

Tatjana-Xenia Puhan

**Balancing Exploration and Exploitation
by Creating Organizational Think Tanks**

GABLER EDITION WISSENSCHAFT

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With a foreword by Prof. Dr. Jetta Frost

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Foreword

Key for successful knowledge management is a balance between exploration and exploitation. Exploration means the generation of new knowledge in non-targeted search processes, while exploitation denotes the use of existing knowledge in targeted exploitation processes. The relationship between the two processes is one of fundamental tension; this poses a challenge to organisations which seek to make their knowledge management effective. There is a danger that exploration is neglected in favour of exploitation. This results in an organisation which lacks innovation capability. In order to prevent this, an idea has been put forward for debate in recent knowledge management research called ambidexterity, which means the simultaneous and balanced pursuing of both exploration and exploitation activities. In the following work, Tatjana-Xenia Puhan further develops this idea masterfully, by concluding that ambidexterity need not necessarily be implemented in one single organisation but can also be realised in a network of associated organisations. This approach, which she terms interorganizational ambidexterity is based on co-specialisation: one organisation is devoted solely to exploration, while associated organisations focus on their core competences in exploitation. Ms. Puhan additionally draws on the concept of the think tank. Think tanks play an increasingly important role in society: as a source of ideas, in an advisory capacity and sometimes even as devil's advocate for the purposes of injecting new momentum to current debate in society, business and science. Astonishingly, however, think tanks have hardly been examined in organisational research hitherto. Ms. Puhan develops in an original way the concept of think tanks as organisations which concentrate on radical innovations, while their network associates exploit this newly generated knowledge commercially. Ms. Puhan's contribution to elucidating this topic lies in her very masterful alternative solution to the problem of balancing exploration and exploitation, a problem which has hitherto been the subject of intense debate in knowledge management. Against the background of the hitherto largely inconclusive debate, this is an outstanding contribution both to knowledge management research and to practical organizational structuring.

Prof. Dr. Jetta Frost

Preface

Entrepreneurs in mature and well developed industries or markets face disproportionately high problems which arise due to the fierce competition for market shares and the clients' favor. Tight profit margins for established products lead to a market concentration that only these companies that produce in the most efficient way, can survive.

Those companies who can not – due to whatever reasons – win this market game have to be the champion in another discipline if they want to survive. The challenge they have to handle is the creation of radically new ideas that are transformed into products. Thereafter, these products need to be successfully commercialized and adequate returns have to be generated quickly enough before the first-mover-advantage is gone. However, this market strategy is highly challenging and demanding. It exposes a company to the dilemma of innovation which can be depicted as the trade-off between the requirements or needs of exploration on the one hand and exploitation on the other hand. It affects an organization's structures, its resource allocation, knowledge and corporate governance as well as its members. Thus it is essential for an organization's management to efficiently and effectively solve this trade-off.

While studying possible remedies for creating a balance between exploration and exploitation, I found that the prevailing concepts in theory and practice that yield at solving this essential trade-off are still afflicted with several pitfalls and shortcomings. In the course of my search for a solution of this problem, I got inspired by the idea that – at the level of societies – think tanks explore and create radically new ideas or concepts while officials from politics and economy exploit and implement them. Therefore the notion of the concept presented in this work is that if think tanks provide an adequate solution to a trade-off between exploration and exploitation at the level of societies, this could also be the case at the level of organizations. So in the course of this work the innovation dilemma is extensively explained and its theoretical roots are analyzed. Major concepts from theory that yield at solving the conflict are presented and discussed. In addition, their advantages and pitfalls are outlined. Furthermore, prevailing concepts from business practice are reviewed, analyzed and discussed. This scientifically based analyses and discussion finally allows for the creation of a management concept which solves the trade-off between exploration and exploitation by the creation of think tanks at an interorganizational level.

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As this concept should not remain an idea of a solely abstract nature, this book also provides entrepreneurs and managers with particular pieces of advice about how they can implement such a concept.

Finally, I would like to thank my parents for the patience, love and understanding that they always show to me. This was an important determinant for my successful work and studies. In addition I would like to express my gratitude to my supervisor Dr. Rick Vogel for the ease with which we worked together and to Dr. Roland Wachs for helpful comments on my work.

Tatjana-Xenia C. Puhan

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1 Introduction

This work presents a framework that is nurtured by several concepts which are discussed, arranged, complemented and in the end covered by a newly developed conceptual framework. In order to structure this work and to guide through it, this introductory chapter depicts the problem definition, the research objectives and the course of investigation.

1.1 Problem definition

Nowadays many companies face an enormous speed of technological sometimes revolutionary change and environmental shifts. In order to remain competitive they have to create rapidly and efficiently innovations like new technologies or products (Collins, 2007; Rothaermel, 2001a; Tushman & O'Reilly, 1996). The development of new capabilities and a high rate of innovation seem to be the present and future key to a sustainable competitive advantage in largely mature markets (e.g. Brusoni, 2005: 1887; Grant 1996: 382; Levinthal & March, 1993: 96). As external competitors frequently tend to pursue similar or even the same market segments, being the first in the market can also turn out to be a hex and is no self-evident permanent state (e.g. Grant, 1996). In addition, fundamental technological changes often demand not only incremental but revolutionary changes. Incumbents are often trapped in inertial patterns that do not allow them to react adequately to the discontinuous changes they face (Leonard-Barton 1992; Tushman & O'Reilly, 1996). The struggle Apple had to undergo in the mid-1990s can be taken as an example for an industry leader who faced increasing losses and decreasing market shares. This was the consequence of Apple's inability to maintain its market position e.g. by being continuously one step ahead of the competitors, having a speedy organizational culture and keeping the organizational structure efficient and lean. It took several years of hard reorganization, product upgrading and new product development until Apple reached again the strength and profitability to report record earnings and gains like in the last quarter of 2006 (e.g. Burrows & Greene, 2000).

However, a broad community of scholars recently proposes and discusses briskly ambidexterity as the answer to the urgency of innovation management. Following the idea that organizations need to maintain and balance exploration as well as exploitation quite a few scholars (Tushman & O'Reilly, 1996; Looy, Martens & Debackere, 2005) favor the so-called ambidextrous organization as organizational setting that enables the simultaneous execution of exploration and exploitation in the same organization. In this context exploration is defined

as “the pursuit of knowledge of things that might come to be known” (Levinthal & March, 1993: 105) incorporating “such things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation” (March, 1991: 71); exploitation is defined as “the use and development of things already known” (Levinthal & March, 1993: 105) incorporating “such things as refinement, choice, production, efficiency, selection, implementation, execution” (March, 1991: 71). Referring to Tushman and O’Reilly (1996: 24), ambidexterity can be initially defined and considered as the “ability to simultaneously pursue both incremental and discontinuous innovation and change.” In fact the notion of duality and ambidextrous organizations was shaped by Duncan (1976) who proposed a dual structure for the initiation and implementation of innovations that should be “integrated into the ongoing activities of the organization so that it is seen as legitimate” (Duncan, 1976: 184).

However, the increasing intensity of the debate on ambidexterity can be interpreted as an indicator for the hypothesis that ambidexterity – as it is proposed at present – is not an optimal solution of structuring R&D activities in an organization and that there are several problems of implementing this ambidextrous structure in an organization.

Already in the late 70ies Duncan (1976) describes the organizational difficulties to find a design for the organizational structures that fits for both explorative and exploitative activities (he calls them initiation and implementation stages). He identifies strongly differing needs in the degree of complexity, formalization and centralization as the main difference between organizational structures designed for either the initiation or implementation stage, resulting in a dilemma of mutually contradictory structural design needs.

Abernathy (1978) points out that it appears to be difficult and partly counterproductive for organizations to engage in activities that concern productivity improvement and the reduction of costs and to make simultaneous efforts in achieving a higher rate of innovation and flexibility. In describing the evolution of the early American car manufacturing industry he finds that high productivity increases of American car manufacturers like Ford Motor Company came along with an increasing difficulty to achieve significant technological changes. A purely cost-minimizing strategy that merely relies on increasing productivity by exploiting existing technologies and realizing learning curve and scale effects will lead to competitive advantages in the short run, but in the long run competitive options will be strongly narrowed. The example of the decline of the American car manufacturing industry illustrates quite well what happens if only rather marginal short-term adjustments are made while the competitors heavily rely on long-term (risky) development projects (Hayes &

Abernathy, 1980). In comparison to its competitors from Japan, Germany, etc. the American car industry lost significant market shares because of its inability to keep up with the technological developments of the foreign producers. This strategic inertia was a consequence of the cost-cutting and productivity focused policy of the U.S. auto industry (Abernathy, Clark & Kantrow, 1981). Abernathy and Wayne (1974) and Abernathy (1978) show in their early case study of Ford and other companies that “conditions stimulating innovation are different from those favoring efficient, high-volume, established operations” (Abernathy & Wayne, 1974: 118). They consider product innovation as “the enemy of cost efficiency and vice versa” (Abernathy & Wayne, 1974: 118). In describing and discussing the inertia of “coevolutionary lock-ins” Burgelman (2002) finds the same phenomenon that already many years ago Abernathy and his fellows had identified.

Other scholars like March (1991, 1996 & 2006), Levinthal & March (1993), Leonard-Barton (1992) and Lavie & Rosenkopf (2006) state that although the existence of both exploration and exploitation is essential for the organizational survival (e.g. Duncan, 1976; March 1991), they can have self rescinding effects on each other that lead to contradictory organizational processes. The self-destructive nature of adaptive processes, failure and success traps cause an imbalance between exploration and exploitation that can result in self-reinforcing processes (Gupta, Smith & Shalley, 2006; Levinthal & March, 1993). It is also important to note that from a dynamical point of view it appears like exploration and exploitation activities have different profitability structures. Several studies prove that exploratory activities seem to be rather unattractive if only short term success is considered by the management to be of importance (Benner & Tushman, 2003; Hayes & Abernathy, 1980; Leonard-Barton, 1992; Tushman & O’Reilly, 1996). By focusing merely either on short term or long term success and by concentrating on only one of the two activities, the organization may end up failing in the long run because of a lack of adaptive capacity or it will not survive the successful completion of promising longitudinal research projects.

In addition to that exploratory activities are considered to be riskier because they increase the variability of the organizational outcomes whereas exploitation increases their reliability (e.g. Garcia, Calantone & Levine, 2003; Gatignon, Tushman, Smith & Anderson, 2002).

Exploration and exploitation compete for similar and often the same scarce resources. The organization has to make explicit (e.g. by applying alternative investment decision rules) as well as implicit (e.g. search rules and practices, decisions concerning the organizational slack, etc.) decisions, on how to allocate these resources most efficiently. This efficient resource

allocation, that should finally create an optimal balance between exploration and exploitation in the organization, depends e.g. on the expectancies, time horizons and adaptive capability of the organization, the variability and reliability of the two alternatives, individual (risk) preferences and socialization of the decision-making units and many other factors. However, these factors are decisive for an organization's capability to manage the trade-off between exploration and exploitation successfully (March, 1991). In addition to that organizational routines and mindsets favoring exploration seem to be of a different nature than those facilitating exploitation. In his morality tale about the past forty years of organizational studies, March (1996: 280) points out, that subfields of organizational studies that exploit existing streams and concepts thrive on other mindsets and properties than explorative ones. Way before March many other organization theorists have figured out that routine and nonroutine decisions necessitate different organizational structures (e.g. Burns & Stalker, 1961; Duncan, 1973 & 1976).

It is certainly naïve to believe that there exists a magic formula for solving a company's decision problem concerning the right structuring and implementation of its exploration and exploitation activities. By now none of the scholars presents a fully satisfying model (as it is partly discussed in the following) and also this work has to fall back on several simplifications.

"I don't demand that a theoretical concept is consistent with reality because I don't know what that actually is. Reality is not a property that you can approve with litmus paper. I'm only interested in whether the concept predicts the results of measurements" (Hawking & Penrose, 1996: 46).¹

Keeping this citation in mind, this work tries to create a concept of the management of R&D activities in (and between) organizations that could have the potential to help overcoming in an efficient and implementable way today's organizational challenges as they are described above. The framework that is presented consists to a large extent of already existing suggestions and findings. It can rather be characterized as a new way of combining these concepts in order to take advantage of their strengths and avoid their pitfalls.

⇒ *This work considers ambidexterity at the organizational level as efficient remedy of the productivity dilemma as problematic by going back to the origins of exploration and exploitation and the central work of March (1991). It therefore proposes the*

¹ All translations are done by the author.

realization of ambidexterity on an interorganizational level. Thus ambidexterity is transferred to a multilevel-approach. Referring to Gupta et al. (2006), the work develops a framework that differentiates between regarding exploration and exploitation as two ends of a continuum and the orthogonality of both and shows under which conditions the first or the second kind of relationship is applicable.

The idea of orthogonality of the two activities as introduced by scholars like Gupta et al. (2006), Rothaermel (2001a) or Beckman, Haunschild and Phillips (2004) enlarges the analysis of the decision problem between exploration and exploitation to a multi domain approach that provides a sophisticated basis for the framework that is presented in this work.

⇒ *The work proposes the idea of ambidexterity at the interorganizational level in network-like settings. Imbalances between exploitation and exploration and the need for ambidexterity are understood as issues concerning not only the organizational level but rather higher levels like entire populations of organizations and societal levels.*

Adopting this point of view enables the work to get inspired by the structures and mechanisms that influence, govern and characterize think tanks. Defining the exact meaning of the think tank expression is not easily and unambiguously realizable. So before discussing think tanks more profoundly in a later section of this work, a short idea of how think tanks are understood here is given by harking back to the definition of think tanks as it is written in the International Encyclopedia of the Social & Behavioral Sciences:

“Research institutes and think tanks are relatively autonomous organizations engaged in the research and analysis of contemporary issues independently of government, political parties, and pressure groups. (...)They are often in resource-dependent relationships with these organizations (...), but the institutes attempt to maintain their research freedom and usually claim not to be beholden of specific interests. Think tanks attempt to influence or inform policy through intellectual argument and analysis rather than direct lobbying; (...) They are concerned with knowledge creation just as much as political communication and the effective application of knowledge” (Stone, 2001: 15668-15669).

⇒ *In drawing a parallel to political think tanks, which provide society and politics with explorative activities at the socio-economical level, the work explains why these activities can be depicted as some kind of societal ambidexterity.*

In order to justify how this should be realized and what exactly is targeted the research objectives and the theoretical framework are presented below.

1.2 Research objectives

The purpose of this work is certainly not to deep-dive into a discussion of political think tank concepts. Therefore the extent to which political think tanks are introduced here is strongly framed by the context of the work.

⇒ *One important objective is to explain why exploration and exploitation should be carried out in separated organizational entities which are connected through certain mechanisms of knowledge and resource exchange.*

It is suggested that ambidexterity is transferable onto a macro analytical level. Applying the solutions of this societal (macro) exploration vs. exploitation trade-off on the meso level of an organizational think tank approach that is situated between societal ambidexterity and the micro level of organizations is an important dimension of the framework that is developed in the course of this work.

⇒ *Before designing a vehicle that implements the idea of organizational exploration in think tank structures, the work figures out how these structures look like questioning if the idea is realizable in network structures of organizations e.g. strategic alliances or corporate settings and what can be learned of or should be made better than other intra- or inter-organizational concepts of R&D alignment.*

Taking the logic of ambidexterity to the context of social systems has already been proposed and further developed by Gupta et al. (2006) who refer to the ideas and findings of March (1991) and Benner & Tushman (2003). Gupta et al. state that it might be possible that under certain conditions organizations specialize either on exploration or on exploitation and create a balance between the two activities via market mechanisms. Other scholars assess more closely the relationship between exploration and exploitation and alliance or interfirm structures (e.g. Gatignon et al., 2002; Gilsing & Noteboom, 2006; Grant & Baden-Fuller, 2004; Holmqvist, 2004; Rothaermel, 2001a & b).

In fact there are quite a few models of structuring exploration and exploitation activities in a modular intraorganizational way or even at an interorganizational level. They are discussed in the following and serve as a fruitful basis for the propositions that are developed in this work.

⇒ *It is important to note that the work focuses solely on horizontal interfirm cooperation.*

In the course of the work it becomes clear that this simplification has to be made in order to create a neatly constructed framework. The importance of horizontal relationships, that lead to competitive and often equally cooperative interdependencies, is also acknowledged by scholars like Hannan and Freeman, (1989) or Grandori (2001a). Furthermore transferring and applying the framework to further research activities on other kinds of cooperation seems to be harmless, straightforward and under certain conditions well imaginable.

The work presents and discusses these different concepts and rudiments in order to apply the societal ambidexterity represented by political think tanks on networks of organizations. It figures out advantages and shortfalls of the proposed organizational remedy to the productivity dilemma. It is e.g. quite probable that especially the transfer and the integration of knowledge between the explorative and the exploitative entities demand for specific governance structures as proposed by scholars like Grandori (e.g. 1997 & 2001).

