In strategic alliance context, explorative and exploitative learning occurs on different levels that may overlap with each other: in individual's cognition, team or project level and alliance level. In an organization, regardless of the important function that both, exploration and exploitation phase individually have, they nevertheless need to compete for the same scarce resources [March, 1991].

March [1991] points to the vulnerability of exploration by stating that the returns are less certain, more remote in time and more distant from the locus of action in an organization. Presumably, explorative activities, such as search for new ideas, markets or relations, has uncertain outcomes, but on the other hand may lead to occasional breakthroughs that result in significant economic gains.
In a strategic alliance, either of the alliance partners may be less risk-taking, and thus avoiding engaging excessively in the explorative mode. If the willingness to take risks, to explore a wide variety of options, differs greatly between the alliance partners, it may result in dysfunctional alliance learning.

The Innovation Tube is depicted in the following picture in the context of Strategic Alliance –tube (SA-tube, Figure 44[17]). The alliance partners are represented as F-1 and F-2.

[17] The Z-axis is not visible in this picture for the sake of clarity.

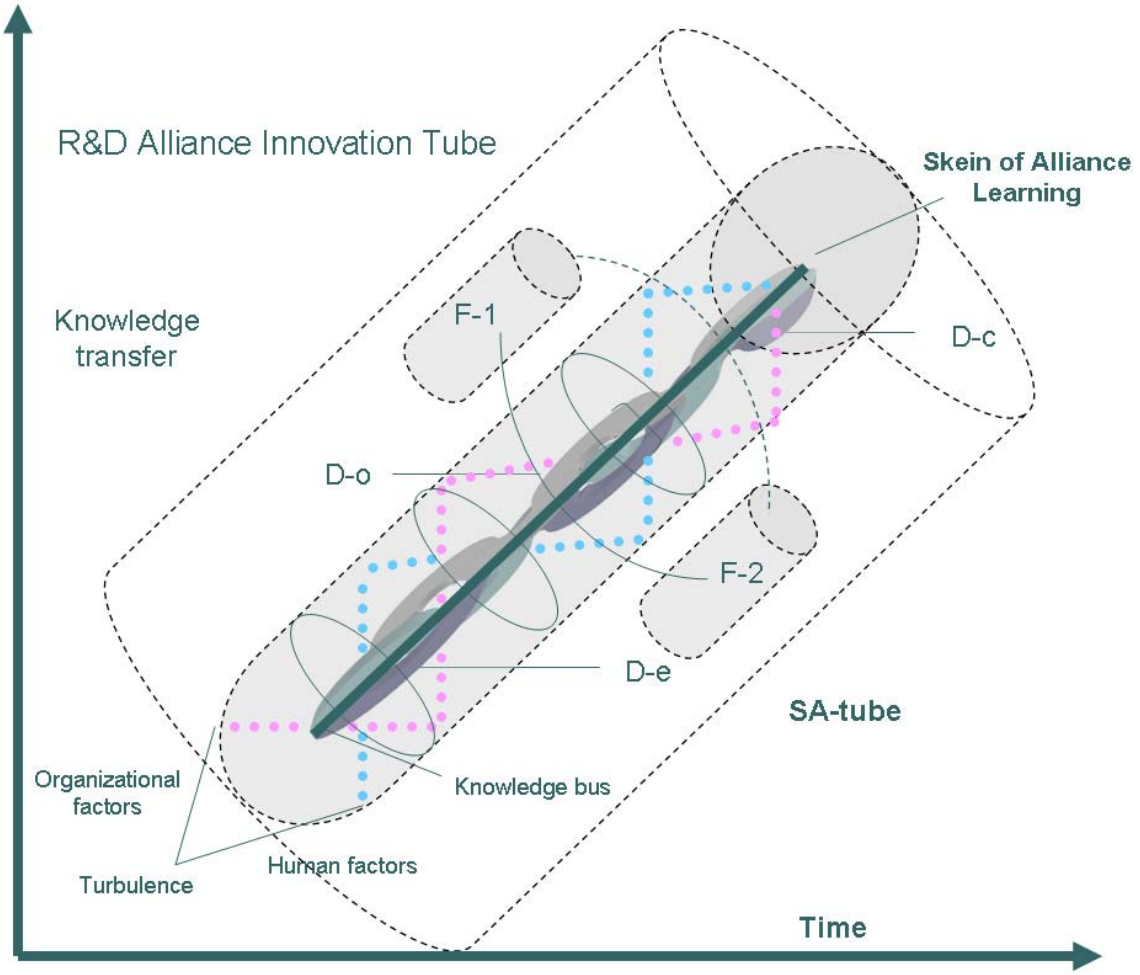

Figure 44. Strategic alliance -tube containing Innovation Tube.

7.2.3. Strategic Alliance –tube

Figure 45 expresses *positional coding* of the 4-Tier Tube –model. The figure is a cross-section of Figure 44: the alliance partners F-1 and F-2 around the Innovation Tube in Figure 44 can position themselves in five different strategic positions (P-1 to P-5 in Figure 45) of alliance learning. The positions were presented earlier in this thesis referring to Larsson [1998]: (1) collaboration, (2) competing, (3) compromising, (4) accommodating and (5) avoiding.

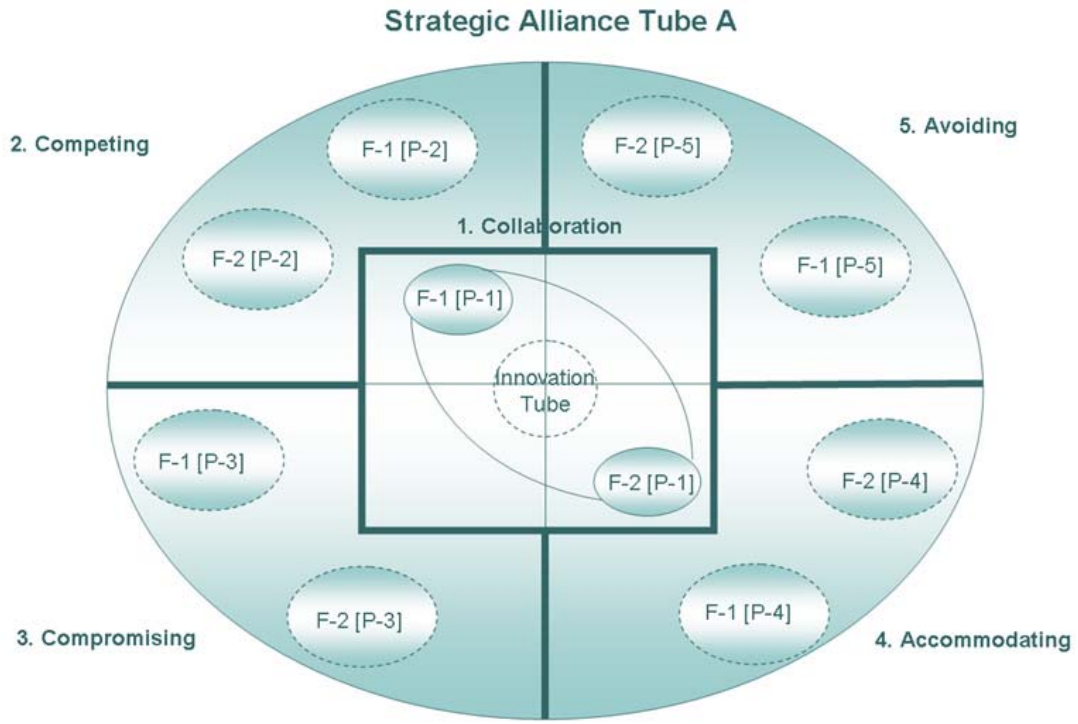

Figure 45. Alliance Learning - strategic positions.

The mutual collaboration strategy – both alliance partners positioned in the collaborative 'square' of Figure 45 – is ideal for nurturing innovation. However, metaphorically thinking, the turbulence factors within Innovation Tube (as depicted earlier in Figure 40) if being strong enough may pierce the wall of the Innovation Tube and enter the realm of Strategic Alliance –tube. When turbulence factors are manifested on this level, they cause the SA-tube to whirl around and the consequent centrifugal force causes the partners F-1 and F-2 to shift farther off from the axis of rotation (out of the collaboration square). After this shake down, the partners settle and lock-in in one of the four other strategic positions of alliance learning.

Innovation Mode

Figure 46 depicts the same SA-tube as in Figure 45, but has other content now, and to avoid confusion is presented as a separate diagram. It visualizes the 'Innovation mode' (*modal coding)* that is a product of two dimensions: radical vs. incremental innovation and technological innovation vs. non-technological innovation (business models, process improvements, etc). The default flag for the R&D alliances innovation mode is the lower left-hand corner of *incremental technological* innovation. Occasional shifts to the other quadrants occur in the emergence of radical innovation or non-technological innovations, the latter being often incidental by-products of R&D alliances.

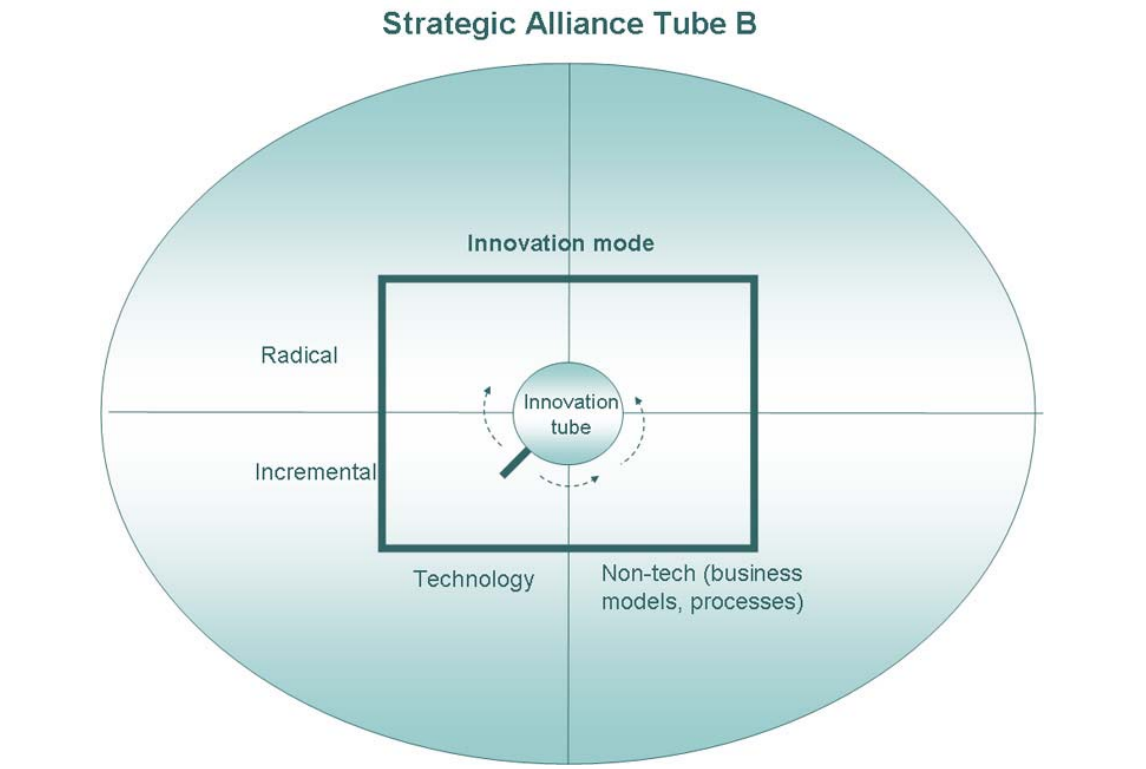

Figure 46. Innovation mode.

7.2.4. Information System –tube

Information System –tube (Figure 47) folds the parts of the 4-Tier Model presented earlier: (1) SA-tube, (2) Innovation-tube, (3) Skein of Alliance Learning and (4) the Knowledge Bus. Each of the former raises one point of observation to the system requirements. The four together constitute the cardinal points of IS-tube from which the proposed alliance supporting system (ANIS, Appendix II) is evaluated.