If organizational think tanks are considered as nodes in a network of organizations that produce knowledge and canalize knowledge flows in the network it is decisive that knowledge sharing can be governed. Differing interests of the cooperating parties as well as asymmetries of knowledge and information are the main problems of knowledge governance (Mahnke & Pedersen, 2004). The governance of knowledge flows and knowledge relations are critical to the applied success of the theoretical framework as it is proposed in this work. The process of knowledge flow reaches from the identification of knowledge to its exploitation. But also the intermediary part of a knowledge flow process – the transfer of knowledge – is a delicate problem that has to be efficiently remedied (Mahnke & Pedersen, 2004: 4-15). The knowledge produced by the think tank is only valuable if it can be transferred to the exploiting network partners. Grant identifies knowledge integration as “the basis for competitive advantage under dynamic market conditions” (1996: 380). Especially the integration of implicit knowledge into the network is supposed to be critical. Miller, Zhao and Calantone (2006) have recently added in a study – that is discussed below – interpersonal learning and tacit knowledge to March’s 1991-model. All parties involved in the network have to maintain a certain level of absorptive capacity, and shared tacit knowledge in order to assure a fertile, balanced working climate of the network (Gilsing & Noteboom, 2006; Levinthal & March, 1993).

The reader of this work is invited to consider as a benchmark for the quality of this work the explanations and propositions that are given below as answers to the following questions:

- ⇒ *Which solutions does the organizational think tank approach open up to managers for the strategic and structural problems they face to overcome inertia and to implement innovation and change?*
- ⇒ *Is solving the dilemma of imbalance between exploration and exploitation in organizations by creating organizational think tanks a potentially favorable way of managing the productivity dilemma?*
- ⇒ *To which extent is it possible to respond with this approach more efficiently to the exploration and exploitation trade-off than with the existing models?*
- ⇒ *How does the backbone network have to be constructed in the organizational think tank approach?*
- ⇒ *What has to be considered concerning an efficient and effective governance of knowledge flow processes in the presented framework?*

After presenting the main purposes and objectives of this work, the course of investigation – as it is envisaged – is presented in the following section.

1.3 Course of investigation

In chapter 2 the conceptual pillars of the exploration vs. exploitation discussion that are situated in organization theory and that concern the context of this work are presented, discussed and recognized. The work exhaustively discusses the exploration vs. exploitation trade-off and reinterprets March's central work (1991). This is in fact a key part of this work because later on the new conceptual framework is strongly based on the implications that are made referring to March (1991). Albeit the idea of ambidexterity as it is shaped by now and other concepts fall back on March (1991) as well, it is outlined that they partly misinterpret March (1991). They therefore construct frameworks that fail to solve the decision problem a company faces concerning its exploration and exploitation activities. In negating the efficiency of a sequential alignment of explorative and exploitative activities and through applying ambidexterity to higher organizational levels the work remedies the productivity dilemma in a way that is supposed to follow March's logic more closely than other concepts do.

In chapter 3 the roles and mechanisms that influence, govern and characterize (political) think tanks are described. A second part of this chapter is dedicated to the transfer of the think tank concept to the remedy of the organizational decision problem caused by the trade-off between

explorative and exploitative activities. Furthermore, a framework of how these organizational think tanks should be implemented is presented. Therefore, a comparison to already existing (inter-) organizational exploration approaches, like strategic alliances, skunkworks or open innovation initiatives, is initially carried out. The work assesses these approaches in the context of their problem solving qualities concerning the exploration vs. exploitation trade-off and finally explains why and how organizational think tanks differ from them and why this could be advantageous in the given context.

A broad discussion that figures out further advantages and shortfalls of the proposed framework is carried out in chapter 4. However, it becomes evident that the mechanisms which govern knowledge flows are so important to the success of organizational think tanks that a significant part of this work is devoted to figuring out how they should be implemented in order to assure that organizational think tanks lead to a sustainable better performance of the organization.

In the end of this work chapter 5 summarizes the most important conclusions and raises some criticism and questions. However, the work contributes results to an important field of research that are applicable in praxi. It wants to encourage other researchers to try to find answers to other yet unsolved questions.

Figure 1 depicts the summarized framework of the work:

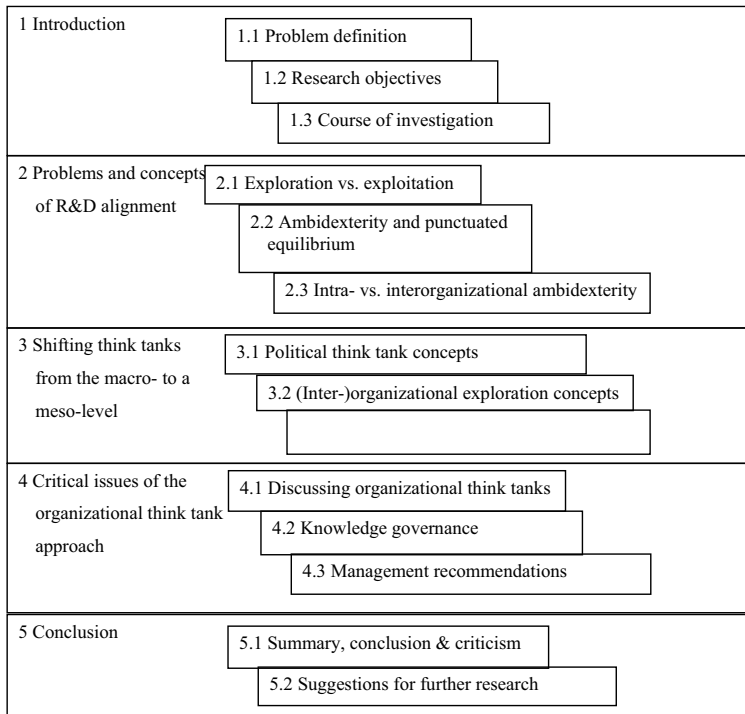


Figure 1: The summarized framework of the paper

2 Problems and concepts of R&D alignment

After introducing in the precedent chapter the main ideas, concepts, purposes and the course of investigation of this work, in this chapter the underlying conceptual pillars that are situated in organization studies are presented, broadly discussed and the deducible implications for the research objectives are emphasized. So in the course of the chapter the intellectual universe that is favored by this work is developed and shaped.

R&D alignment is rather inevitably confronted with the exploration vs. exploitation trade-off because Research and Development can in a sense be interpreted as a synonym for exploration and exploitation. The “R” of R&D means to a large extent the same as it is expressed with the term exploration, while exploitation is comparable to the “D” (Koza & Lewin, 1998).

Providing the work with its conceptual tools is undertaken by deepening the analysis of the tensions between exploration and exploitation in 2.1, followed by a discussion of the dominating propositions for solving the productivity dilemma in 2.2 and finally in 2.3 by stating the conceptual dimensions that are favored by this work.

2.1 Exploration vs. exploitation

Chapter 2 contains an assessment of the concepts that are essential for this work. Their ability to transfer the trade-off between exploration and exploitation – as it is understood and described by March (1991) – to an efficient organizational solution is analyzed; the very beginning of this chapter (2.1.1) is dedicated to a presentation and discussion of March’s central work and it becomes clear what conclusions have to be drawn from March 1991. This is supplemented by findings from related studies on organizational learning as well as extensions to the 1991-framework that appear to fit in the underlying context; additionally their consequences for the decision problem between explorative and exploitative activities are highlighted.

Furthermore in 2.1.2 the considerations about a rationale for thinking about the adequate structuring and organizational coordination of explorative and exploitative activities – as it was already partly introduced in chapter 1 – are engrossed and should underline the importance of dealing with this issue. This includes considerations of coevolutionary lock-in, adaptive capacity and organizational routines.

2.1.1 Exploration and exploitation in organizational learning

In his study March (1991) focuses on the interplay of explorative and exploitative activities in adaptive systems² by considering organizations as the locus of interest. March's statement that balancing exploration and exploitation is essential for organizational survival and success (1991: 71) can be considered as the central thesis of his 1991 paper. Looking at the exploration vs. exploitation trade-off through the lens of organizational learning theory leads to decision problems between the two activities caused by "the myopia of learning" as it is discussed by Levinthal and March (1993). They describe three forms of learning myopia i) ignorance of the long run, ii) ignorance of the larger picture and iii) ineffective failure identification capabilities. According to Lounamaa and March (1987) the overall learning effectiveness of simultaneous learning at multiple hierarchical levels may be mitigated. They characterize learning mechanisms as myopic, ignorant and incremental. These characteristics of organizational learning as identified and discussed by Lounamaa and March (1987), Levinthal and March (1993), March (2006) and other scholars, are central problems to the balancing of an organization's explorative and exploitative activities. In focusing an organization to a simplified world where learning is restricted to only some parts of the organization, learning can inhibit a sufficient reconsideration of organizational capabilities. In addition, learning can lead to a self-reinforcing process of concentration on extensive competencies that frequently comes along with only marginal engagements in activities that are not supported by distinctive organizational capabilities and which therefore do not result in immediate advantages. But it is also well imaginable that organizations are trapped inside a process of excessive exploration due to great short-term success of explorative activities. These suboptimal equilibria are a result of strong path dependence that is caused by positive local feedback (March, 1991:73). Furthermore, Levinthal and March (1993) state that market power (although it might be quite useful in the short-run) can lead to underdeveloped adaptive skills. This can threaten the organizational survival in an environment that changes independently of the organization in the long-run. In addition to that organizations tend to solve problems after they already occurred and do not act wisely in advance (Holmqvist, 2004; Levinthal & March, 1993: 102).

² For detailed information on the properties of adaptive systems see e.g. Cyert & March, 1995: 114.

The exploration vs. exploitation trade-off incorporates to a significant degree a competition for scarce resources. As a result of this competition Crossan, Lane and White (1999: 524) identify a tension that they describe as follows:

“This tension is seen in the feed-forward and feed-back processes of learning across the individual, group, and organization levels. Feed forward relates to exploration. It is the transference of learning from individuals and groups through to the learning that becomes embedded – or institutionalized – in the form of systems, structures, strategies, and procedures (...). Feedback relates to exploitation and to the way in which institutionalized learning affects individuals and groups” (Crossan et al., 1999: 524).

Levinthal and March (1993) emphasize the necessity of organizational learning because it can increase the average performance and reliability of organizational outcomes. Nevertheless, they also underline a very important drawback of organizational learning: The output of the learning processes (e.g. ideas, new technologies, management and organizational techniques, etc.) is a public good (that means it is not possible to prevent and price their public diffusion) whilst all the risks and costs of exploration have to be borne by the organization. Furthermore, it is sometimes extremely difficult and not predictable for an organization to generate a successful new idea. The risk of explorative projects is extremely high. If one single firm has to bear it all alone this may cost large amounts of money that could threaten the organizational survival if several projects fail. In his 1991 paper March also emphasizes that deciding whether to explore or not can cause a dynamic trade-off because what is good in the long-run can have negative outcomes in the short-run. The returns generated by explorative activities in comparison to returns from exploitation “are systematically less certain, more remote in time and organizationally more distant from the locus of action and adaption” (March, 1991: 73). This is in fact a very important reason for many companies to neglect explorative activities and to rely mainly on the exploitation of already existing competencies. In the past, a success of this strategy in the long-run frequently proved to be strongly questionable.

March makes a distinction in his 1991 paper between mutual learning and competition for primacy as two distinctive characteristics of the social context of organizational learning. This work follows his approach and dedicates two separate sections to these characteristics.

2.1.1.1 Mutual learning and the exploration vs. exploitation trade-off

Mutual learning – as it is understood by March 1991 and in the following – can be described as the development and storage of knowledge through organizations learning from their members and vice versa. In the context of mutual learning the trade-off between exploration and exploitation is transferred to a trade-off between long term and short term considerations

as well as a conflict between additional individual knowledge and additional collective knowledge. March 1991 sets up a model of mutual learning that could be summarized as follows:

The process of the creation and diffusion of knowledge in an organization has as its starting point “an organizational code characterized by neutral beliefs on all dimensions and a set of individuals with varying beliefs that exhibit, on average, no knowledge” (March, 1991: 75). The organizational code and the individuals mutually affect each other in a dynamic process that does not display reality. In this process mutual learning is a result of mutual imitation of the organizational code and of (superior) individuals. In a closed system the organizational code and individual knowledge converge over time and reach a stable equilibrium.

It is interesting to reflect about when (or better how fast) this equilibrium is reached and at what level of knowledge accumulation that happens. March (1991) finds that a fast learning organizational code and the slow socialization of the individuals to the code leads to the highest equilibrium knowledge. In fact this is also intuitively comprehensible because individuals as a long lasting source of diversity in an organization, that is open to profit from the new impulses brought in by the individuals, can influence the organizational code more than individuals that are quickly socialized. But still March (1991) finds that there is a positive first-order effect on the accumulated individual knowledge if individuals show a rapid learning behavior from the organizational code. Thus he proposes that it is overall most advantageous to have fast as well as slow learning individuals in an organization in order to profit of the advantages of both positive learning effects. This is again intuitively comprehensible; if slow learners expose an organization to a high degree of diversity this has to be efficiently integrated and realized in the organization. This happens through the fast learning individuals.

Considering now an open system that is exposed to things like personnel turnover or environmental turbulences, the effects of these factors can also serve as a source of variability. Looking at personnel turnover March (1991) suggests that individual knowledge and the length of service in an organization are positively related to each other. On the other hand moderate (!) turnover creates a degree of diversity that has positive effects on the accumulated knowledge. This relationship is not as easy comprehensible as the ones that were depicted beforehand. If the individuals are slow learners but their average continuance in the organization is short (which is the equivalent of a high turnover rate) this will cause an inadequately low level of exploitation in the organization. This may happen because

frequently the organization simply can not stick to the point of exploitation. The slow learner contributes diversity to the organization but in the average quits it before the exploitation of the new knowledge can be carried out. Therefore a moderate turnover rate can mitigate the negative effects of too little exploitation as well as assure the positive effects of diversity that personnel turnover has on organizations. On the other hand fast learning individuals are not able to contribute enough impulses to the organization in order to sustain an adequate level of exploration. Through a moderate level of turnover this effect can also be mitigated as new employees will automatically increase the level of diversity in the organization. Thus it should be evident now that personnel turnover contributes to higher accumulated knowledge. Nevertheless it is important to note that these findings do not permit the conclusion that new employees possess generally better or more knowledge than the long-time employees. But it is possible to state that new employees are more likely to contribute new impulses to the organizational code because their knowledge is in the average more diverging from the organizational code than the knowledge of long-time employees.

Environmental turbulences can lead to a rapidly aging and therefore less useful knowledge. As already mentioned in the introductory chapter environmental turbulences presently seem to be very intensive so it becomes more and more important for organizations to renew their knowledge in shorter periods of time. March (1991) states that if there exists no turnover and equilibrium is finally reached the beliefs that are contained in the code and held by the individuals are identical and remain unchanged. This leads to a disastrous degeneration of knowledge over time if the organizational code is exposed to environmental turbulences. In the end marginal changes (positive or negative) of the knowledge code only occur more or less at random. This can be prevented if there exists a moderate level of personnel turnover that provides the organization with diversity and therefore enables the organizational code to get an "update".

Recent findings by Jansen, van den Bosch and Volberda (2006) find support for a positive correlation between exploration, high levels of environmental dynamics and financial performance of organizations.

2.1.1.2 Competition for primacy and the exploration vs. exploitation trade-off

The "ecologies of competition" (March, 1991: 81) as the second distinctive characteristic of the social context of organizational learning are determined by external and internal competition for scarce environmental and scarce organizational resources and opportunities.

According to March there is a dependency between the consequences for competition of learning by one organization and learning by other organizations (1991: 81). In a competitive environment returns to one organization always have to be regarded relative to the returns of the competitors. This leads March to the conclusion that “returns to changes in knowledge depend not only on the magnitude of the changes in the expected value but also on changes in variability and on the number of competitors” (1991: 81). Considering the chance of being the best in a group of identical competitors March (1991) shows that the mean and the variability of the performance distribution are positively correlated. In addition, the mean and the variability of the performance distribution are to a certain degree mutual substitutes. The decision between the two is significantly determined by the total number of competitors. The more competitors there are, the more the variance of the performance distribution contributes to the competitive advantage and the less important becomes the mean. This is in fact a very important finding that should be kept in mind until later in this chapter the work draws some conclusions from March’s findings. These findings are partly supported by the study carried out by Jansen et al. (2006). Auh and Menguc (2005) study the differences of the financial impact of explorative and exploitative activities on organizations in various competitive positions. They find that depending on an organization’s competitive position and its dominating learning mechanisms the decision of resource allocation to either explorative or exploitative activities in a highly competitive environment has to be well reflected by the management. Auh and Menguc (2005) find for instance that prospectors who already maintain a high level of exploration can enhance their effective firm performance in highly competitive environments; additionally, an increased level of exploitation can contribute to an efficient firm performance. Interestingly the converse is true for defenders.

However, there are still important findings that also have to be emphasized. According to March (1991: 83) the following relationships can be stated:

- The performance distribution can be changed through learning.
- Variability is only helpful if the organization has reasonable causes for yielding at a high position between the competitors. However, if the organization is so badly positioned that it can only yield at the avoidance of a low position, variability influences the achievement of the goal negatively. This becomes evident if one reflects about the respective position of top and bottom organizations in the performance distribution.