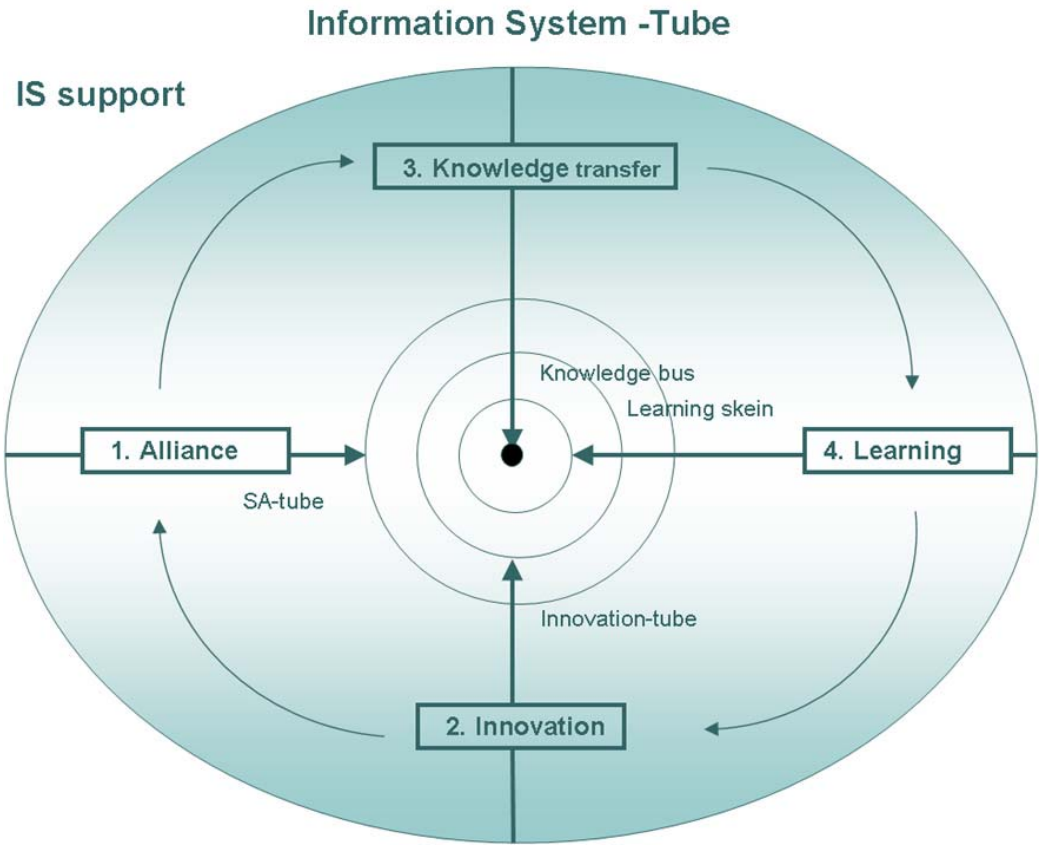

Figure 47. Information System support.

The cardinal point of 'knowledge transfer' (the relation of IS-tube to the Knowledge Bus): the system should provide features that support the flow of information and knowledge transfer between the alliance partners.

The cardinal point of 'learning' (the relation of IS-tube to the learning skein): the IS should provide features that support teams and individuals of partner companies to learn jointly.

The cardinal point of 'innovation' (the relation of IS-tube to the Innovation Tube): the system should provide a platform for brainstorming, elaborating and implementing innovations.

The cardinal point of 'alliance': the system should support decision making in the alliance level.

The round arrows in Figure 47 depict the relation of different cardinal points to each other: knowledge transfer is the prerequisite for alliance learning, as the latter is for the innovation. All these three can be supported by right decisions on the alliance level (in this respect there could be two-way arrows between 'alliance' and the rest of the tree). Prospering in innovation fulfills the objectives of the alliance level (assuming that the alliance has been formed as a platform of innovation) and thus completes the cycle.

The four different cardinal points should be taken into account equally when designing an interorganizational information system. I designate this view as a *balanced* design approach.

System level concepts

The purpose next is to introduce the important underlying system level concepts relevant to the IS -tube. From system point of view, two different cases of interrelationships can be distinguished: *interfacing* and *integration* [Waring and Wainwright, 2000]. *Interfacing* is described as interaction and communication between two elements or subsystems - whereas *integrating* refers to a process, where various traits, attitudes and behaviors are organized into one entity. In general, integration is needed when heterogeneous information system environment has become a burden for an organization and standardization is desirable for the improved efficiency [Waring and Wainwright, 2000].

Information system interfacing on an abstract level can be divided further to *semantic* and *syntactic* interoperability [Park and Ram, 2004].

Semantic interoperability is defined as "knowledge-level interoperability that provides cooperating businesses with the ability to bridge semantic conflicts arising from differences in implicit meanings, perspectives, and assumptions". Idealistically the information environment should be semantically compatible resulting from commonly agreed rules and concepts by different business units [Park and Ram, 2004].

Syntactic interoperability is an application-level interoperability that allows different software components to interact with each other, even though their implementation is different [Park and Ram, 2004]. Hasselbring [2000] states that that syntactical level is addressed by middleware, while Enterprise application integration (EAI) addresses the semantic level also.

7.2.5. Strategic Management -tube

In the following Figure 48, the previous Strategic Management -tube is viewed from the top. This cross-section visualizes four different strategic options:

1. Strategic partnering
2. "Non-partnering": organic growth and mergers and acquisitions
3. Non-strategic partnering (e.g. non-strategic outsourcing).

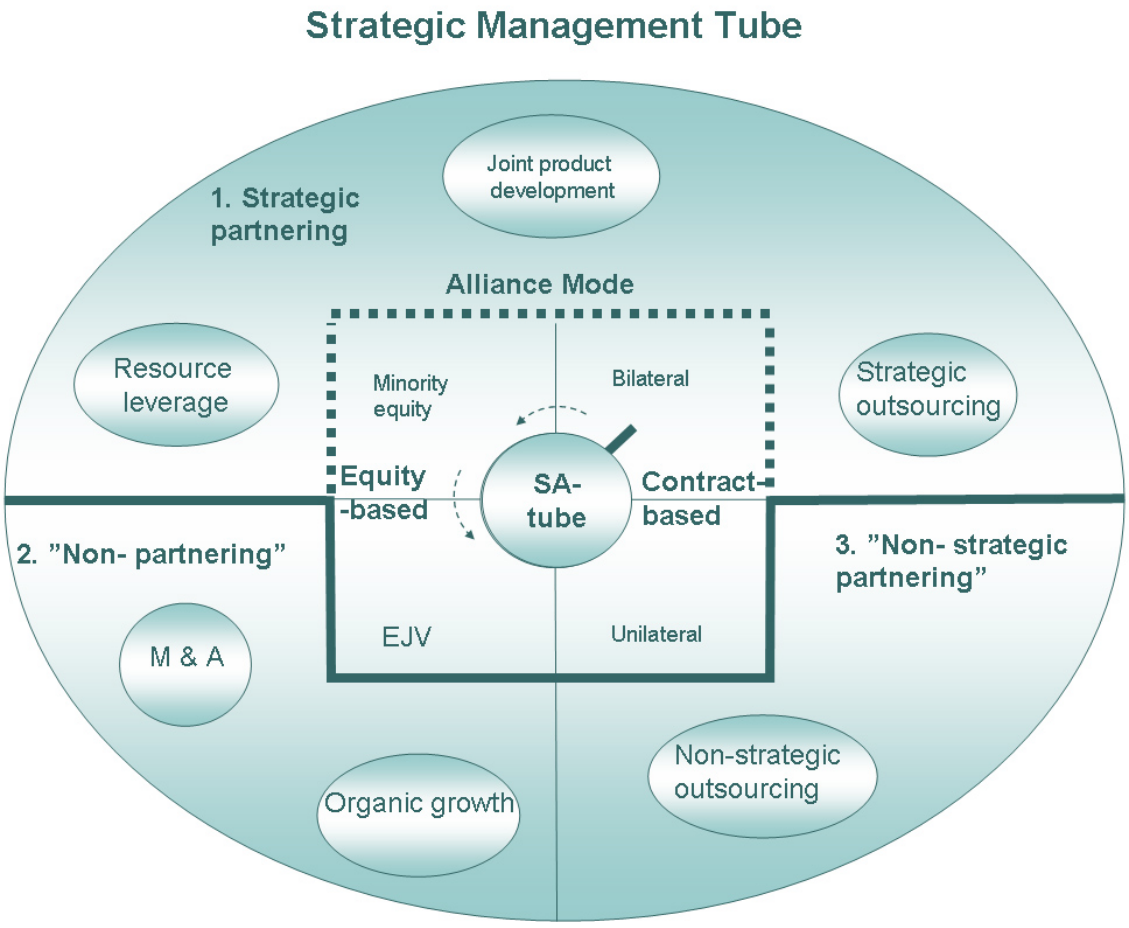

Figure 48. Cross-section of SM-tube.

In the centre of this Strategic Management –tube is the *Alliance Mode* (R&D). The picture visualizes how there is four different positions within the Alliance Mode for SA-tube to lock in (refer to Alliance Typology –section): two of them are *equity-based*, namely minority equity alliance and equity joint venture. The other two are *contract-based*: bilateral and unilateral alliances. As visualized in the picture, it could be hypothesized that there is tendency to shift from contract–based to equity-based alliances, and further to equity joint ventures (EJVs), but further study would be needed to support this claim.

Two uppermost quadrants of the Alliance Mode, *minority equity alliances* and *bilateral* alliances lean *towards* 'strategic partnering' while *equity joint ventures* and *unilateral alliances* lean *away* from the 'strategic partnering'. This is because EJVs as established organizational entities can be considered as single organizations (or partnerships) depending from the viewpoint. Unilateral alliances are asymmetrical relationships and thus have characteristics of (strategic) outsourcing relationships.

Table 4 summarizes the 4-Tier Tube –model: the four tubes (SM-, IS-, SA- and Innovation Tube) and the three other parts or layers (column 1): Knowledge Pool, Alliance Learning Skein and Knowledge Bus.

Each of the layers corresponds to a unique domain of interest (column 2): strategic management, IS management, alliance competence, innovation management, knowledge management, ontological dimension (organizational learning), culture and epistemology. Columns 3 and 4 describe the use of modal and positional coding. The column 5 declares the succeeding element inside the focal element. The column 6 declares the mode of the particular tube or layer while column 7 lists the possible flags of a particular mode. The last, 8th column, describes any other information contained in the 4-Tier Tube -model in regard to the particular tube or layer.

Table 4. 4-Tier Tube Model -summary.

Layer association → / Layer ↓	Problem domain	Modal coding	Positional coding	Content	Mode	Flags	Other
SM-tube	Strategic management	N/A	Strategic choices	IS-tube	Strategic mode	Strategic partnering, "Non-partnering", Non-strategic partnering	N/A
IS-tube	IS management	IS-support balance	N/A	SA-tube	IS-mode	N/A	N/A
SA-tube	Alliance competence	Equity/contract -based	Alliance Learning Strategy (5 positions)	Innovation -tube, Firms F-1, F-2	Alliance mode	Minority equity, equity joint venture, bilateral, unilateral	N/A
Innovation-tube	Innovation management	Technology/non-tech, radical / incremental	N/A	Learning skein, turbulence factors	Innovation mode	High, low (Alliance Learning Sync), Exploitative, Explorative (Learning phase)	N/A
Knowledge pool	Knowledge management	N/A	N/A	Learning skein, knowledge bus	N/A	N/A	N/A
Learning skein	Ontological dimension & culture	Alliance Learning Sync & Learning phase	N/A	Challenge cubicles	Learning mode	N/A	N/A
Knowledge bus	Epistemology	Knowledge transfer balance	N/A	Knowledge	Balance mode	Partner-A dominant, Partner-B dominant, balance	Knowledge transfer supply, knowledge type

7.2.6. Innovation output

In Figure 49 on the next page, I have depicted Strategic Alliance –tube along with Knowledge transfer challenge cubicles and the realized *knowledge transfer outcome* square with four options:

1. High-support, low-challenge (best)
2. Low-challenge, low-support (average)
3. High-challenge, high-support (average)
4. High-challenge, low-support (worst)

Further, I propose that the *innovative output* of a particular alliance is the product of *knowledge transfer outcome, innovation potential* (Figure 15) and *interorganizational competence* as depicted in the figure. Here, innovative output refers to product, service or process innovations.