- However, learning can increase both the mean and the variability of the distribution. Nevertheless, it can also lead to less variability or, saying it the other way around, through learning the reliability of the outcomes can be increased. This is easily comprehensible. It is evident that by standardizing processes, by repeating and engrossing them and by increasing their quality the left-hand tail of the performance distribution can be reduced. So one important conclusion that March (1991) draws is that knowledge can reduce the probability of finishing last. But what is the price for the variability reduction?
- It is possible that knowledge increases reliability not only by reducing the left-hand tail of the distribution but also by reducing its right-hand tail. This means that if the effects of knowledge on the competitive situation of a top organization should be reliably estimated, it has to be ascertained what effects knowledge has on the right-hand side of the distribution. This has to be clarified because there are certain kinds of knowledge that will have a disadvantageous effect on the competitive position of a high-yielding organization. So organizations always have to keep in mind that increasing the reliability of the outcomes induces a decreasing chance of finishing first. This is the price of a reduced variability and every particular organization has to decide by considering its particular competitive position and the kinds of knowledge that are involved how relevant the payment is in its particular situation. But how does this choice exactly look like?
- Also for this question March's 1991 findings provide an answer. Up to a certain degree it is possible for organizations to influence the average and the variability through strategic organizational choices. Considering this choice situation from a long-term point of view is nothing else than the already well-known exploration vs. exploitation trade-off. In the short-run this decision is one between the levels of efforts an organization wants to make (this will influence the mean). In addition the degree of reliability can be influenced by choosing between particular levels of knowledge accumulation or risk taking. Keeping in mind that an increasing number of competitors leads to a decreasing importance of the mean and an increasing influence potential of variability it becomes evident that in a highly competitive environment it is far more attractive to increase variability and to neglect the mean. Especially those organizations that can not come up with a high mean will concentrate solely on augmenting the right-hand tail of their performance distribution. According to March

(and in fact intuitively very well comprehensible) this leads frequently to a neglect of exploration.

- The trade-off between exploration and exploitation is also a decision between uncertainty, risk, as well as distant and often negative returns in the case of exploration and predictable, stable, proximate and mostly positive returns in the case of exploitative activities. It happens quite frequently that these trade-offs are solved by deciding in favor of more reliability. Therefore a self-destructive process is frequently initiated. So while considering the trade-off between exploration and exploitation it is important to look at the properties of the particular organizational relationship between knowledge and discovery. In the end it still remains questionable if it is possible at all to choose the optimal degree of explorative or respectively exploitative activities.

Before this work comes to the point of interpreting March's 1991 paper Miller's et al. (2006) thesis is presented because their approach of embedding interpersonal learning and tacit knowledge into the framework presented by March (1991) seems to be of particular interest in the context of this work.

2.1.1.3 Introducing interpersonal learning and tacit knowledge to March 1991

In the previous sections organizational learning is merely considered in terms of being a reciprocal process of learning between individuals and an organizational code. Referring to the study of Miller et al. (2006) this section adds direct interpersonal learning to March's model. This interpersonal learning mode does not need the mediation of an organizational code to work. By introducing the direct person to person dimension to March's model the location of the members of an organization and of the particular social networks in which they act get a distinctive importance whilst March does not consider matters of location at all. The exchange with the organizational code is regarded by March as independent of spatial aspects. The problems that can arise from the spatial dimension of learning are characterized by Levinthal and March (1993: 110) as "spatial myopia". Spatial proximity is an important determinant of individuals that learn of each other (which frequently happens in social network structures). However, Miller et al. (2006) find that the organizational code can help mitigating the negative effects of distant search and learning on the overall knowledge level. Miller et al. (2006) recommend that organizations should apply decentralized organizational learning modes in order to overcome an inertial concentration on exploitation. The enhancing

effects of a decentralized structure on exploration are empirically supported by Jansen et al. (2006).

For the conceptual framework presented below it is important to note that spatial proximity and established network connections can increase the effectiveness of learning and facilitate its process (Miller et al., 2006: 711). The finding that dense social networks can have positive effects on learning is also supported by recent empirical results presented in a study by Jansen et al. (2006). It is also important to note that Miller and colleague's findings provide support for the idea of a partial specialization on either exploration or exploitation at differing levels of an organization. Simultaneously they support duality of the two activities on the overall level of the organization.

There is another important issue that is not considered by March (1991) but Miller et al. (2006) introduce it now to the model. Hitherto March (1991) makes no distinction between different dimensions of knowledge, however, Miller et al. (2006) acknowledge the existence of different knowledge types that possess unequal properties of transferability and codification. While Grandori (2001: 22ff.) classifies knowledge into several more categories (paradigmatic, critical, substantive, procedural, tacit and explicit knowledge) Miller et al. focus only on the two latter ones. Especially the tacit dimension of knowledge seems to be crucial for the analysis of knowledge flow processes. Grandori characterizes tacit knowledge as follows: "Knowledge is tacit if it is intrinsically difficult to identify which information and procedures are applied in successful processes" (2001: 26). Adherent to tacitness is the notion of implicit and hardly (or not all) codifiable knowledge that is frequently a result of an individual's working experience. Transferring and sharing this knowledge via an organizational code is extremely difficult because for this purpose knowledge has to become explicit. Scholars like Nonaka and Takeuchi (1995), Polanyi (1967) or Grandori (2001a) state that as a result of the merely partly codifiability of tacit knowledge (e.g. through the development of organizational routines or learning by doing under the supervision of individuals that already owe the respective skills) interpersonal learning becomes crucial to exploration and mainly to exploitation because the organizational code, as the only vehicle of organizational learning, fails to assure a rich, efficient and effective exchange of both explicit and implicit knowledge. The findings of Miller et al. (2006) strongly support this. In addition their simulations reveal that tacit knowledge has counterproductive effects on exploitation but conversely has an enhancing effect on exploration.

Later in this work (4.2) it becomes clear that thinking about the efficient and effective governance of knowledge flow processes is essential to the ideas that are presented here. So implementing the issue of tacit knowledge into the 1991-model and recognizing its importance to the underlying context is the first introductory step towards a decisive facet of this work.

One last interesting aspect of Miller et al. (2006) has to be emphasized because it seems to be of special importance in the context of this work. They conclude and thereby fall into line with Kogut and Zander (1996) that organizations are systems that provide a favorable environment for knowledge sharing. Keeping this in mind facilitates the understanding of the proposed conceptual framework of organizational think tanks as an efficient solution to the exploration vs. exploitation trade-off.

Before moving on to the next point of interest that is indicated on the imaginary road map of this work, a brief summary is given. It includes these findings that are presented above and that are of a distinctive importance for the ideas that are developed in this work.

- ⇒ Balancing exploration and exploitation is essential for organizational survival and success.
- ⇒ Organizational learning can increase the average performance and reliability of organizational outcomes.
- ⇒ Learning processes in organizations also have negative properties which make them act in a myopic, ignorant and incremental way.
- ⇒ Explorative activities frequently contain high uncertainties and require the application of long-run considerations by the management because their short-term returns tend to be negative.
- ⇒ A fast learning organizational code and slow socialization of the individuals lead to the highest level of equilibrium knowledge. However a certain amount of fast learning individuals in an organization seems to support the process of knowledge accumulation.
- ⇒ Environmental turbulences are one main reason for the necessity to maintain a certain level of diversity in an organization. In the face of unstable environmental conditions the organizational code must not stay unchanged but needs interim “updates”.
- ⇒ In highly competitive environments the variance of the performance distribution becomes increasingly important and assures a sufficient resiliency of the organizational code.

Therefore it is inevitable for the management to figure out how to produce this variability in an efficient and effective way. It appears like variation is mainly achieved by technological innovation (Benner & Tushman, 2002).

- ⇒ Decentralized structures, spatial proximity as well as dense social networks have significant positive effects on exploration.
- ⇒ Considering different dimensions of knowledge is essential for solving the exploration vs. exploitation trade-off in an efficient and effective way. Therefore it seems to be useful to create an efficient and effective system of knowledge governance mechanisms in an organization.
- ⇒ While on the intra-firm level a respective partial specialization of organizational units on exploration or exploitation is useful, the overall system is dominated by duality.

After presenting the approach of the tension between exploration and exploitation that March (and some other scholars who largely base their frameworks on March's 1991-model) proposes and that is basically applied on this work, the following section engrosses the view on the issue. For this purpose works by other scholars that have partially a slightly different focus but in the end also discuss (even though differently packaged) the same tension that March found are analyzed.

2.1.2 The productivity dilemma

The euphonic term of the productivity dilemma – as it was shaped by Abernathy (1978) – goes back to a phenomenon of productivity improvement situated in an area of conflict between costs and benefits. If the costs of a decreased innovative capability are outweighed with potential gains from an increased productivity and vice versa there is no problem and no dilemma. But in fact this balancing is a hard job in the organizational reality. Abernathy and Wayne (1974: 109) also point out that following a sheer cost-minimizing strategy may in the end leave the manager behind with extremely narrowed competitive options. In addition, there will be continuously less cost reduction potentials when the bottom of the learning curve is reached due to little remaining flexibility potentials. Studying the early American car industry Abernathy describes this phenomenon as follows:

“But while the course of development in mass production helped create the industry, it has also introduced a set of constraints. The moving assembly line, steel bodies, automation, and many other advances have made change and product innovation more expensive. Large-scale production processes in which the direct labor costs are low but indirect costs are high create strong economic forces to reduce real product variety” (Abernathy, 1978: 27).

Box 1: Lessons from the early American car manufacturing industry

The **Ford Motor Company** and its famous founder Henry Ford went through times of enormous success in the very first part of the 20th century (market share 50.4%) and experienced hard times of stagnation and rapidly decreasing market shares until the middle of the same century (the market share dropped to 22.2% while the level of units sold was about the same). Apart from today's struggle the company has to go through, it is interesting to focus for a short moment on what happened to Ford so many years ago; interestingly it is possible to observe the same developing pattern in other industries in other decades and differing countries. The famous Model T was one of many success stories that Ford created beside revolutionary changes in the production process. The idea of creating a car that every average American citizen could afford, rely on and be satisfied with shaped the innovation strategy of Ford. But early in 1920 Model T was an aging model and Ford lost market shares because competitors like General Motors performed better providing customers with broader product lines. In 1926 Ford even closed its plants in order to develop a new model that was finally launched in 1927. The plant closing was caused by the extreme cost-minimizing strategy of Ford that created highly specialized work forces and technological processes squeezing out even the least experience curve effects. But again Ford had to realize that the once so successful strategy of standardized design, low prices and mass production did not work out anymore. The problem of Ford's strategy was its static nature that did recognize neither competitive dynamics nor those of a changing market.

Source: Abernathy (1978)

And it is not only the early (and present) American car manufacturing industry that did not manage the balance of explorative and exploitative activities successfully. There are many other examples of companies (e.g. Douglas Aircraft, IBM, etc.) that got into trouble with learning curve effects and productivity improvement on the one hand and new product development on the other hand. Some radical changes in technologies and product requirements even pushed old leaders entirely out of the market.

Box 2: Reaching the limit – a lesson from Apple Inc.

When in August 2006 Steve Jobs the CEO of **Apple Inc.** presented the new operating system "Leopard", he certainly did not think that already in April 2007 it would become clear that the launch of "Leopard" would have to be postponed for at least two months. How could that happen? The answer can be found in a combination of a self-reinforcing process (as mentioned above in 1.1) that leads to a heavy specialization on exploratory activities (and in the end Apple reached its limits because exploitation was extremely neglected) and the public good problem of learning processes (cf. above in 2.1.1). Besides many other exploratory projects, Apple worked on intensively in order to broaden its still quite narrow product range, the quick product launch of iPhone binds in the moment so many resources that Apple is not able to keep the schedule for "Leopard". But it is not only the lack of resources that jeopardized the launch of the new OS X system. At Macworld Conference & Exposition 2007 in San Francisco Jobs already presented the iPhone although the market launch was planned no more than half a year later. This early presentation was maybe a

mistake because in this moment competitors started working under high pressure on comparable and cheaper “copies” of iPhone. This again put Apple under pressure to launch the product earlier in order to realize sufficiently large first mover advantages for achieving redemption of its pioneer exploratory costs. And analysts were not sure if Apple would be able to launch iPhone as previewed. In addition these are not the first delay problems of Apple. Recently AppleTV was launched with a two months delay. As a result of these imbalances in Apple’s explorative and exploitative activities, the software sales volume of Apple is supposed to be postponed for about two months and it is also probable that potential customers do not buy their new Apple computer now but only after the yet uncertain (concerning the date) launch of “Leopard”. So the trap that Apple stepped in compared to Ford’s problems seems to reveal that Apple is caught in the second kind of trap at the other end of the continuum between exploration and exploitation.

Source: Laube, 2007

If this antagonism between product innovation and cost efficiency – as it is proclaimed by Abernathy and Wayne (1974: 118) – really exists then a very tough management with a broad view is needed that can prevent of strategic decisions that finally lead into a situation where the productivity dilemma constrains the company’s success. Management needs to consider the short-, mid- and long-term dimension of the issue. As Hayes and Abernathy (1980: 68) note, the short-term focus should rest on creating a high level of efficiency in production and work processes. Mid-term decisions are concerned with the replacement of scarce (and expensive) resources like labor with machines and other technical devices. But what is needed in the long-run are the development of new products, the restructuring of processes and the creation of new visions. Only if management takes the right decisions, in every single of these three dimensions, it will give the company a strategy that leads to sustainable success. However, keeping up the balance between efficiency progress and innovativeness can result in very high resource requirements that only very large companies can sustain. The changing relative predictability against high risks and uncertainty requires the willingness to act rather like a gambler; sometimes the organization’s pockets have to be very deep if there is no immediate exploration success or even several failed research projects in long periods of time. The fact that Ford had to close down its plants for one year in order to develop a new product line (cf. Box 1) shows what could happen if management does not meet with success the right balance between exploration and exploitation. The overweight of one activity may finally cause a collapse and the need for dramatic changes of the entire system.

What should be clear until this stage of the chapter are the difficulties which can be caused by the trade-off between exploration and exploitation. However, the question of how these problems emerge is hitherto not sufficiently discussed. In order to do so the work focuses now in several subsections on specific aspects that influence an organization’s ability to solve the

exploration vs. exploitation trade-off. Therefore in 2.1.2.1 the notion of coevolutionary lock-in is discussed, followed by considerations about adaptive capacity in 2.1.2.2. Finally in 2.1.2.3 organizational routines and their influence on the underlying conflict are addressed more profoundly as it was done in the sections above.

2.1.2.1 Coevolutionary lock-in

The phenomenon of coevolutionary lock-in is in fact a dangerous problem for organizations which leads them into strategic inertia. Its occurrence is significantly depending on the decision between different degrees of explorative and exploitative activities. In a longitudinal study (1987-1998) of the impacts of the strategic policies of Intel Corporation's former CEO Andy Grove, Burgelman (2002) reveals and discusses the reasons that lead to a coevolutionary lock-in situation of Intel and its consequences for the organization.

Under Grove's leadership Intel's great success was based on its microprocessor technology for personal computers. But unfortunately telling the story of Intel's golden years due to the microprocessor business is just one side of the medal of Grove's strategic policy. By the end of Grove's time with Intel the microprocessor business became much harder. While Grove had focused all activities on the exploitation of the microprocessor business, explorative activities were neglected. Therefore there was no proper marketable alternative that Intel could have focused on in order to mitigate the effects of the slowing microprocessor business.

The story of Grove and Intel can be told in a similar way for several other companies that got trapped in a situation of coevolutionary lock-in. Burgelman (2002: 326) defines coevolutionary lock-in as "a positive feedback process that increasingly ties the previous success of a company's strategy to that of its existing product-market environment, thereby making it difficult to change strategic direction."

In the Intel case it was the high concentration on the microprocessor business that tied the company to an increasing degree on the PC market. In addition there existed dependencies towards original equipment manufacturers and the Microsoft Corp. that enhanced this effect. And even worse, it seemed like Intel was locked inside a strategy trap while the market was moving on to new worlds, leaving behind the once so important PC microprocessor producer. Albeit Grove realized that Intel got caught in a success trap, the efforts he induced in order to lead the company out of this trap – as long as the company was still in a strong and healthy condition – did not have any great results (Burgelman, 2002). This was possibly also caused

by the fact that in situations of coevolutionary lock-in organizations tend to have large black spots in their observation of market needs. This may happen because they became accustomed to a situation in which they dominate the evolution of a market. But this situation may change and due to the narrowed view of an organization that is trapped in a coevolutionary lock-in situation, the organization risks failing to respond early to revolutionary changes that may make their business obsolete or much less attractive. Burgelman (2002: 351) finds strong self-reinforcing processes and structures that lead to a sole concentration of organizational resources and activities on R&D projects with exploitative contents and a large neglect and nearly a refuse of non-core business activities and developments.