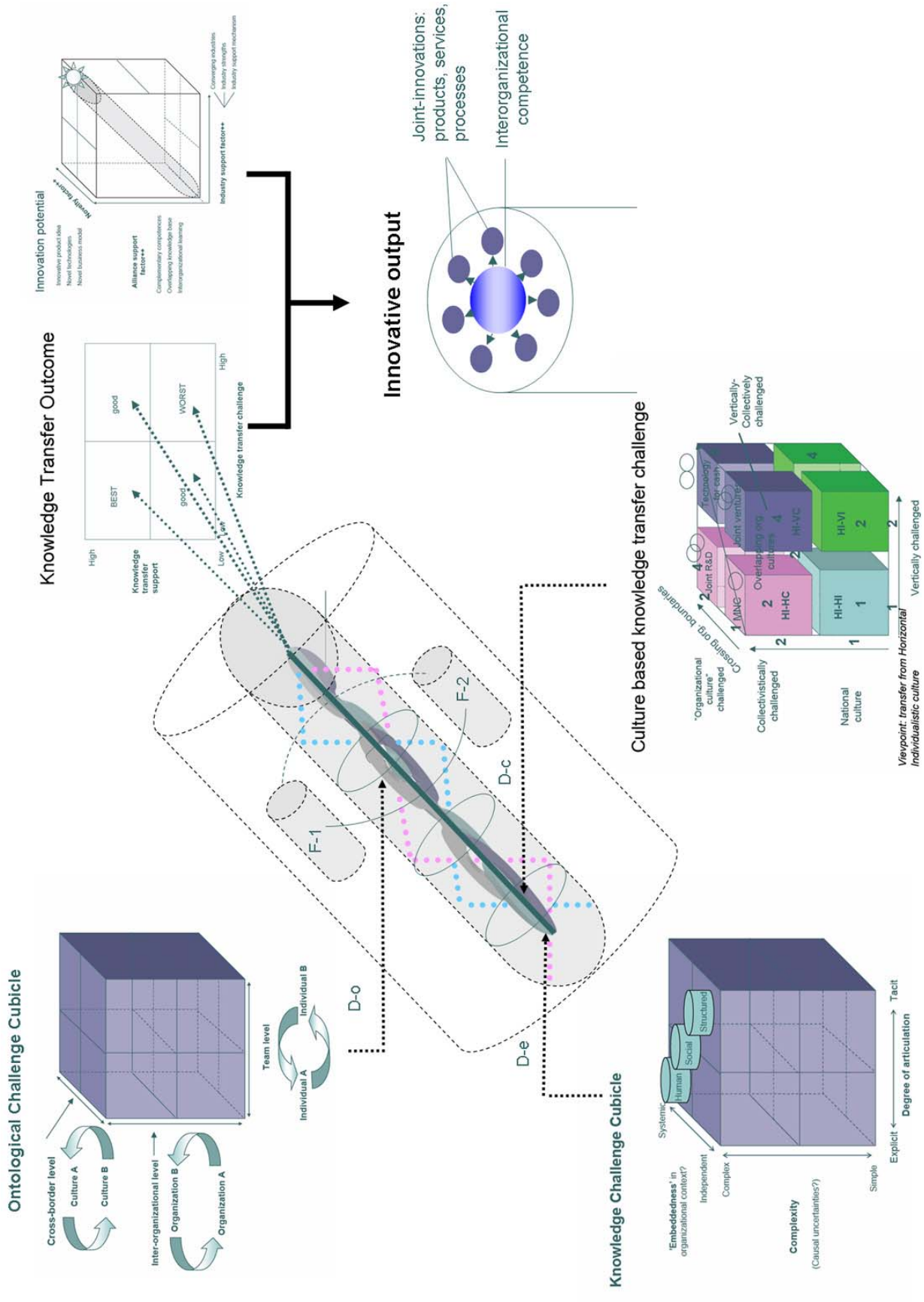

Figure 49. Innovation output.

7.2.7. Propositions and merits of the 4-Tier Tube –model

The 4-Tier Tube –model is a novel and intuitive model for knowledge transfer in cross-border alliance context. The model perceives knowledge transfer in its actual context of alliance learning and innovation, not in isolation as most of the formal models tend to do. Thus we can call it a *holistic model*. The 4-Tier Tube utilizes *systemic layering*: the model is described starting from the inner core and progressing gradually towards the outer layers. The 4-Tier tube is *a dynamic model* since it traverses in the three dimensions adjusting its angle as the knowledge is injected by partners to fuel it. Because the innermost tube, Innovation Tube, has certain inputs and outputs, we can also state that the 4-Tier Tube is an input-output –model.

The 4-Tier Tube -model utilizes its own terminology for describing dynamics of alliance learning (tubes, modes, modal and positional coding, turbulence factors, Knowledge Pool, Knowledge Bus). The model is visually stimulating because it is an analogue to a concrete object. The model facilitates the discussion about dynamics of strategic alliances through providing a rich set of metaphors.

The learning skein in the core of the Innovation Tube is depicted as consisting of the three threads of epistemology, ontology and culture. In fact, these three are the *challenges* of alliance learning, not depicting literally the learning process itself. Do we circumvent here the difficult question of what inter-organizational learning actually is? It is wise to acknowledge that alliance learning cannot be defined only in one way and depending from the viewpoint it can be described as processes, as a game theoretical interaction of partners in a complex system or as in this thesis, as the three intertwining threads.

What can we learn from the 4-Tier Tube –model? The main implications of the model are summarized in the following:

1. Knowledge transfer should be adjusted according to strategic objectives, being neither *knowledge-surplus* nor *knowledge-deficit* in regard to the attainment of the objectives. Exposure of too much of firm's knowledge assets too early or in greater degree that is purposeful for the tasks at hand should be avoided. Knowledge-deficiency can be a result of withholding critical knowledge resources from the partner or learning disability of another party.
2. Knowledge transfer is perceived as *an atomic determinant* of joint-innovation. It is a prerequisite for joint-learning and joint-innovations of alliance partners.

3. For an alliance to sustain in long-term, the *knowledge transfer contribution* must be in balance (both partners contributing equally).
4. Information System –support should take into account the four *cardinal points* equally: (1) knowledge transfer, (2) learning, (3) innovation and (4) alliance.
5. *Alliance Learning Synchronization (ALS)* develops over time in an alliance relationship and is a determinant for achieving the learning objectives of an alliance.
6. *Turbulence factors* in Innovation Tube hinder the joint-learning and –innovation processes, but when amplified and expressed in the realm of the SA-tube, they cause severe instability for a strategic alliance, leading potentially to the dissolution of the alliance.
7. In an ideal situation, both partners adopt a collaborative learning strategy (locating in the '*collaborative square*' of the SA-tube). However, the turbulence factors tend to shake the equilibrium of the *alliance eco-system* resulting the alliance partners to drift to learning positions not optimal for innovation.

8. Conclusion

8.1. Revival of research questions

The research questions set in the very beginning are revived in the following coupled with a short summary of how this research has addressed them.

Research question 1: *What are the challenges in knowledge transfer in (East-west) cross-border strategic alliances of software companies?*

The challenges were in the beginning categorized into epistemological, ontological and cultural. This classification proved to be feasible for the purpose of this thesis.

Epistemological challenges: knowledge is seen as a valuable asset to a company and is shared with the partner only in the presence of appropriate levels of trust, commitment and collaborative learning strategy. Knowledge in a software company can be highly complex and systemic requiring sufficient absorptive capacity from the receiving party and transparency from the side of the possessing party.

Ontological challenges: the partners need to develop interorganizational learning practices. Without shared ontologies, knowledge sharing is not possible. Crossing the borders of entities (individual, team and organization), causes discontinuity of underlying assumptions of knowledge and raises the need to validate the used ontology again.

Cultural challenges: those dimensions of culture that restrict the flow of information and knowledge in an organization are the ones affecting knowledge transfer most (e.g. verticalness of a culture). Similarly as above, culture, as perceived as an ontological entity, demands that representatives of different cultural orientations ensure the use of shared ontology, i.e. all communication should be double-checked so that misunderstandings are avoided.

Research question 2: *What kind of model is best suited to describe the 'knowledge transfer challenge'?*

The Knowledge Transfer Challenge Cubicle was created as the draft model for knowledge transfer challenge for this thesis context. However, it does not take into account the dynamics of an alliance relationship by any means. For this purpose a more sophisticated model, the 4-Tier Tube –model, was created.

The strength of the 4-Tier Tube is that it allows us to perceive knowledge transfer in a *context*. In the model, the role of knowledge is highlighted because the Knowledge Bus, in which knowledge is metaphorically injected, resides in the very core of the model. Shared knowledge is the fuel of the 4-Tier Tube, without which the learning skein stops twining further. The rate of knowledge transfer is examined in relation to the strategic objectives and partly determines the angle of the whole tube.

Research question 3: *What are the strategic choices when entering cross-border strategic alliances (A) and how the 'knowledge transfer challenge' relates to these (B)?*

3A. The strategic choices are determined based on the following questions:

- What degree of interaction of partners is needed to achieve the objectives of an alliance? High vs. low degree.
- Is it justified to look for an overseas alliance partner? Cross-border aspect increases the alliance challenge many-fold.
- What are the targeted pay-offs through strategic partnering? Categorized into innovation, business and competence development.
- What is the desired equity / contractual commitment for an alliance?
- Based on the previous, what is the most suitable alliance type to be adopted into use?

3B. Knowledge transfer challenge obviously increases in cross-border context because of cultural differences and geographical distance. Knowledge transfer expectations are higher in alliances formed for innovation and competence development, compared to business alliances. Knowledge transfer is supported by such equity / contractual commitments that create favorable conditions for trust to develop between the partners.

8.2. Summary

Figure 50 summarizes the main content of this thesis in the form of a logical tree that raises an interesting case study possibility for the future. Numbers 1-4 hail from the chapter dealing with strategic management context, numbers 5-6 from the 'dimensions' -chapters, numbers 8, 9, 10 and 11 from the Integrative Framework –chapter.

Number 1 in Figure 50 (original: Figure 16) concluded the chapter concerned with the strategic management context of this thesis. X- and Y-axis of the cubicle forms two subcubicles of its own (3 and 4, Figure 14).

The a*lliance decision* (whether to engage in particular alliance or not) is supported positively (+ sign) when alliance *pay-off potential* (4) is relatively high compared to *alliance challenge (3).*

Knowledge transfer challenge cubicle (8, Figure 34) contributes the X-axis of the alliance challenge cubicle (3). X-, Y- and Z-axis of the knowledge transfer challenge cubicle is formed by the subcubicles of *knowledge challenge* subcubicle (6), *ontology challenge* subcubicle (7, Figure 27) and *culture-based* knowledge transfer challenge cubicle (5, Figure 32).

In regard to the final knowledge transfer outcome expectation (11, Figure 36), knowledge transfer challenge cubicle contributes negatively (- sign) and knowledge transfer support cubicle positively (+ sign). The whole framework could be tested in a case study research in which alliances with different knowledge transfer expectations would be compared with realized outcome.