But interestingly there were a few managers that were able to break through the self-reinforcing exploitation circle, where Intel was trapped in, and figured out a way of developing Intel's competencies in a new emerging product market environment. The efforts to push Intel forward in the PCI chipset business were mostly carried out by "flying under the radar" in order to prevent an early stop of the project because top management forced the allocation of nearly all resources to the core business. The final success of the project not only convinced top management of allocating significant resources to this new business segment but also showed how – as Burgelman (2002) calls them – processes of strategic context determination can act as a circuit breaker of self-reinforcing processes that would lead to imbalances of explorative and exploitative activities and which would therefore endanger the long-term survival of an organization.

The Intel case seems to be one more abundantly clear example of the great difficulties that companies face while trying to balance explorative and exploitative activities. Apparently Intel's lacking ability to adequately evaluate external and new information and its integration and application to commercial ends contributed to the patterns of strategic inertia where Intel was trapped in. Considering this specific problem more closely leads to an analysis of the relation between the exploration and exploitation trade-off and an organization's absorptive capacity as it is carried out in the next section.

2.1.2.2 Absorptive capacity

Considering the exploitation of external knowledge as a significant determinant of innovation processes of organizations, makes it important to recognize that its processing depends on prior related knowledge and absorptive capacity respectively (Cohen & Levinthal, 1990: 128). Absorptive capacity can be defined as a bundle of organizational abilities that are closely related and enable an organization to evaluate, integrate and exploit external knowledge

(Cohen & Levinthal, 1990: 128). Osterloh, Frost and von Wartburg (2002: 957) identify absorptive capacity as the “(meta-) core competency” of an organization through which the generation of core competencies is accelerated and their application to commercial ends is facilitated. Findings of psychological studies suggest that – on the level of individuals – there exists a close relationship between creative and absorptive capacity. Prior related knowledge seems to be an important basis for creativity and the ability to reach new dimensions of cognition (Cohen & Levinthal, 1990).

However, the absorptive capacity of an organization is more than the sum of the absorptive capacities of its members. The organizational absorptive capacity incorporates matters of exchange with the external environment as well as intraorganizational knowledge and information flows. Cohen and Levinthal (1990: 132ff.) suggest that the external as well as the internal communication structures of organizations are critical to its absorptive capacity and need to be effectively and efficiently implemented in order to maintain a sufficient level of organizational absorptive capacity. The tacitness of large parts of the knowledge which is critical to R&D activities (and especially to explorative R&D activities) implies that the acquisition of absorptive capacity is not a simple make or buy problem. Absorptive capacity for certain types of information that are related to contents of tacit knowledge is not purchasable and it usually takes a lot of time (or other resources) to create this type of absorptive capacity in an organization. So again – like e.g. in 2.1.1.3 – the tacitness of knowledge turns out to be a critical dimension of the underlying context. The difficulties that are connected with the tacitness of knowledge and the suggestion of Simon (1985) that both diverse as well as overlapping knowledge structures provide the most fruitful basis for creating organizational (adaptive) capabilities that allow for a high level of innovativeness to an organization, are of importance for the design of the conceptual frameworks presented in 2.3 and 3.3.

Garcia et al. (2003) suggest that the viability of new knowledge as well as the effective application of skills in new technologies depend largely on organizational adaptive capacities. In addition, they consider adaptive capacity as having a mitigating effect on R&D risks. Adaptive capacity is also acknowledged by Lavie and Rosenkopf (2006: 801f.) especially for its enhancing effects on explorative activities. In the context of this work it is of additional special interest that Lavie and Rosenkopf (2006) reveal a positive relationship between organizational adaptive capacity and knowledge generating R&D alliances. High levels of

organizational adaptive capacity facilitate the creation of this type of knowledge-generating alliance (that provide cost and resource saving advantages as will be broadly discussed in 3.2). They enable organizations to enter into knowledge exchange processes with partners and encourage them to search for new ways of knowledge creation through partnerships with sometimes completely new partners. These findings are well applicable and central to the conceptual framework for aligning R&D activities as it is proposed later in this work. So already at this point of the work the importance of adaptive capabilities for an organization, in order to remain successful in a highly competitive market environment, seems to be evident.

In the preceding subsection (2.1.2.1) a lock-in process was described in terms of a company that is trapped in a situation of strategic inertia. Cohen and Levinthal (1990) introduce the notion of organizational lockout. Low initial investments in absorptive capacities in a certain field or technology may lead in the subsequent periods to inertial patterns because the organization is not able to appreciate and exploit new market developments and opportunities. Therefore the organization is locked out of them and of further future market developments. Thus also on the level of absorptive capacity, processes of a self-reinforcing nature can be identified. The conceptual framework presented in 3.3 may offer a solution to this problem. In addition Cohen and Levinthal (1990: 137) state that a high level of organizational adaptive capacities implies a more proactive and tackling behavior of organizations that finally leads to a significantly higher innovation potential.

Apart from coevolutionary lock-in situations caused by strategic inertia and inertial patterns of organizational lockout there is another frequently mentioned potential source of inertia in organizations, the so-called organizational routines. The threats but also the chances that are inherent to organizational routines in the context of the exploration vs. exploitation trade-off are discussed in the following section.

2.1.2.3 Organizational routines

Organizational routines are broadly considered as essential for a sustainable organizational performance and as a source of flexibility for an organization (Feldman & Pentland, 2003). However, organizational behavior that relies heavily on organizational routines can be a significant source of failure. This may be the case if the routines are applied to an inappropriate problem or if the organization is trapped in inertial patterns due to slowly,

marginally changing and backward looking (because they are experience-build) routines (Cohen & Bacdayan, 1994; Levitt & March, 1988).

This work is not supposed to find a final answer to the argument about whether organizational routines are overall change enabling sources for organizations or not. What should become clear, however, are the possible negative and positive impacts of organizational routines on the exploration vs. exploitation trade-off.

Traditionally (cf. Cohen & Bacdayan, 1994; Levitt & March, 1988) organizational routines are considered as contributing significantly to a more efficient execution of organizational tasks and the simplification of a highly complex organizational environment. They are designed as outcomes of organizational learning processes and defined as follows:

“The generic term ‘routines’ includes the forms, rules, procedures, conventions, strategies, and technologies around which organizations are constructed and through which they operate. It also includes the structure of beliefs, frameworks, paradigms, codes, cultures, and knowledge that buttress, elaborate, and contradict the formal routines. Routines are independent of the individual actors who execute them and are capable of surviving considerable turnover in individual actors” (Levitt & March, 1988: 320).

Because of their stabilizing and past oriented properties organizational routines incorporate the danger of competency traps (March, 1991), inappropriate transfer to novel situations and tendencies of rejection towards new developments (Cohen & Bacdayan, 1994). A discussion of organizational routines also comprises the issue (and the problems that are related to this) of tacitness because large parts of the routines are not formalized (Cohen & Bacdayan, 1994; March, 1991). So from the traditional point of view organizational routines seem to be counterproductive towards explorative activities in organizations. Conversely they appear to be supportive towards exploitation by storing collective organizational memories in an implicit and explicit organizational knowledge stock. Thereby exploitative activities are also facilitated.

However, drawing this monochrome picture of the impact of organizational routines on the exploration vs. exploitation trade-off does rather not seem to be modern. There are some more recent suggestions by e.g. Feldman and Pentland (2003) or Feldman and Rafaeli (2002) that should also be considered in order to broaden the view on the properties and impacts of organizational routines. The above mentioned scholars emphasize that the yet existing conceptualization of organizational routines has to be completed through an ostensive and a performative aspect. They understand the notion of organizational routines as “recurring

patterns of behavior of multiple organizational members involved in performing organizational tasks” (Feldman & Rafaeli, 2002: 311). The ostensive aspect of organizational routines can be described as this very part of organizational routines that allows one to identify and specify a routine. Although it is not necessary that the ostensive aspect of routines is non-tacit it frequently is in whatever form explicitly available (e.g. a master that was used for the last report to the board). In addition, the ostensive aspect of organizational routines allows for a differing perception of the routine depending on the respective individual’s understanding. The performative aspect of organizational routines emphasizes the inherent potential of these routines to be adjusted by improvisational actions of the organizational members that face novel situations and problems.³ So the performative aspect of organizational routines allows for variability in the ostensive frame (Feldman & Pentland, 2003; Feldman & Rafaeli, 2002; Feldman, 2000). This variability becomes mainly possible due to the introduction of organizational routines as multi individual involvement schemes. The interdependency of the individual actions that are carried out in an organization assures an adequate level of stability so that the actions still keep the character of routines.

The interplay between the ostensive and the performative aspect of organizational routines can be interpreted as enabling the organization to fall back on a large and reliable source of solution patterns that can be modified by the using entity in order to reach an optimal fit with the always changing problem worlds that organizations face. By recognizing this kind of duality in the nature of organizational routines, it becomes evident that organizational routines are (besides the not negligible negative impacts that they can have) to a certain degree harmonizing with the organizational needs for stability and flexibility whose controversial potential leads to the exploration vs. exploitation trade-off. Therefore organizational routines have to be considered as important determinants that can contribute to a remedy of the dilemma.

In this subchapter a detailed description of the exploration vs. exploitation trade-off as designed by March (1991) was given. This included an enlarged discussion of its importance to a sustainable organizational development. Additionally, several further aspects that appear to be critical to an organization’s innovation policy were introduced. In the following, the discussion and presentation of ambidexterity and punctuated equilibrium as two ends of a

³ E.g. dancing a Tango on a crowded dance floor also forces the dancers to improvise the size of their steps, the dancing figures etc. if they do not want to crash into others, although they still use the steps and figures that are characteristic for a Tango.

continuum serves as a further basis that provides useful tools for the concepts that are developed later in this work.

2.2 Ambidexterity and punctuated equilibrium

This section focuses on ambidexterity and punctuated equilibrium as the dominating diametrically situated strategies for solving an organization's decision problem concerning the right extent and organizational implementation manner of exploratory and exploitative activities. This is an important section of this work because here the first part of the puzzle of solving the productivity dilemma is presented by the general support of ambidexterity. But this work does not support ambidexterity at the organizational level and so in 2.3 the work proposes a new way of understanding ambidexterity by realizing it at an interorganizational level.

This subchapter is organized as follows: In 2.2.1 and 2.2.2 the concepts of ambidexterity and punctuated equilibrium are presented and in 2.2.3 their weaknesses and strengths are discussed and compared to each other.

2.2.1 Ambidexterity

The definition of ambidexterity in the introductory part of this work reveals its underlying idea of a simultaneous execution of exploratory and exploitative activities in an organization. Duncan (1976) who shaped this notion (as well as other scholars who act on the suggestion of duality and significantly enlarge the considerations about this issue) derives the need for an ambidextrous structure from the assumption that an organization has to be able to respond adequately to major sometimes revolutionary (technological) changes and simultaneously to execute its routine decisions and business in a highly efficient manner. This was also discussed and explained in the previous subchapter (2.1).

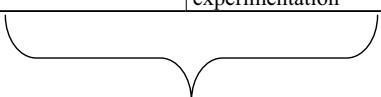
It is interesting to reflect about how the proponents of this approach design their ambidextrous organizational settings in order to avoid the traps and problems that occur in the exploration vs. exploitation context. These problems were also extensively discussed above (2.1). It was stated that there exists some kind of antagonism between the requirements of exploration and exploitation concerning issues like structures, culture, capabilities, resources, etc.. For the purposes of this work one of the clearest and most utilizable specifications of the organizational logic that is inherent to ambidexterity is provided by Benner and Tushman (2003):

“Ambidextrous organizations are composed of multiple tightly coupled subunits that are themselves loosely coupled with each other. (...) Strategic integration – the ability to drive innovation streams and take advantage of contrasting organizational capabilities – occurs at the senior level of analysis. (...) Ambidextrous organizational designs are composed of highly differentiated but weakly integrated subunits. While the exploration units are small and decentralized, with loose cultures and processes, the exploitation units are larger and more centralized, with tight cultures and processes” (Benner & Tushman, 2003: 247).

The structural separation of exploration and exploitation implies a clear separation between the focuses, structures and cultures of the respective units that is only breached through an interconnected senior executive level. It is important to note that the top management level has a key function by linking the different units and deciding on organizational structures, cultures, resources, etc. which is decisive for making ambidexterity applicable (e.g. Smith & Tushman, 2005). In the following it becomes clear that inherent to the critical function of top management in an ambidextrous design is a great potential of failure if top management does not act in the way the concept of ambidexterity supposes it to do.

In Figure 2 the scope of the ambidextrous organization is summarized.

Alignment of	Exploitative units	Explorative units
Strategic intent	cost, profit	innovation, growth
Critical tasks	efficiency, incremental innovation	adaptability, breakthrough innovations
Competencies	operational	entrepreneurial
Structure	formal, mechanistic	adaptive, loose
Culture	efficiency, low risk, quality, customers	risk taking, speed, flexibility, experimentation



Senior team integration, common visions and values, and common senior-team rewards as **linking mechanisms** that are critical to the success of ambidexterity

Figure 2: The scope of ambidextrous organizations

(Source: on the basis of O’Reilly & Tushman, 2004: 80)

O’Reilly and Tushman characterize this ambidextrous structure as allowing for “cross-fertilization among units while preventing cross-contamination” (2004: 77). They state at a conceptual level that through this design it is possible to use synergies (e.g. resource sharing).

Simultaneously it prevents the explorative units of distraction through the different focus, cultures, needs and structures of the exploitative units and vice versa. In the end it is the integration of an overarching element that allows for sufficient autonomy of the business units and thus makes this concept hold (Van Looy, Martens & Debackere, 2005).

This way of reasoning the advantageousness of ambidextrous organizations seems to be as critical as it is simultaneously highly assailable. Therefore in 2.2.3 and 2.3 the discussion comes back onto this issue.

He and Wong (2004) find a positive relationship between ambidexterity and the level of performance. However, it has to be noted that they test only on ambidexterity in general. They do not explicitly consider different organizational design principles that could be chosen for an ambidextrous organization and – as will be explained later (2.2.3 and 2.3) – that could also be considered as influencing the intensity of the impact of ambidexterity. However, there are obviously some kind of synergies between exploration and exploitation that make it worth to find a way of balancing the two activities (e.g. March, 1991). By reducing the intragroup variance-to-mean performance ratio, ambidexterity creates an important synergistic effect that makes it superior to a one dimensional approach (He & Wong, 2004).

Birkinshaw and Gibson (2004) also find a positive relationship between ambidexterity and the business unit performance. This is also supported by the findings of Van Looy et al. (2005) who focus on the overall value creation of ambidextrous organizations compared to focused mature firms. They find that in the long-run ambidextrous organizations outperform focused mature firms because apart from mature activities they can also rely on newly emerging activities. Thus they mitigate the declining performance of mature activities at the end of their life cycle as well as compensate the inferior returns and higher risks concerning new developments. In addition the realization of synergies and a higher flexibility in resource allocation between growing and declining units contributes to an even larger long-term advantage. Furthermore, search scope (which is about the exploration of new knowledge) and search depth (which is about the exploitation of existing knowledge) interact positively with new product development. Therefore several scholars draw their conclusions in favor of an ambidextrous organization that operates with familiar as well as unfamiliar elements (Katila & Ahuja, 2002).

The idea of dynamic capabilities – as proposed by Eisenhardt and Martin (2000) – that incorporate routine behavior and reconfiguration of resources as well as experiential behavior

and new knowledge creation, contains implicitly the idea of an ambidextrous alignment of exploration and exploitation activities. Depending on the market velocity these dynamic capabilities tend to be more exploitation-like in moderately changing environments. In fast changing markets they reveal more explorative properties. Thus in Eisenhardt's & Martin's (2000) concept dynamic capabilities enable organizations to use these capabilities better and earlier than their competitors in order to create resources that are very important contributors to an organization's competitive advantage. Teece, Pisano and Shuen suggest that dynamic capabilities can be considered as "the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments" (1997: 516). Obviously – as it is the case with the exploration vs. exploitation trade-off – there exist several designs of ambidexterity. However, in the end they all can be reduced to the same starting point, the simultaneous execution of explorative and exploitative activities in an organization that contributes to a sustainable development of the organizational success. Nevertheless, the concept of ambidextrous organizations is also still tainted with imperfections. So later in this work (2.2.3 and 2.3) the strengths and weaknesses as well as the extent of applicability of the ambidextrous organizations concept (in whatever "package" it may be designed) are discussed.

Apart from ambidexterity there is another possible solution of the exploration vs. exploitation trade-off that is discussed and proposed by several scholars like Burgelman (2002), Tushman and Romanelli (1994) and Gersick (1991). The so-called punctuated equilibrium can be described as "sequential allocation of attention to divergent goals" (Levinthal & March, 1993: 98). In the following subsection this concept is presented because it seems to be a serious alternative for the idea of ambidexterity. Therefore it should be worth dedicating a few pages of this work to it.

2.2.2 Punctuated equilibrium

In negating the Darwinian gradualism Eldredge and Gould (1972) describe evolutionary processes as consisting of long periods of static states (equilibrium) and sudden, revolutionary and rapid changes which represent the so-called punctuations that lead to the appearance of new species.

Applied to the problem of balancing exploration and exploitation in organizations this means that organizations carry out both activities sequentially. Long periods of highly intensive

exploitation of existing capabilities and technologies are followed by short concentrated exploratory activities that lead to revolutionary changes.

Miller and Friesen (1980) even shape the notion of momentum and dramatic revolution as determinants of an organizational adaptation model. The revolutionary nature of the changes make the outcomes of these punctuations unpredictable and thus create high degrees of freedom because there are no pre-set ends but rather high uncertainties in an organization. The partly disorganized and bursting nature of punctuations leads to changes that can also affect the pillars of established processes and structures. Thereby it possesses the inherent ability to potentially infect all parts of the organization with the virus of change (e.g. Gersick, 1991: Miller & Friesen, 1980). In equilibrium, organizations simply stick to incremental adjustments that should facilitate the treatment of moderate changes in the internal or external environment while remaining major components stable. A limited awareness for possibilities of change, motivational barriers, social pressures and operational advantages of consistency are stated by several scholars as the main reasons for the persistency of equilibria (Gersick, 1991).

Burgelman's Intel-study (2002) was mentioned before and already served a few times in this chapter for a discussion. In connection with the punctuated equilibrium concept it is again very helpful to take a closer look at what Burgelman found. He concludes from the events and developments that he had observed at Intel that it may be a more advantageous strategy for firms if they rely on sequential exploration and exploitation patterns rather than on a simultaneous execution of variation reducing and variation increasing activities (Burgelman, 2002: 354). Consistent with the strong proponents of punctuated equilibrium (e.g. Tushman & Romanelli, 1994) he strongly doubts that an organization is capable of adequately balancing exploration and exploitation. According to Burgelman (2002), in the situation of coevolutionary lock-in that Intel was trapped in (2.1.2.1) only a revolutionary burst in connection with high efforts seemed to be a viable way of breaking the strong inertial patterns.

This way of interpretation is supported by e.g. Tushman and Romanelli (1994) and Gersick (1991) who state that the permanently occurring and persisting inertias are only breakable by punctuated bursts of change. If it is not possible to break them they will finally threaten the organizational success once internal and external changes are too significant to respond to them with incremental changes inside a never changing equilibrium.

After presenting these two major concepts of the alignment of exploration and exploitation that appear (at least at the first glance) to be rather diametric, the work continues with a discussion and comparison of both concepts and outlines its potentials and shortfalls. Thus an adequate view on the concepts is given that allows for a substantial reasoning in 2.3 about which concept and to which extent is favored by this work.

2.2.3 Ambidexterity vs. punctuated equilibrium

The strengths of the respective concept became already quite clear in 2.2.1 and 2.2.2. So the main focus of this subchapter lays on their respective weaknesses and a comparing discussion of the two concepts while their strengths are mainly considered as a supportive mean of discussion.

The punctuated equilibrium concept follows – by stating the advantageousness of a sequential alignment of exploration and exploitation activities (2.2.2) – the idea that there exists a “natural” trend of organizations to get trapped by and by in strong inertial patterns. According to the concept this inertia can only be broken (if a fundamental change is needed due to drastic internal or external changes) by sudden and revolutionary bursts of innovation and organizational change. However, believing that this way of carrying out exploration and exploitation activities will work in most of the cases and for a broad range of organizations seems to be rather naïve. Namely, it is highly questionable whether radical innovations and changes can be developed “on demand” or in very short development periods (and sometimes coincidentally). It surely is possible in some branches or for some products. Nevertheless, to rely on this concept as the major technology and change strategy of an organization does not appear to be generally advisable and representative for the experiences of a lot of companies (Brown & Eisenhardt, 1997). Abernathy and Wayne (1974) for instance report that Ford had to close down its plant for nearly a year in order to develop a new product generation after the success of the Model T rapidly decreased. Although this happened many years ago, it is a very pronounced example for what happens if a company becomes highly specialized over the years; then, the revolutionary burst is simply not possible because the processes, technologies, work forces and management are too narrowed in their focus and therefore they are not capable of providing the essential supportive bases for such a change.

Today’s world does not only ask for refinements or extensions of established products but mostly for radical new concepts that optimally provide at least a temporary possibility for the

inventing firm to escape of highly mature markets. Hence, at present the success of the pure punctuated equilibrium concept seems to be even more questionable.

The Intel case appears to be a very good example of how difficult it is to develop new businesses after long periods of inertia. When CEO Grove realized after a long period of enforced specialization that the microprocessor business was slowing down continuously and that new developments were needed, Intel tried intensively for about many years to develop new business opportunities but did not achieve any real breakthrough. So this shows that it is frequently not possible to develop something radically new overnight.

In addition it seems like a long top management team's tenure and a long firm history make it even more difficult for a company to break out of the equilibrium.

It is therefore questionable if Burgelman (2002), Tushman and Romanelli (1994), etc. are right when they state that there can frequently occur periods of inertia and stability and that these can be broken – if it is needed – by revolutionary bursts. But it obviously is not that easy to induce such bursts that deliver breakthrough innovations “on demand” and under a high pressure for time. The findings of Brown and Eisenhardt (1997) that companies with a successful product portfolio never lose the long-term view on future developments and transitions while unsuccessful companies do not effectively anticipate future concerns support the suggestion that a pure sequential alignment of exploration and exploitation is generally not successful.

Ambidexterity on the other hand tries by means of simultaneous exploration and exploitation efforts inside a specific organizational structure to balance these activities in an organization and through this to avoid the inertia trap. Ambidexterity therefore follows the concept of March and several other scholars (2.1). It supports that in order to guarantee short-term (moderate) success and to avoid long-term failure of an organization (and thus its sustainable development and survival), there has to be a simultaneously balanced execution of exploration and exploitation.

However – as it was already extensively discussed in 2.1 – playing these two games simultaneously is not easy at all.

The coexistence of two organizational blocs that need and consist of differing organizational cultures and forms, management styles and reward systems is a critical feature of an ambidextrous organizational concept. It should by design buffer the two diametric activities (Vinekar, Slinkman & Nerur, 2006).

However, it appears to be very difficult that this is continuously assured by such an organizational structure that in fact has to create “Chinese walls” inside an organization. It is especially questionable if the senior management is able to adequately fulfill the central function of a governing node. Their integrating, communicating, planning and forward looking function is in fact the decisive factor that makes an ambidextrous organizational setting work. Thus top management has to cope with high requirements and challenges. It is quite probable that in many cases senior managers are overburdened with this. Managers need to be able to find success strategies for mature markets. Simultaneously they need skills that enable them to manage the development of new products or services. Within a company it is frequently not easy to find a compromise or agreement on how to allocate resources inside the ambidextrous structures. Internalizing concerns for the needs of explorative and the frequently diametric needs of exploitative activities is a very tough task (Katz 2005; Tushman & O’Reilly, 1996).

P&G for instance was first of all criticized by the analysts for neglecting exploration although P&G was excellent in exploiting existing businesses. After P&G had done a 180°-shift of this innovation policy and had launched successfully several new products, they were criticized for neglecting existing products and brands. Again also the Intel case can be cited (Burgelman, 2002) where Grove was not able to keep a balance between exploration and exploitation but rather drove the company into “a highly focused induced strategy process” (Burgelman, 2002: 327). Finally he was not able to lead the company out of the inertia where it was stuck in.

In addition – as it was already noted in the introductory part – several studies find that exploratory activities seem to be rather unattractive if only short term success is considered to be of importance by the management. Therefore management is tempted to stay with the already known, much more certain and predictable technologies and products (e.g. Hayes & Abernathy, 1980; Leonard-Barton, 1992). This is also due to biases of individuals (so also of the top management) to be risk averse in the gain domain and therefore they prefer to reinvest in exploitative activities because they are less risky than explorative ones (Kahneman & Tversky, 1979). In addition ambidextrous organizations are supposed to perform in a sustainable way but this will generally lead to a short-term underperformance in comparison to more focused organizations (Van Looy, Martens & Debackere, 2005).

Some managers try to push parts of this oversized responsibility package down the hierarchy by decentralizing exploration and innovation through the empowerment of lower hierarchical levels. This is – according to the findings of Siggelkow and Rivkin (2006) – not a viable way of facilitating senior management the fulfillment of their difficult function that an ambidextrous organizational structure assigns to them. Instead, this can lead to a lower overall exploration and weaker firm performances. This is mainly due to an extensive screening by low-level managers who follow only their own interests (that are frequently quite parochial). Therefore they frequently do not report findings to the top management that could otherwise have become a breakthrough if their potential was only identified.

Due to a lack of sufficient quantities of significant and valid empirical data that supports or negates the advantageousness of ambidexterity it is not possible to give a definite final answer to the question if ambidexterity is really favorable in comparison to punctuated equilibrium. Managing the balance of exploration and exploitation is simply too complex and delicate. For instance He and Wong (2004) find that there is generally a possible positive effect of ambidexterity on the organizational performance. Nevertheless, they also have to limit this result due to other findings that lead to the conclusion that extremely high simultaneous levels of exploration and exploitation as well as very low simultaneous levels of these activities do not enhance the firm performance or may even interact negatively. So there is obviously a high level of ambiguity in this balancing problem.

Recapitulatory, it is evident that it can not be stated with certainty and as a general rule if aligning explorative and exploitative activities sequentially or simultaneously is generally more advantageous. But as the result of an analysis of the existing findings, this work proposes the following essential statements:

- ⇒ If organizations want to survive in the long-run they have to exploit existing technologies and explore new businesses.
- ⇒ It is not possible to postpone exploration in favor of excessive exploitation because this will usually lead to strategic inertia that makes it very difficult to reanimate successful exploration (and with it the long-term success).
- ⇒ In supporting the idea and the general need for a balanced simultaneous execution of explorative and exploitative activities while accepting the obvious large problems to keep this balance inside an organization, this work proposes a redesign of ambidexterity in interorganizational network-like settings.

Finally, there is one more idea that appears to be worth being highlighted: Hitherto punctuated equilibrium and ambidexterity were interpreted as two ends of a continuum of the alignment of explorative and exploitative activities. This was never really put into question but it is probably not too presumptuous to challenge this monochrome present picture of the relation between sequential and simultaneous alignment by stating that there are good reasons to assume that punctuated equilibrium is also just another kind of ambidexterity. The sequential alignment of exploration and exploitation at a single organization level could possibly be interpreted as an effort to separate the diametric activities in an effective way without giving up the idea that both activities have to be carried out in order to assure the long-term survival of an organization. The possibility of a concentration on one of the activities and the clearer distance between the two activities is actually a very charming aspect of the concept of sequential alignment. Hence what becomes clear by the design of interorganizational ambidexterity in the next subchapter (2.3) is that it seems to be advantageous to implement explorative and exploitative activities in a certain structural distance of each other (albeit the design still assures a high level of interconnectedness).

So the next subchapter justifies, explains and critically appreciates the approach of situating ambidexterity at a higher level that can in the end include entire populations of organizations and societal levels.

2.3 Interorganizational ambidexterity

The major idea behind the concept of interorganizational ambidexterity is that in order to avoid the above mentioned problems that can occur inside an ambidextrous organization (2.2.3), the entity that is mostly neglected because of its riskier, more uncertain and long-term character – the exploration unit – is extracted from the organizational context and implemented at an interorganizational level.

Gupta et al. (2006) propose an interesting approach that acknowledges basically what is stated in this work concerning the relationship between exploration and exploitation. It is furthermore extended in this subchapter. Testing the performance effects of balancing exploration and exploitation they find the following relationships that are displayed in Figure 3 and 4:

⇒ On a single domain level exploration and exploitation are diametric.

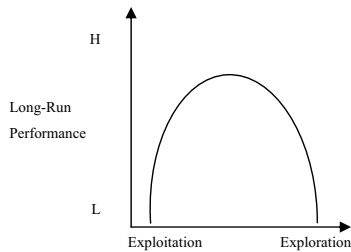


Figure 3: Single domain mutual exclusivity of exploration and exploitation

(Source: Gupta, Smith & Shalley, 2006: 697)

⇒ On a multi domain level there is generally an orthogonal relationship between exploration and exploitation.

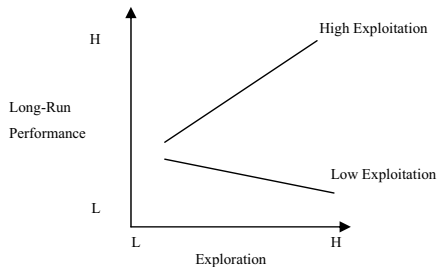


Figure 4: Orthogonality between exploration and exploitation at a multi-level

(Source: Gupta, Smith & Shalley, 2006: 697)

The conclusions of Gupta et al. (2006) are in fact a large progress for finding an adequate way of balancing exploration and exploitation. Through applying their approach it is possible to solve the ambiguous balancing problem by locating where the simultaneity of exploration and exploitation leads to problems and where the positive effects of the ambidexterity come from.

However, in the context of this work, it is important to note that making a distinction between the single domain level and the level of several loosely coupled domains inside one organization can not be considered as sufficient. In most organizations this separation will presumably not adequately mitigate the density of the units so that the balancing problems that were discussed above (2.1) will not occur anymore. The particular problems of an

ambidextrous design that were discussed in 2.2.3 are also not likely to be solved. One main reason is that a simultaneous execution of exploration and exploitation – even if it is situated at a multi-level inside an organization – is still highly endangered to get trapped by inertia, wrong resource allocations, fishy compromises, risk aversion and overburdened senior managers.

Nevertheless, this work proposes an approach where the single domain relations – as depicted by Gupta et al. (2006) – are interpreted as being valid at the single organization level; departing of Gupta et al. (2006), the multi domain orthogonality between exploration and exploitation is supposed here to be rather active in an interorganizational or multi-organizational context. This leads to the assumption that it is effective to apply ambidexterity at an inter-/multi-organizational level. The idea is to leave exploitative activities within the single organization while situating the major explorative activities at an interorganizational level. Herewith the propositions made in this work actually do not differ too much from Gupta et al. (2006) because apart from the idea of single domain mutual exclusivity and multi domain orthogonality the three scholars support the idea of duality combined with specialization. They hereby support the idea of achieving a balance between exploration and exploitation at the level of broader social systems; they recognize that this can be advantageous in comparison to attempting this at the level of individual organizations. They propose a mutual specialization of the participating organizations on either exploration or exploitation and the creation of a balance between these activities by means of a (quasi-)market interface. Hence, the deviation of the concept of interorganizational ambidexterity – as it is proposed in this work – from the propositions of Gupta et al. (2006) consists mainly of the way exploration and exploitation are situated in the interorganizational context. The main reason for the difference is that in the context of this work it is considered as problematic to govern the mutual specialization of organizations via a (quasi-)market interface.

This is also supported by the findings of Miller et al. (2006) and Kogut and Zander (1996) that suggest that organizations are systems which provide a favorable environment for knowledge sharing (cf. 2.1.1.3). For instance it is very difficult, especially for the explorative part, to design adequate but not too restrictive contractual safeguards and to make sufficiently certain predictions of future outcomes. This is also connected with the tacitness of large parts of the knowledge that is acquired and accumulated in explorative units. This tacitness (cf. 2.1.1.3 and 2.1.2.2) will make monitoring as well as the transfer of such knowledge very difficult (e.g. Gilsing & Nooteboom, 2006). As a result companies that are specialized on

exploitation quite presumably fear that they are placed at a disadvantage relative to the exploration focused organizations.

Hence in this work it is supposed that the idea of exploitation at the individual organization level and exploration in a joint unit is a more effective and functional solution of the balancing problem. It is suggested that asymmetries can be avoided which could occur in the case of mutual specialization – as it is proposed by Gupta et al. (2006) – where the exploiting organizations have a disadvantageous position towards exploring firms. Because the design of the organizational think tank approach puts all partners into the same (exploiting) position and gives them the same control and participation possibilities (over the exploring think tank) it is very likely that the disadvantageous asymmetries are avoided. In the end this is rather a matter of clever negotiations and deliberate contractual arrangements if the partnering organizations use these equal chances or not. Additionally the positive effects of single domain specialization and multi domain orthogonality can be utilized to their full extent.

Of course this design is also exposed to similar governance problems like the concept of Gupta et al. (2006); the question what major problems could occur in the context of ambidexterity at the level of broader social systems, how exactly they can be solved and how the particular design of interorganizational ambidexterity as proposed here looks like, is exhaustively discussed in the course of the work.

So at this point it is possible to summarize the reasoning for an approach of interorganizational ambidexterity as proposed here by the following major arguments:

- ⇒ By situating explorative activities at an interorganizational level it is possible for the organizations to share their research risks and they take advantage of a much larger resource pool. Especially the risk sharing aspect seems to be of decisive importance because it spreads the extremely high risk of exploration over the shoulders of all partnering firms. It is therefore well imaginable that this will encourage the organizations to maintain continuously a relatively high level of exploration. This is especially valid for small or medium-sized companies that struggle with the high resource and skill requirements of today's exploration but it is also important for large cooperations (cf. 3.2).
- ⇒ Extracting explorative activities from the single organization context can efficiently reveal senior management. It may also prevent never ending rivalries for resources between the diametric units. In addition an excessive concentration on exploitation due to shareholders' pressure on the management is presumably mitigated.