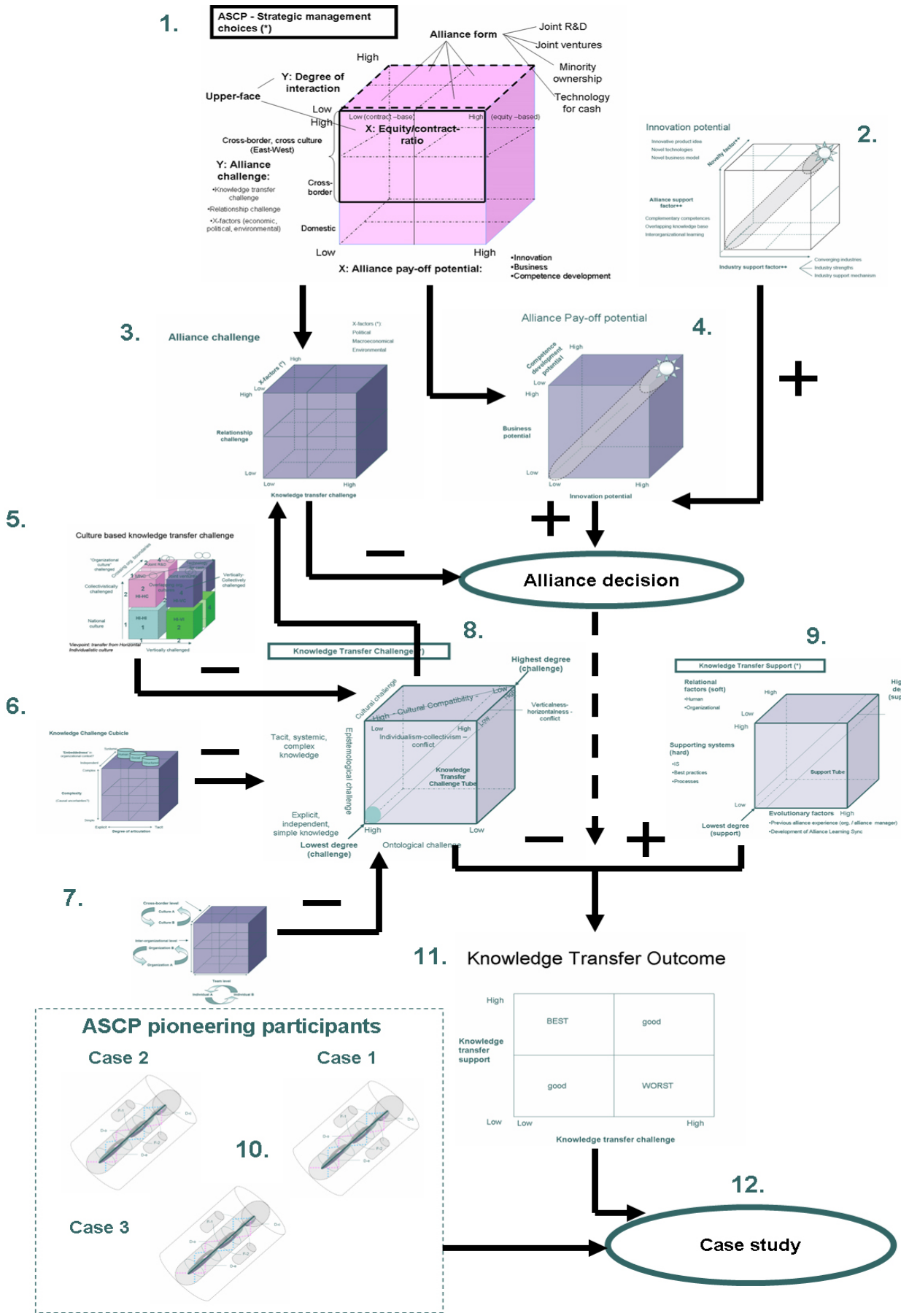

Figure 50. Summary of the thesis - arrival in the starting point for a case study research.

8.3. Thesis contribution and limitations

The main contributions of the thesis are revived shortly here.

In Chapter Three, it was shown how academic research has evolved in the last 15 years reaching a stage of '*Alliance thinking*' in which the streams of strategic management and knowledge management converge into one; and in which strategic alliances are used as 'vehicles of innovation'. A framework was presented for evaluating different aspects of a prospective strategic alliance: in particular the *strategic potential* of a particular alliance, the *innovation potential* and *strategic management choices;* all in the form of 3D-cubicles.

In Chapter Four (Epistemology), I presented a 'working' model for knowledge transfer between individuals. I identified and evaluated different kinds of knowledge in software companies.

In Chapter Five (Ontological dimension), I reviewed Nonaka's work and accommodated it to the strategic alliance context (updated spiral of organizational knowledge creation).

In Chapter Six (Culture), I built a model to depict *culture-based knowledge transfer challenge* along with constructs 'individualism-collectivism –conflict' and 'verticalness-horizontalness –conflict' that together contribute the upper-face diagonal 'cultural compatibility' in Knowledge Transfer Challenge Cubicle.

The most important contribution of the thesis hails from Chapter Seven 'Integrative framework'. I introduced *Knowledge Transfer Challenge* (Figure 34) and *Support* (Figure 35) *Cubicles* that contribute to the theoretical *Knowledge Transfer Outcome* (Figure 36). Finally, I described the *4-Tier Tube* –model (Figure 38 to Figure 48, summary in Table 4) as the model for knowledge transfer and alliance learning.

The thesis provides theoretical framework, but no supporting empirical data. However, conducting a case study in latter stages is a conscious choice that has allowed more in-depth immersion in the literature review and framework development.

The following Table 5 summarizes the contribution of this thesis. Proposed *significance* of the contribution is divided into scientific, academic and practical. *Scientific* implies a real contribution to the scientific research in the domain. *Academic* implies that the contribution is a valid piece of academic thought, possibly an incremental development of existing model, introduction of novel concepts or a fresh perception to an old problem domain. *Practical* implies that the contribution is mostly useful from the perspective of practitioners.

Table 5. Thesis contribution evaluation.

Thesis contribution	Significance	Reasoning
4-Tier Tube - model	Scientific	A novel, complete model for knowledge transfer in cross-border alliance context with its own terminology, dynamics and propositions.
Knowledge Transfer Challenge Cubicle	Academic	Contribution: Knowledge Transfer Challenge Diagonal, Verticalness-horizontalness -conflict, individualism-collectivism -conflict.
Knowledge Transfer Support Cubicle	Academic	Contribution: Alliance Learning Synchronicity (ALS), evolutionary and relational factors.
Innovation Potential Cubicle	Practical	Assists managers to evaluate the innovation potential of a prospective strategic alliance.
Alliance Pay-off Potential vs. Alliance Challenge	Practical	Assists managers to weigh the alliance pay-off potential against the challenging aspects of an alliance.
Strategic Management Choices Cubicle	Practical	A tool for strategic thinking that enables management to weigh different alliance choices and pay-offs to each other.
A 'rough' model for knowledge transfer process of tacit knowledge	Academic	A model depicts the phases of knowledge transfer based on the authentic (Polanyi) understanding of tacit knowledge.
Updated spiral of organizational knowledge creation	Academic	Addition of the 3rd dimension (culture) to the original spiral of Nonaka [1994].
Culture-based challenge	Academic	A proposal for culture-based knowledge transfer challenge.

8.4. Thesis traversal

In the very beginning (Figure 2: *1. philosophy*), I had a genuine question in my mind: what is knowledge all about? Much has been written about the management of knowledge in the 90's, but majority of this research is overly emphasizing the 'knowledge management level' while undervaluing the 'knowledge object level' – distinction of the two different levels by Wiig [1997]. In this thesis I have covered the third level as well – to say – 'knowledge atom' level in the epistemology section. I wholeheartedly believe that understanding of these three levels together provides strong foundations for researchers in a wide variety of fields. After all, regardless of the domain, the properties and characteristics of the core knowledge remain the same: knowledge varies in its degree of articulation, complexity and organizational embeddedness as stated earlier. Also I believe, that understanding of how knowledge really 'flows' is the key in today's world in which researchers, corporations and industries are increasingly cooperating to advance science and technology.

Thesis traverse continued uphill through the 'wilds' of culture and strategy and arriving on the 'top of the hill' (Figure 2): organizational science and information system science. From the high point, it was easy to perceive the need for a supporting IS in the cross-border alliance context. This thesis has come to an end, but it feels like a beginning of a greater journey. The real research is yet to begin.

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Appendix I: Positional and modal coding in the 4-Tier Tube –model

Figure 51 depicts *modal coding* of the 4-Tier Tube –model. The direction of the tube is indicated by the 'barb' pointing to the one of the quadrants, i.e. different sub-modes (1-4), the values of which are called 'flags'. For example, Tube X (corresponding to Mode Y) of Figure 52 has four different flags to point to.

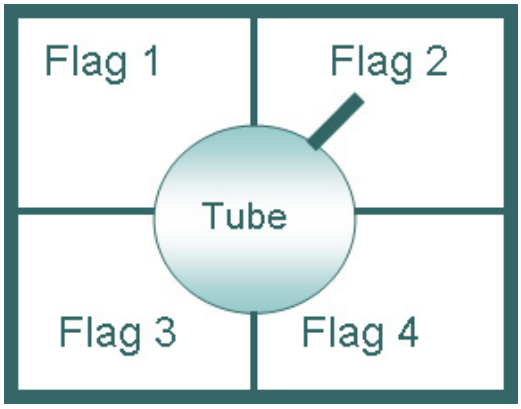

Figure 51. Modal coding.

Figure 52 demonstrates *positional coding* of the 4-Tier Tube –model. The main idea is that there exists entities, such as a strategic alliance (folding the partner firms inside it), individual firms or an inner tube, that can be placed in different positions and the placement of these entities in relation to each other or to an inner or outer element codifies information in the model.

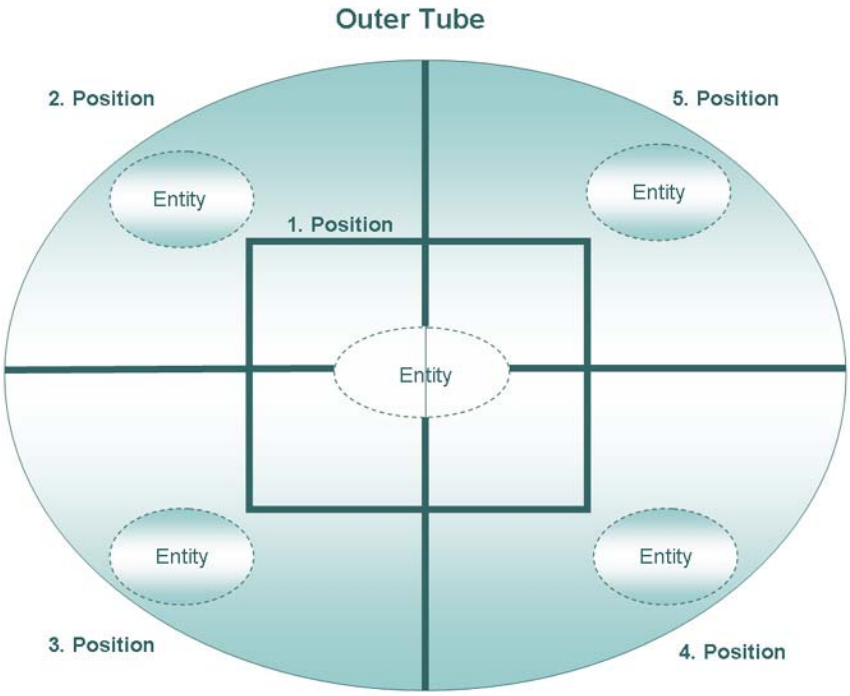

Figure 52. Positional coding.

Figure 53 demonstrates the modal and positional coding in simultaneous use. The Mode 2 is locked for the Inner tube while it is positioned in the lower left-hand quadrant of the Outer tube.

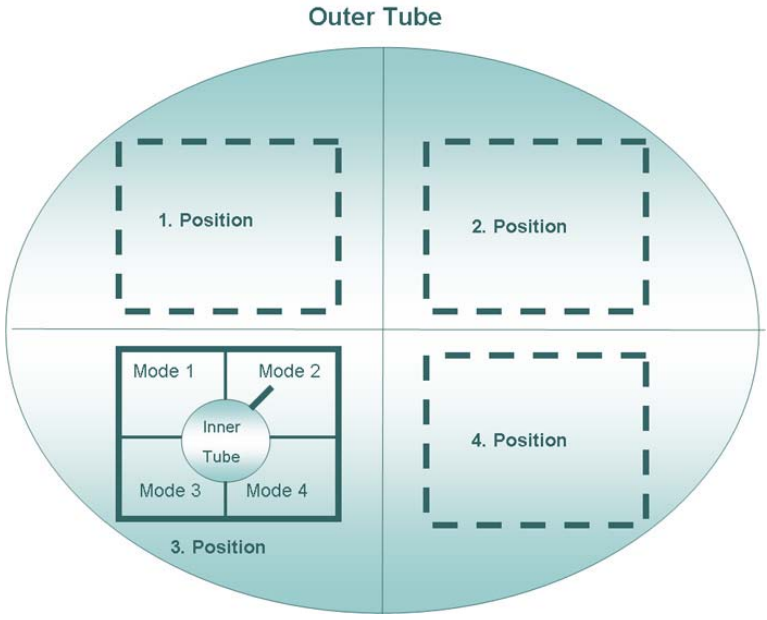

Figure 53. Dual coding (positional and modal).