- ⇒ Every single organization can concentrate on its core capabilities and is able to continue exploiting its existing businesses. The simultaneous explorative activities at the interorganizational level do not disturb the exploitation but are a source of new business or product ideas. This can prevent the organization of being stuck in strategic inertia due to excessive exploitation. Like this it is also possible for incumbent firms to get access to emerging technologies; thus they can get much easier and faster adapted to new commercial and technological challenges (Rothaermel, 2001a & b). In addition the advantageousness of this design can be supported by the findings of Miller et al. (2006) that were presented above (2.1.1.3). Especially the positive effects of decentralization, spatial proximity and dense social networks on exploration could be realized.
- ⇒ The proposed design of interorganizational ambidexterity has the potential to assure reliability and stability. Simultaneously it allows for a sufficiently high level of variability and of updating of the organizational code.
- ⇒ Via the interconnecting exploration node it is also possible to transfer experiential exploitative knowledge that was generated intraorganizationally between organizations; finally by means of interorganizational learning new input can be provided to the intraorganizational learning processes of the other network partners and to their exploitative activities (e.g. Holmqvist, 2004). In addition several scholars find that carrying out explorative activities at a multi organizational level (mainly in alliance relationships) leads to a better R&D performance (Eisenhardt & Martin, 2000).
- ⇒ Furthermore this design acknowledges the need to create structures that allow for the development of large absorptive capacities; this is especially promoted through the network-like setting that allows for a wide range of diverse as well as overlapping knowledge structures (cf. 2.1.2.2).
- ⇒ Situating exploration in a joint unit as a node between organizations in a network-like setting can help organizations to overcome their own ignorance of the long-run, their frequent ignorance of the larger picture and the often occurring ineffective failure identification capabilities (cf. 2.1.1).
- ⇒ Situating (most of) an organization's activities at an interorganizational level and practicing (more or less) pure exploitation at the individual organization level may lead to improved efficiency inside the organization; this may be done through

applying concepts like process management or implementing a largely routinized organizational behavior while simultaneously avoiding their dampening effect on exploration because of its delocalization.

- ⇒ Concerning organizational structures like the matrix approach, it may also be possible to profit of its efficiency and fast short-term innovation enhancing properties without suffering from its detrimental influence on exploration activities due to the extraction of exploration of the matrix structure.

In chapter 2 the underlying problems or conflicts and the most important conceptual pillars of the work were presented and (partly controversially) discussed. This discussion was finally closed by the proposition of interorganizational ambidexterity as a concept that is supposed to serve as a remedy of the exploration vs. exploitation trade-off that offers more problem-solving capabilities than most other concepts. Hitherto interorganizational ambidexterity was only introduced at a rather abstract level. Remaining at the level of such suggestions appears to be not satisfying in order to answer the research questions that were posed in the introductory chapter. Therefore chapter 3 is dedicated to present a more explicit framework of interorganizational ambidexterity. As already mentioned above, the proposed concept is inspired by political think tank concepts. It tries to link this kind of structures to organizational theory in order to create a (as far as possible) clear picture of how a think tank at the (inter-)organizational level in an innovation policy context could look like.

3 Shifting think tanks from the macro- to a meso-level

The problems that are caused by the exploration vs. exploitation trade-off for the innovation management of a firm were extensively discussed in the previous chapter. In addition, it was outlined that the implementation of interorganizational ambidextrous structures seems to have the potential to solve the trade-off in an efficient and effective way. This approach follows the idea to situate exploitation at the level of the individual partnering firms and merging (most of) the explorative activities of these firms in a central unit that acts as focal and mediating center of explorative excellence in an alliance between these firms. The design of this explorative unit is derived from political think tank concepts. Think tanks as private or public organizations that are non-profit oriented are usually a research subject of politically or sociologically interested scholars. Additionally it seems to be very difficult to define exact boundaries between what can be considered as a think tank or not. So without deep-diving into the political think tank theory, the first part of this chapter (3.1) introduces traditional and recent findings on what think tanks are and what role they play in a society; like this a basis is established on which the following considerations concerning organizational think tanks can be grounded. Furthermore it is argued and reasoned that think tanks are in fact agents in the mission of a phenomenon that could be called societal ambidexterity.

And because the wheel does not always have to be entirely reinvented, in 3.2 the work gives a compressed overview over prevailing concepts of the alignment of explorative activities in inter- as well as intraorganizational settings that seem to be relevant and useful in the underlying context. Finally in 3.3 the concept of organizational think tanks is outlined and specified. Additionally it becomes clear why an organizational think tank could be considered as advantageous for solving the exploration vs. exploitation trade-off in comparison to the concepts that are introduced in 3.2.

3.1 Political think tank concepts

In the introductory part it was already mentioned that it is very difficult to specify what a think tank really is. Scholars who do research on think tanks disagree frequently in their understanding of what think tanks actually are. Nevertheless in the following it is attempted to separate the prevailing think tank concepts into a traditional (3.1.1) and a modern stream (3.1.2). This may facilitate the understanding of what the basic assignments and competences of think tanks are and how their present role is interpreted. In 3.1.3 the work contributes the idea of think tanks as explorative units of an ambidextrous society. Considering think tanks

from this perspective may facilitate later in this chapter the understanding of why political think tank concepts and innovation management can be merged into a concept of the alignment of exploration and exploitation activities in organizations.

3.1.1 Traditional think tank concepts

The notion of think tanks has its major historical roots in the USA and it is to a large extent shaped by Anglo-American perspectives and experiences. In World War II the term emerged for about the first time and characterized “secure and ‘sealed environments’ for expert strategists preoccupied with military planning” (Stone, 2001: 15668). In the following decades the term was (and still is) used for a broad range of independent research institutes that do not necessarily concentrate on foreign policy or defense strategies, but on a wide range of economical, political and social issues. Many of them are located in the USA where the particular political structures and environment strongly contributed to a real boost of think tanks (e.g. Braml, 2004; Stone, 2001).

However, it has to be emphasized that there are several varying think tank concepts today, whose differences are mainly caused by different cultural and national traditions and characteristics. Especially the Western view of think tanks as entities that are independent of state or corporate interests is a critical issue that is not considered as a property of think tanks for instance in countries like China or India. However, the following discussion falls back on the Western view or better Anglo-American view of think tanks because this is still the dominating one in literature and think tanks like the Brookings Institution, the Heritage Foundation or the RAND still appear to be the “prototypes” of a traditional think tank.⁴

The problem of finding an exact definition for think tanks was already mentioned above. The even greater difficulties of categorizing think tanks and of placing them neatly into one of these categories also seems to be due to the high variance of organizational think tank structures. However, it is possible to identify a certain pattern of frequently mentioned think tank categories in the literature so it seems to be possible to propose the following typology:

- i. Academic think tanks (universities without students)
- ii. Contract research institutes

⁴ Admittedly it has to be noted that also in the Western world there are significant differences between the applied think tank concepts. For instance U.S. and German think tanks exhibit so great differences that Braml (2004) dedicated large parts of his doctoral thesis to the depiction, explanation and discussion of these differences.

iii. Advocacy think tanks

iv. Party think tanks

Think tanks of the type i) and ii) rely heavily on scientific staff and research methods and emphasize their independency and objectivity in order to be perceived as highly objective and credible. The main difference between academic think tanks and contract researchers appears to be that academic think tanks get mainly and continuously funded by governmental agencies while contract researchers generate their sources of funding through single contracts with governmental and non-governmental entities. Advocacy think tanks as the third think tank type do not consider objectivity and independence as their main properties and participate very strongly in an ideological competition. They are less scientifically oriented and their main focus does not lay on basic research. Political party think tanks as the fourth major think tank type mainly act as the idea pool for political parties and depend in their staffing, agenda-setting and funding heavily on the related party (Weaver & McGann, 2000).

In the following the term think tank refers mainly to academic think tanks and contract research institutes because type iii) and iv) are rather policy and ideology specific and it would be more confusing than helpful to use them for the considerations in the underlying context of this work.

In traditional think tank theory there are several critical roles that are assigned to think tanks (e.g. Braml, 2004):

- Basic research that should contribute to finding solutions for policy problems.
- Assurance of research diffusion.
- Function as agenda-setters or early-warning systems.
- Mediating agents between the private and the governmental sector.
- Application of objectivity and professionalism as major principles in all areas of its work.
- Evaluation of present and future government activities.
- Linking-pin function in issue networks.
- Educating function and high potential or expert pool for policy, business and research domains.

As one result of these think tank specific assignments, think tanks can be characterized as providers of intellectual knowledge that come up with new ideas and place them at prominent places on the public agenda (Stone, 2004). It is therefore rather well understandable that think tanks are often characterized as “future-oriented, reform-minded and outward-looking

organizations” (Stone, 2000: 47). In this function think tanks try to make policy communities, which are stuck in inertia and progress resistance, familiar with new ideas or concepts. Therefore they are often depicted as policy entrepreneurs that act as agenda-setters and early-warning systems that make the results of basic research applicable to the political practice (Cassel, 2000). Like this they want to create and promote innovative concepts and deliberately do not stay in the scientific ivory tower, thus stepping into a mediating function (Osborne, 2004). In this context the finding of Braml (2004: 386) appears to be very interesting that suggests that the highest influence on the research agenda of think tanks have the interests, ideas and proposals of the think tank’s research staff followed by the anticipated (and not the articulated!) needs of policy makers. So it is the think tank (or rather its staff) that sets up the research agenda in a highly independent, undirected and future-oriented way.

Additionally, think tanks facilitate the transfer of ideas as nodes in a network between decision-makers, groups, states, etc. (Stone, 2000).

The media and issue or thematic networks are very important means of communication for think tanks through which they try to promote the ideas and concepts that they consider as important for the political and societal agenda (Braml, 2004; Thunert, 2004). In addition the media visibility of think tanks seems to be important for their funding, particularly through individual and corporate contributions, private foundation support and income from fees and sales (Braml, 2004: 205).

For U.S. as well as German think tanks Braml (2004: 189) finds that their primary products are original applied/policy relevant research as well as synthesized academic and policy relevant research (although the U.S. think tanks are much more oriented on practical questions). Think tanks use as main means of dissemination for their ideas, concepts and findings written publications like reports, books, journal articles, newsletters, etc. or means of personal interaction like conferences, coaching, interviews, hearings, personal advice, etc. (e.g. Braml, 2004).

Briefly summarizing the traditional perception of think tanks, one could characterize them as knowledge producing, research and policy bridging institutions that dedicate the results and aims of their activities to the public (Stone, 2007).

3.1.2 Modern think tank concepts

The discussion about think tanks has to some extent changed in recent years. Today several scholars depart from the traditional view as it was depicted above or complement it through enlargements that accommodate the developments and changes in the international think tank universe. In this sense the prevailing political research on think tanks is considered here to be “modern”. Think tanks are today far more than what was once considered as a think tank in the traditional Anglo-American system. It appears like there is some kind of convergence process on the way between the traditional think tanks and other organizations that makes it even more difficult to define today what a think tank is or not. Weaver and McGann (2000: 8f.) propose – in order to describe and to categorize somehow the ongoing hybridization – that to each of the four think tank categories, that were mentioned above, there could be assigned respective “organizational siblings”:

- i. Academic think tanks and university research centers
- ii. Contract research institutes and for profit consulting agencies/government research organizations/temporary government commissions
- iii. Advocacy think tanks and interest groups/public interest lobbies
- iv. Party think tanks and party research departments

While Weaver and McGann (2000) still propose a continuum between the organizational siblings and their respective think tanks, today the boundaries between these entities seem to be even more blurred⁵ and should possibly be entirely abandoned.

This postulation is in accordance with Stone (2007). She also proposes a stretch of the think tank notion as a reaction to the developments of recent years. Stone (2007) disenchants additionally some other “myths” about think tanks that derive from traditional think tank concepts and that are still maintained in the public opinion. She points at the fact that think tanks are frequently not interested in educating the entire society but that they are much more interested in educating and communicating with (future) elites in order to achieve a realization of their ideas by means of pushing them up into the circles of the real decision-makers. In addition she states that today, knowledge and policy rather act in a symbiotic and interdependent than in a linear way as it is traditionally supposed (2007: 276).

⁵ For example in Germany temporary government commissions have become essential for nearly every serious reform agenda that is set up. In addition the market for policy advice through for profit consulting agencies has strongly grown in recent years. On the other hand many think tanks have to transform themselves to rather profit oriented entities because governmental funding sources are no more reliable and private funding possibilities are still quite limited.

In recent years apart from policy and sociology scholars, even anthropologists, economists and recently organization studies' scholars (Frost & Vogel, 2007) take part in the modern discourse about think tanks.

This work can also be considered as contributing to the modern think tank theory from the perspective of organization studies. Drawing a parallel to the discussion about exploration and exploitation in organizational science, the next subsection introduces the idea of think tanks as agents in an ambidextrous society. It is suggested that they prevent its decision-makers of information overload, inertia and wrong decisions in highly ambiguous and complex situations.

3.1.3 Think tanks and societal ambidexterity

In chapter 2.1 the problems of decision-makers in firms facing a trade-off between explorative and exploitative activities were exhaustively discussed. Chapter 2.2 then discussed prevailing solutions of the dilemma that are provided by organizations theory. Finally in 2.3 it was stated that interorganizational ambidexterity – as a concept that proposes ambidexterity at a multi domain level – generally seems to have the potential for being a very efficient solution to the exploration vs. exploitation trade-off.

In the following it becomes clear that in fact politicians are also trapped in a very similar trade-off and that (modern) think tanks are a solution to the dilemma, that assures the balancing of exploration and exploitation at the societal level – societal ambidexterity.

The evident reasoning why it seems to be viable to apply the concept of ambidexterity on the society appears to be straightforward if one acknowledges that in fact the “management” of a society – which is supposed to be the political elite – faces similar problems at the intra- and international sphere like business managers do, only with the differing shade of politics and macroeconomics.

However, the need for an extraction of explorative activities to specialized entities is created by rapidly growing myriads of information, increasing complexity in political decision problems, high levels of ambiguity and very fragile power relations, societies and economies as well as oversized and overburdened bureaucracies that can not provide adequate analysis and solution finding capacities to political decision-makers anymore; these entities focus on exploring the present and future problems and provide advice to the decision-makers which

would otherwise have to find a solution of the problem on their own (Stone, 2001 & 2004; Weaver & McGann, 2000). Catchwords like demographic change, globalization, wars or global warming are examples for rather unrulable decision problems that cause the support needs of the political elite.

And support is not only needed in these huge problems of essential concern. Already issues that, in comparison to those “big” problems, look rather boring and conventional like the compilation of a (maybe in the future legally binding) corporate governance codex – as recently in Germany and in many other Western countries – is already a far too complex task for the average politician or government and is – at least in the German case – carried out by a commission of specialists that was founded only for this end. The commission is supposed to find mechanisms that can prevent the German economic system of such nasty and disastrous events like the Enron or WorldCom case. Thus the commission serves the government to prevent the society of problems that could endanger its sustainable development and that could not have been adequately solved by the leaders of the country.

Again, the parallel to what was told about the organizational level in chapter 2 seems to be more than obvious. In the previous chapter managers were not able to develop and implement new strategies, technologies and products in order to assure a sustainable organizational success. Analogously it happens very frequently that politicians are not able (or willing) to identify future problems early. It is also difficult for them to develop and implement adequate means to prevent a country of getting trapped in issues like high unemployment rates, low rates of productivity, high trading deficits, insecure and low pensions, a lack of academics and specialists etc. – just to give some examples of what happens if states are trapped in strategic inertia, coevolutionary lock-in and self-reinforcing processes that do not allow for sufficient variability and creativity through explorative activities. It is frequently a complete lack of competency that leads the present political elite to their inability of fulfilling also the exploratory part in a successful and sufficiently intensive way.

Therefore already decades ago think tanks started to take over the explorative assignments of the political elites. The explorative activities are to a large extent extracted onto the level of the think tanks, while the think tanks still stay interconnected with the political elites in network-like structures. In fact one proposition of describing the nature of these network-structure is to outline (in a very rough way) think tanks as nodes in a network between political elites, economical elites, other think tanks (or think tank like entities) and the media (as the gatekeeper to the bigger masses of the society).

As a result of their explorative activities think tanks are able to propose new ideas and innovative concepts that help the society to avoid stagnation and (long-term) counterproductive developments which can be interpreted as “macro”-siblings of the phenomenon of coevolutionary lock-in and strategic inertia that can occur on the “micro”-level of organizations (cf. 2.1). The future-oriented, outward-looking early-warning capacities of think tanks prevent decision-makers of acting only on the behalf of short-term goals and success – which is in fact the same temptation to which senior management is exposed to.

In addition the frequently undirected way of basic research that is carried out by think tanks and that is not a result of a fashion or caused by some politicians that cry out for a particular solution to a particular problem creates a level of variability in the society that allows for adequate updates of the “societal code” and assures like this a sustainable and progressive development of the respective society. It has to be stressed again that think tanks do not want to stay in the ivory tower. Instead, they aim at actively transforming their knowledge to exploitable concepts in order to enhance the probability of their diffusion and proper application in practice. Therefore Frost and Vogel (2007) introduce the notion of an intermediating role between exploration and exploitation that is characterized by them as “the very mission of think tanks” (2007: 8). By systematically transferring their explorative findings to other societal domains that are supposed to exploit the innovative knowledge and concepts think tanks are an essential component that assures the societal ambidexterity.

In a brief summary of this subchapter the following aspects should be emphasized once again:

- ⇒ Think tanks – as mostly independent, non-profit, private or public entities – can be characterized as providers of intellectual knowledge that come up with new ideas and place them at prominent places on the public agenda (Stone, 2004). They are often depicted as policy entrepreneurs that act as agenda-setters and early-warning systems that make the results of basic research applicable to the political practice (Cassel, 2000). They are herewith stepping into a mediating function between exploration and exploitation (Osborne, 2004).
- ⇒ Recent research and findings on think tanks make evident that the traditional think tank notion and its distinctive demarcation towards other organizations that work on knowledge-intensive, explorative issues of societal importance is no more supportable in the traditional way. It should therefore be revised to a broader think tank definition.

- ⇒ This implies an enlargement and a redefinition of the assignments and mission of think tanks that put an emphasis on the think tanks' mediating function between exploration and exploitation. It makes them act as active transformers of knowledge that is developed inside the think tanks and in symbiotic network-like relationships with particular elites, other think tanks or think tank like entities and certain experts (Frost & Vogel, 2007; Stone, 2004).
- ⇒ It is possible to identify a similar kind of exploration vs. exploitation trade-off as it was identified at the level of individual organizations at the societal level. Many societies solve this trade-off in applying a multi-level ambidextrous approach, extracting (most of) the explorative activities onto think tanks that are embedded in interdependencies with several differing organizational domains (Frost & Vogel, 2007).

Transferring these findings about think tanks and about their role in a concept of societal ambidexterity onto the meso-level concept of interorganizational ambidexterity, that was proposed as a viable and efficient remedy to the exploration vs. exploitation trade-off at the micro-level of organizations, is not easy. It implies the delicate matter of transforming structures that accrued from developments and requirements in a society to a context of individual profit minded organizations and their competitive environments.

Before the political think tank concept is applied on organizations, a compressed overview over prevailing concepts of the alignment of explorative activities in inter- as well as intraorganizational settings that seem to be relevant and useful in the underlying context is given (3.2). It helps to analyze how an organizational think tank should be designed and which major implementation and application problems have to be addressed.

3.2 (Inter-) organizational exploration concepts

“Let us create a more efficient IT industry by pushing the efficiency of computers”, this was said by Pat Gelsinger, senior vice president and general manager of the Digital Enterprise Group that is part of Intel Corporation, who outlined like this the spirit of the “Climate Savers Computing Initiative” that is borne up apart from Intel Corporation by other IT players like e.g. Dell, Hewlett Packard and IBM. The initiative yields at saving (starting at 2010) every year 54 millions of tons of carbon through the development of energy saving computers. This is in fact not only some green marketing campaign but it is even more a long-term strategy. In

times of continuously increasing energy costs the IT industry as well as their clients can save every year several billions of dollars by using more energy efficient computers and servers (Krümpel & Jess, 2007).

However, the development of such efficient technologies requires a lot of resources (financial, time, human, etc.), technical expertise and the willingness to take high development risks and the risk that all of this will not be sufficiently compensated by the market because e.g. others will quickly start copying the technology (cf. 2.1). Therefore companies form network- or alliance- like structures in order to e.g. pool resources and limit the individual development risks. The “Climate Savers Computing Initiative” is only one of endlessly more examples that could be given for supporting the (quite common) proposition that it appears to be advantageous for many companies to cooperate in their explorative activities at an interorganizational level.⁶

So as the general advantageousness of such cooperations seems to be straightforward acceptable it is much more interesting to look at the various organizational forms, structures and mechanisms in which they are shaped. Hence the following sections roughly outline several frequently applied cooperation forms as well as some remarkable concepts of exploration alignment inside single organizations that led to (at least short/mid-term) outstanding success stories. Of course it is not only interesting to consider the success factors of these concepts but also their negative effects or disadvantageous properties in order to learn from this analysis what has to be improved by the new structure that is proposed in 3.3 and what should be adopted because it has turned out to be essential for a successful exploration. Therefore first of all exploration concepts that are still situated at the individual organizational level are introduced (3.2.1) followed by considerations at an interorganizational (network like) level (3.2.2). It has to be noted that it is unfortunately inevitable to make selective choices between the vast mass of prevailing concepts in order to keep the breadth of this subchapter adequate to its significance in the context of the entire work. Thus only a few concepts are presented that were chosen under the priority criterion of applicability on the underlying context.

⁶ There is also a very interesting study of product development consultant agencies whose business is the generation of new concepts and solutions carried out by Hargadorn & Fanelli (2002) that shows how for-profit firms act as professional suppliers of new ideas for other companies.

3.2.1 Individual organization level exploration concepts

Companies are in fact not as myopic and ignorant as many scholars aver. A lot of companies have realized that if they want to manage the challenges of their competitive environment successfully, they have to be able to manage the challenge of balancing exploration and exploitation in an ambidextrous setting successfully. In order to avoid the already discussed problems of intraorganizational ambidexterity several companies have developed different intraorganizational approaches to deal with the productivity dilemma. Firstly the broad idea of radical innovation that is projected onto the intraorganizational concepts is introduced. This is followed by a discussion of concrete intraorganizational approaches which should be representative for the respective levels of groups (3.2.1.2), subunits (3.2.2.2) and individuals (3.2.2.3). Later on (3.3) these concepts also serve as a benchmark and inspiration for the design of the organizational think tanks.

3.2.1.1 Radical innovation

When Leifer, McDermott, O'Connor, Peters, Rice and Veryzer published their book on radical innovation in 2000, it was a result of a six years lasting research project that tried to describe and analyze innovation policy patterns that were prevalent since several years (and partly still are) in varying companies⁷ of different industries. So in fact they did not come up with something new but they were the first who systematically painted a clear picture of this prevalent innovation philosophy including its chances and weaknesses. So before looking at a subset of concrete designs of such intraorganizational solutions, the following description and discussion of the radical innovation concept should clarify its importance and reasonability. It is suggested that in a way the radical innovation concept acts as an innovation philosophy which is projected onto and materialized through concrete concepts of the alignment of an organization's research activities.

Radical innovation projects yield at exploring completely new products, services or capabilities. In addition they can try to radically improve (> five times) known products, services or capabilities including radical cost reductions (> 30%) (Leifer et al., 2000: 5). In order to succeed in innovating radically, organizations need a sufficient level of absorptive capacity (2.1.2.2) and the ability to generate new capabilities (Hill & Rothaermel, 2003).

⁷ Air Products and Chemicals Corporation; Analog Devices Inc.; DuPont; General Electric; General Motors; IBM; Nortel Networks; Polaroid; Texas Instruments; Otis Elevator Division of United Technologies.

Radical innovation projects are subject to a long-term, stochastic (and therefore highly unpredictable and uncertain) life cycle that depends significantly on the underlying organizational context and that is shaped by discontinuities (Leifer et al., 2000: 18). It has to be noted that the radical innovation concept incorporates apart from the exploration of technological breakthroughs the management of their successful commercialization. As this is – following the definitions that were made in the introductory part of this work – rather an issue of exploitation, the following considerations focus mainly on the solutions for explorative activities that are provided by the radical innovation concept. Furthermore – as it is discussed in 3.2.2 – the radical innovation concept can be enlarged onto the interorganizational level if incumbent firms recognize the advantageousness of inter-firm networks (e.g. Rothaermel, 2001a & b). Nevertheless in this subchapter only intraorganizational concepts are considered.

While several of the surveyed companies did not have an institutionalized regime of continuously initiated and implemented radical innovation projects, there were some firms who created “innovation hubs” in order to systematically implement the radical innovation concept into the organization (Leifer et al., 2000; O’Connor & Ayers, 2005). In these hubs mostly experienced and highly creative researchers serve as focal idea generators of the organization at the highly ambiguous and uncertain explorative front end of an organization’s R&D activities. Additionally another essential role of the hubs is the identification of business opportunities that arise from the radical ideas and to evaluate their market potential.

There are several ways of implementing these idea generators into a company. Some of them are introduced in the following sections. What these concepts all have in common is that they try to create an organizational environment for the idea generators that assures a strategic momentum for radical innovation and a culture that creates the willingness and ability in an organization to deal seriously with completely new ideas.

One advanced model of the organizational implementation of such an exploratory unit as it was reported by O’Connor and Ayers (2005) as well as O’Connor and DeMartino (2006) resulting from a second phase of the above mentioned research program is illustrated in Figure 5.

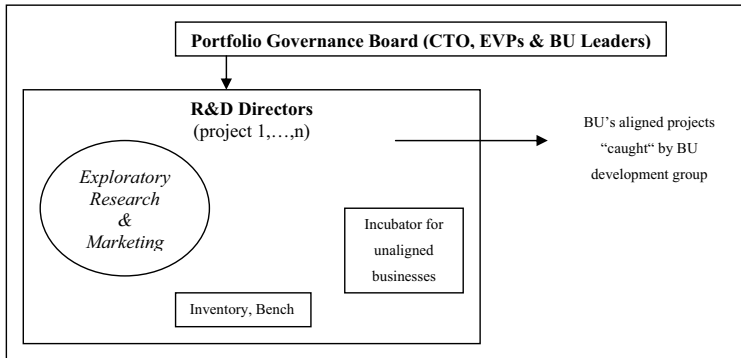


Figure 5: R&D Management System

(Source: O'Connor & Ayers, 2005: 26)

During the research project it was found that while a lot of exploitative innovation happens in the single business units, central research fulfills the role of the generator and developer of radical innovation that will bring the company into new worlds. The exploratory marketing is set up to screen the market for new business opportunities relying and grounding at this on the research and knowledge expertise of the R&D laboratory. So the researchers will not only acquire new ideas from their own inspirations but also from these proposals that are forwarded to and collected in the bench. Like this there is always a filled “pipeline” of interesting projects that can be approached if other projects are dismissed, failed or simply accomplished (O'Connor & Ayers, 2005). The portfolio governance board is the “man in charge” for a successful incubation and alignment of promising projects that have already reached a certain level of maturity and thereby plays a key role for the successful transfer of the innovation to the current markets and business models of the business units (O'Connor & DeMartino, 2006).

So after getting a rough idea of the motivation and structuring of intraorganizational exploration, some prevalent and outstanding concepts of intraorganizational search for radical innovations are presented in the following subsections. In the end (3.2.1.5) some comments on intraorganizational exploration are made that emphasize critical issues. Additionally these comments help understanding the motivation for interorganizational concepts that are discussed in 3.2.2.

3.2.1.2 Skunkworks

In some organizations there exists a rarely scientifically explored way of implementing exploration and exploitation, called skunkworks. They can be defined as teams or groups that are allowed to work on projects with unconventional, experimental methods in order to achieve revolutionary breakthroughs. The group members often have highly sophisticated technological skills, strong entrepreneurial competencies and are sometimes extensively heterogeneous. Skunkworks – that were firstly developed and used by Lockheed Martin – receive high degrees of freedom inside an organization that allows them for sustaining a high variability of their outcomes and a systematic violation of established organizational norms. Usually there exists little or no pressure for an efficient and profitable work execution for these small exploration groups that are frequently strictly isolated from the rest of the organization (Bommer, DeLaPorte & Higgins, 2002; Rich, 1991).

The structural, physical and cultural isolation of the skunkworks is in fact an interesting feature of this way of aligning explorative activities. It arises from the awareness of the management that although ambidexterity is necessary for an organization it also leads to tensions and contradictions between explorative and exploitative activities. These are frequently solved at the expense of a sufficient level of exploration and finally lead to great organizational inertia. Through the isolation of the skunkworks they try to find an intraorganizational solution that helps mitigating the balancing problem and enhancing creativity and the feeling of ownership of the particular project (Bommer, DeLaPorte & Higgins, 2002; Tushman & O'Reilly, 1999). The existing structures and parameters of big companies should not constrain the idea search of the innovative, long-term focused teams (Murphy, 2003). The reintegration and consistency of the explorative outcomes has to be assured by the management. Tushman and O'Reilly (1999) propose the implementation of a clear competitive organizational vision and a mediating and supervising function of the senior management that prevents conflicts between the diametric architectures and assures a certain degree of organizational cohesion.

<p>Box 3: BMW's skunkworks</p> <p>Within the BMW group there exist think tank-like structures that are implemented separately from the other organizational units and equipped with highly qualified staff that has high degrees of freedom. BMW Group Research & Technology is an example of skunkworks that are successfully applied in the car producing industry. Long-term high expertise projects like the development of hydrogen engines are carried out by this special unit of BMW. Another example is the BMW Technik GmbH that allows its staff to carry out 'submarine' projects up to the amount of \$5,000 per engineer until the project has to reach a stage in which a definite decision is made if it should be cancelled or continued. Like this BMW yields at enhancing the company's innovative capabilities.</p> <p><i>Source: Couretas, 1996; Edmondson, 2006</i></p>

So overall it is possible to say that the idea of creating structurally, culturally and physically isolated explorative elite units inside a company is a concept that has already been partly able to assure the successful realization of ambidexterity inside an organization. However, there are not only success stories to tell and there still remain some problems with this concept that have to be solved in order to find a more reliable and more generally applicable concept.

Basically, in connection with skunkworks there are four main areas of concern that can be identified:

- ⇒ The senior management still faces the same enormous integrating function as in the “classical” ambidextrous organization. So the same criticism concerning this issue that was raised in 2.2.3 seems to be still applicable to this approach.
- ⇒ The reintegration of the newly acquired knowledge out of the isolated community into the established company frequently did not work out successfully (Brown & Duguid, 2001).
- ⇒ It is also questionable whether the intraorganizational separation and distance that should be created through the skunk work design is sufficient to prevent self-reinforcing processes and high tensions between exploration and exploitation.
- ⇒ Frequently skunkworks are created for the solution of particular problems or in order to carry out given projects. This way of vectored exploration does not produce enough variability in order to prevent an organization of inertia and coevolutionary lock-in as it was the case in the Burgelmann study (2002).

3.2.1.3 Bell Labs

Eight Nobel Prize winners, far more than 35,000 patents and an impressive range of revolutionary innovations (e.g. the transistor, cellular telephones, laser, C++, etc.) this are

only some of the most outstanding parts of the Bell Labs' track record (Buderi, 1998). This section discovers the success story of the Bell Labs, points additionally at periods of decline and failure that they also went through and tries to draw some teachings out of these events and developments.

Bell Labs were created as the explorative centers of excellence at AT&T (American Telephone & Telegraph Company) already in the beginning of the last century during the tenure of CEO Theodore Vail. At about the time when Vail became CEO of AT&T (1907) the company was in a bad shape. Vail decreed a new strategy for AT&T that contained as one important feature the implementation of an industrial laboratory as supplier of new technologies that were based on internally developed science-based innovations. The academic, free and pure research spirit was a very important component of the Bell Labs concept (Galambos, 1992). Vail recognized that the fundamental innovations that were generated in the labs assured a continuous growth of AT&T. Vail always acknowledged the importance of the long-term oriented explorative research in the Bell Labs and therefore spent 10% of its budget on pure research. On the other hand Vail also promoted exploitative innovation that was also carried out in a separated organizational entity, the Western Electric Company. Like this Vail tried to balance exploration as well as exploitation, new production functions as well as standardization and fundamental as well as adaptive innovations.

However – and this was certainly due to the reasons that were broadly discussed in chapter 2 – this balancing strategy produced also tensions between the adaptive and the fundamental innovation entities (Galambos, 1992). After the monopoly of AT&T was broken up in 1984, the decentralization of AT&T's structures did not only lead to a divestiture of the laboratories into seven regionally operating Bell Labs, but caused also a dramatic decrease of R&D expenditures (Krouse, Danger, Cabolis, Carter, Riddle & Ryan, 1999). The Bell Labs already appeared to be sentenced to death but after several hard years they are back now as trailblazers of a new generation of innovation centers. The Bell Labs are currently part of Lucent Technologies that has chosen an innovation strategy which is situated between corporate development and venture capital strategies. While the Bell Labs are still part of the corporate development, the development of promising ideas outside Lucent in spin-offs is encouraged by a corporate venture company that was founded by Lucent for this particular purpose (Chesbrough & Socolof, 2000). Although less emphasis is put on basic research in today's Bell labs, they are still dominated by an academic culture and a long-term oriented way of doing research. Lucent Technologies also acknowledges this kind of long-term

fundamental research as a kind of insurance for a sustainable development and growth of the organization. However, there are also some critical voices which claim that the new Bell Labs are strongly constrained in their basic research activities and strongly forced to focus on short-term, profit-oriented research and therefore this would finally lead to a self-reinforcing process of concentration onto exploitation that fails to produce the revolutionary breakthroughs that once created the glorious reputation of the labs and that is the insurance for future growth (Buderi, 1998; Gehani, 2003).⁸

So again it can be concluded from the Bell Labs-case that even if the concept of isolated intraorganizational units, which should assure the innovativeness of a company, is implemented, finally there appears again the balancing problem between exploration and exploitation that leads to tensions and counterproductive effects on exploration. Hence it seems that also the Bell Labs concept still reveals room for improvement.

3.2.1.4 Distinguished engineers

Currently it seems that the distinguished engineer approach is frequently applied in practice but did not register substantial attention in the community of management and organizational studies scholars. Therefore the following introduction and discussion of the distinguished engineer concept is based on small case studies (cf. Box 4 and 5) of companies that consider this approach as part and parcel of their innovation policy as well as reports of rather less scientific print and online media. Thereby a more structured understanding of the concept should be given that considers it from an organizational sciences' point of view.

First of all, a clear definition for the distinguished engineer approach as a part of organizational innovation strategy has to be drafted. The distinguished engineer is a formal organizational title that is usually bestowed upon a highly experienced and educated employee in the field of technological/software/network engineering for achieving exceptional merits by creating successful radical innovations. But in fact the idea behind promoting technical workers to distinguished engineers is far more comprehensive than creating simply some sophisticatedly sounding new title. Companies like Microsoft, Sun Microsystems Inc., IBM, Yahoo or Cisco Systems Inc. have recognized that outstanding talents who can be producers of an organization's core competences need to be treated with

⁸ According to e.g. Campbell, Birkinshaw, Morrison & van Basten Batenburg (2003), corporate venturing in the area of innovation is only successful under very particular circumstances. So it seems like this way of structuring R&D activities also incorporates additional problems that could have a negative influence on the optimality of an organization's innovation policy.

outstanding organizational and management solutions. In addition, they also acknowledge the fact that frequently these special individuals compassionately work and dedicate their creativity and skills into the development of new products or services but that they should not get rewarded and will not get motivated by promoting them to a high-level manager. These creative technical workers are frequently not interested at all in a leading position. Often, they feel simply burdened by the responsibilities over human and financial resources and the administrative requirements that are connected to a leading management function. Most of, what they are interested in, is working for and in their small creative worlds and having enough freedom to live out their creative bright minds (Microsoft, 2007a & b).⁹ In addition they can reach a compensation level which is equivalent to director level salaries without being forced to manage people (Rubenstein, 1999). The distinguished engineer function gives them the opportunity to advance and reach more freedom without any managerial obligations.

Box 4: Distinguished engineers at Sun Microsystems Inc.

By creating a group of outstanding elected engineers of a limited number who have the enormous freedom of being allowed to work wherever on whatever project they want, **Sun Microsystems Inc.** has established a tool of considerable and material impact on Sun's innovation potential and leadership. In addition Sun's distinguished engineers transfer their unique (implicit) knowledge to other talented engineers through a well established mentoring program. One mission of the distinguished engineers who work in the Sun laboratories is to think about the "unthinkable" questions and problems. A stable budget, that makes it possible for the research teams to take the high risks and uncertainties of the long-term projects they undertake, is assured through the direct linkage of the laboratory's budget to Sun's operating budget.

Source: Verespej, 1999; Sun Microsystems Corp. (2006 & 2007)

So by establishing the position of a distinguished engineer the organization recognizes the value that this particular person has for the company and that it does not lay in its management abilities but its technical contributions. Like this it is possible to achieve the most optimal and efficient exploitation of the value of these individuals. By giving them a lot of freedom and by acknowledging their efforts through awarding them with a special title, the organizations seem to have implemented a very efficient and effective way of motivating the technical knowledge workers (at least if you can believe their statements about the success of the introduction of the distinguished engineer position). In fact, this is more than just a tool of human resource management; it is a part and parcel of these organizations' innovation policy because the position of a distinguished engineer should create the most optimal environment

⁹ Cf.: <http://research.sun.com/minds/>

for these outstanding individuals to act as creative explorers and successful radical innovators. In addition companies usually require the distinguished engineers to act as a mentor for other talented engineers so like this the company wants to assure fruitful knowledge flow processes inside the organization and to establish a culture of continuous learning. By giving the technical knowledge workers the freedom that they would get in a small start-up firm but by backing them also in their risky projects with the resources of a big incumbent firm, the companies try to bind the strongly haunted talents.

Box 5: Distinguished engineers at IBM

With the creation of the distinguished engineer position in 1963, **IBM** implemented a concept that should help to retain and develop its technical high potentials in order to assure a sustainable company growth through innovation. Even in hard times IBM kept this strategy functioning knowing that in the long run it will pay out. In addition IBM takes advantage of the "in-house ripening" of new talents rather than buying talents away from other companies. There is only one higher honor that an engineer can seek to reach at IBM, the IBM fellow. Less than 0.1% of IBM's technical staffs obtain this honor whose implementation is in fact a result of the same considerations that lead to the creation of the distinguished engineer function. What IBM is looking for is technical excellence, personal commitment, a passionate way of working, teamwork and an open and honest dialogue. The distinguished engineers also fulfill an example function for professional integrity and excellence in technical issues. In addition they are considered as the major change agents of the company that have large competences to make their imaginations of how this change should look like come true.

Source: Ladendorf, 2006; Koenig, 2002; Klein, 2006

Sometimes the distinguished engineer honor is used of particular associations, universities, etc. which want to profit from the enormous variety and wealth of engineering knowledge, skills and expertise of their elective members that are also frequently interdisciplinary multi talents. The title is also an award for outstanding alumni. One example is the Association for Computing Machinery whose members are the world's leading heads of research labs, universities and industries. In order to become a member of this association the candidate has to pass through a demanding filter process that assesses his or her skills, potentials, weaknesses and strengths (ACM, 2006 & 2007).¹⁰

However, there is also at least one large drawback to this concept that should be outlined. What happens if one or even an entire team of distinguished engineers is lured away by a

¹⁰ For further information see:
http://www.acm.org/awards/distinguished_member_nom_guide.html

competitor or simply by another company that also searches for bright technical minds? The company is not able to tie these talented people forever to the organization. The example of Marc Lucovsky who was a distinguished engineer at Microsoft and who was responsible for a lot of important key innovations and elements illustrates that even such a company veteran does not feel indefinitely bounded to a firm. After 16 years he left Microsoft and defected to Google (Foley, 2005). It will certainly not always be possible to compensate the loss of such talents and the question is if mentoring programs and other initiatives to encourage knowledge transfer processes can mitigate the effects of knowledge concentration at certain employees sufficiently. The higher the competition for these outstanding talents, the more likely it becomes that they get lured away and that their turnover raises. So maybe companies have to acknowledge that if these talents are so scarce it might be better to pool them. This is in fact the approach that is followed in 3.3.

3.2.1.5 Comments on intraorganizational exploration

In the preceding subsections it became clear that the internal alignment of explorative activities in a mainly isolated manner supports the development of breakthrough innovations and creates small worlds for highly creative researchers. By isolating the explorative activities from the rest of the organization the tensions between explorative and exploitative activities should be eliminated while still maintaining ambidexterity in the overall organization. However, it turned out to be not that easy to eliminate the (already exhaustively discussed) problems and causes of the exploration vs. exploitation trade-off that often made the internal organic growth and renewal strategies fail (O'Connor & Ayers, 2005). Frequently a too strong isolation is also not satisfyingly efficient because the isolation within a single organization would prevent the diffusion of scarce knowledge, resources and skills that is needed in both activities. It does not appear to be possible to keep the explorative unit entirely away from the organizational mainstream.

There are various major reasons to these problems. First, it seems like as long as the explorative unit is still integrated in the organization it is not possible to remove it far enough from the exploitative activities of the firm in order to prevent the negative mutual effects. The finding that the radical innovation activities go at the expense of exploitative processes (and vice versa) is also supported by Petersen, Boer and Gertsen (2004) who carried out a longitudinal case study of a Danish manufacturing company. Second, for less risky exploitative activities it is still easier to get money out of the R&D funding sources than for

the riskier explorative projects with an uncertain outcome that is situated in the far future. In addition the expenses for explorative activities are sometimes unpredictable at the beginning of a project and sometimes in the end turn out to be enormous for the usual company standards (Leifer et al., 2000). Finally, another problem that frequently occurs for exploration projects is the occasionally high turnover of senior management. Due to the long tenure of the projects they need continuous and stable support of senior management during a long time. This is also related to the key function of senior management in ambidextrous organizations. If senior management changes in shorter time horizons than the projects are finished, it frequently happens that new managers want to leave their own fingerprints on the innovation policy and therefore retard ongoing research and support new projects. In the end this leads to several unfinished and only a few accomplished projects (Leifer et al., 2000; O'Connor & DeMartino, 2006).

So obviously incumbents face significant difficulties in implementing successful exploration units within their boundaries (e.g. Zollo & Winter, 2002). Thus it might be instructive to study other forms of explorative alignment, namely interorganizational forms, in order to learn more about their weaknesses and strengths and to analyze if interorganizational networks avoid the problems that occur in intraorganizational settings. Through the consideration of both concepts it is possible to get a broader view on the issue and equipped with these findings it might be possible to create an approach that unifies the strengths and avoids or at least mitigates the weaknesses of both concepts.

3.2.2 Interorganizational level exploration concepts

In a closer consideration of today's organizations and their technological innovation policies it is possible to identify a certain tendency that enhances cooperative behavior between particular competitors. In addition, in some industries it appears to be even unimaginable that one company alone can bear all risks and efforts of creating a technological revolution. Today's great innovations frequently demand for extensive amounts of resources (Bacholle, 2006) and seem to expose the organization to higher uncertainties and coordinative problems than other investment decisions. While the sources of innovation as well as the target markets become more and more globally dispersed, it becomes also much easier to take a free ride by copying others' through laborious efforts developed ideas (Jorde & Teece, 1989). In addition it can also simply turn out to be much cheaper because duplicated efforts can be avoided and the high synergistic potentials of R&D activities could be used (Teece, 1989).

Due to these reasons BMW and Peugeot for instance develop and produce jointly motors. In addition, Peugeot cooperates with six other car manufacturers for the development and production of various models (Spiller & Gassmann, 2007). Highly mature markets with strong competition force organizations to cooperate in order to survive the battle. For instance Samsung and LG Group, who are actually long-time competitors particularly in the flat-screen production, decided recently to form a cooperative alliance that will comprise especially R&D activities, supply management and the exchange of patents in order to eliminate the keen competitors from Japan and Taiwan (Song, 2007).

So obviously firms really expect additional benefits from interfirm (R&D) cooperation. The philosophy that serves as the foundation for this trend is the concept of open innovation and is therefore discussed as the very first subject (3.2.2.1) of this subchapter. This is followed by the introduction to alliance structures and designs as interorganizational network solutions.

3.2.2.1 Open innovation

The notion of open innovation can be defined as “the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively” (Chesbrough & Schwartz, 2007: 55).

In 2003 the concept of open innovation was firstly introduced by Chesbrough (2003a, 2003b, 2003c) who had discovered this way of organizing research activities as being applied of a few companies that had well performed albeit they faced an increasing competition. He proclaims a new era of innovation with porous company boundaries and diffusing ideas. In applying an open innovation approach companies admit that external R&D can also create significant value without condemning internal R&D activities. In a sense open innovation can be interpreted as a company philosophy that promotes an opening of a company’s innovation activities rather than a concrete concept of exploration and exploitation alignment. This philosophy determines in a second step the distinctive way in which exploration and exploitation are aligned. The concept of open innovation can be considered as some kind of extension to the idea of radical innovation. While the radical innovation concept (3.2.1.1) yet focused mainly on intraorganizational solutions for the alignment of exploration and exploitation, open innovation extends the organizational perspective to interorganizational approaches as frequently even more successful and sense-making ways of facing today’s market challenges.

<p>Box 6: P&G's Connect + Develop initiative</p> <p>Procter & Gamble as one of the world's leading consumer products company faces the challenge of an enormous need for fast innovation and significantly shortening product life-cycles. Therefore P&G switched to an innovation strategy that is inspired by the open innovation model of internal and external R&D collaboration. An essential feature of P&G's strategy was the Connect + Development initiative that should support the integration of internal R&D with external units. C+D enabled the company giant to profit from the flexibility of small sized entities. Like this they achieved their given innovation with less financial means. Products like "Swiffer Wet Jet and Duster", "Mr. Clean Magic Eraser", "Olay Regenerist", etc. are successful results of the C+D initiative. Finally more than 50% of the newly launched products of P&G result of external C+D relations.</p> <p><i>Source: Teresko, 2004b; Huston & Sakkab, 2007</i></p>
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Therefore open innovation is introduced at the beginning of this subchapter in order to emphasize the different philosophy that forms the basis of interorganizational exploration concepts in contrast to closed innovation models that underlie concepts like Bell Labs or skunkworks that were presented above (3.2.1). For instance the open innovation philosophy is recently promoted as allowing for using co-development partnerships as a mean of innovation policy. It is therefore quite close to the idea that is proposed in 3.3 (although there are still some significant differences that will become clear later).

Reductions of R&D expenses, higher innovation rates and extended market access are considered to be the major strengths of co-development partnerships. So if these partnerships are well designed and successfully implemented they can leverage the innovation capabilities of the own and of the partner firms significantly. But the delicate matter of designing and implementing such a partnership may also easily fail and affect the organizational success in a negative way. The failure of this business model can be caused for instance by a wrong definition of business objectives for partnering. In addition every company has to define firstly, before entering any partnership at all, which capabilities could be subject to such a partnering and which capabilities are so distinctive and essential to a company that it is not wise to share them with competitors. Therefore Chesbrough and Schwartz (2007) propose that it might be advisable that before entering a co-development partnership, companies carry out a strategic analysis that clusters its capabilities into core, critical and contextual¹¹ in order to

¹¹ **Core capabilities** are key assets that contribute strongly to the competitive advantage of a company and should therefore be very carefully shared although they are also essential to the success of a partnership model.

Critical capabilities are important for product/service success but they are not core; they are presumably most easily and purposefully useable for co-development partnerships.

Contextual capabilities are considered as necessary but not unique complements to the organizational capability set. (Chesbrough & Schwartz, 2007)

find out what partnering potentials exist. Furthermore, Chesbrough and Schwartz (2007) emphasize the importance to analyze as a start what potentials for the mutual exploitation of complementarities between the own and the potential partners' business models exist. The more complementary the business models are the more they subserve a sustainable and fruitful partnership. If business models are not aligned a partnership can undercut and threaten the respective business model of some partner.

Box 7: Open Innovation at toy makers and retailers

Several companies of the toy manufacturing industry and some retailers try to enlarge their search scope for new ideas by means of using professional idea brokers. These brokers collect ideas e.g. for new toys directly from inventors and filters out the promising ones.

Source: Chesbrough, 2003c

The idea of Chesbrough (2003c) is that the opening of an organization's innovative activities acknowledges the high mobility and interconnectedness of today's knowledge workers and assures continuous mutual benefits even for competitors. The idea of mutuality is very important at this because it implies that the connected companies can benefit from the import as well as of the export of knowledge. Like this new ideas can flow into the organization and new ideas flow out e.g. those which can not be exploited by the inventor company but which develop a high commercial value in another company (Chesbrough, 2003a & 2004). In addition open innovation can be an effective risk hedging strategy concerning uncertainties about new markets' needs and technical uncertainties (Chesbrough, 2004).

As was already mentioned in 2.1.2.2 Cohen and Levinthal (1990) emphasize the importance of absorptive capacity to a firm's ability to evaluate, integrate and exploit external knowledge. This determines also the success or failure of an organization's open innovation strategy. In an extension of Cohen and Levinthal's (1990) approach, in a study of U.K. manufacturing industries, Laursen and Salter (2006) shape external search breadth and depth as influencing determinants of the innovativeness of a firm. They find that wide and deep search strategies of these companies have a significant positive impact on their innovativeness but this is not a never-ending game because there seems to be a point where it becomes unproductive and leads to decreasing returns if searching is continued. In addition in early exploration stages openness seems to be more effective. Thus their findings correspond to the findings of Katila and Ahuja (2002) that were already mentioned in 2.2.1.; other scholars like Nelson and Winter (1982) and Levinthal and March (1993) also emphasize the importance of wide and deep search in certain technological and competitive environments.

Finally it seems to be important to note that open innovation does not stand for a complete outsourcing of R&D activities, it even strengthens internal R&D and makes it more valuable (Teresko, 2004b). Existing R&D projects can be inspired by new complementary ideas and it is possible to get access to knowledge and technologies that would be too expensive and time intensive to develop but that support the innovation process enormously (Teresko, 2004a).

Obviously the trend toward an opening of the innovation models of many organizations in differing industries and of differing sizes reveals a contemporary tendency towards cooperative ways of dealing with today's economic environment and challenges as it was already stated in the introductory part of this work. It is now interesting to consider how these interfirm relationships are presently governed, coordinated and designed. As it was already mentioned above there is a vast array of differing interorganizational relationship designs in practice. Within the scope of this work it appears to be more purposeful to concentrate on some major, rough categorization of such cooperative designs in order to keep the following discussion clearly structured and reasonably concise. In the following the interorganizational cooperative structures are considered as networks between organizations. These networks act as vehicles for the coordination of the inter-firm cooperation. In keeping here with Grandori and Soda inter-firm networks are defined as "a mode of regulating interdependence between firms which is different from the aggregation of these units within a single firm and from coordination through market signals (...) and which is based on a cooperative game with partner-specific communication" (1995: 184-185).

As a result of the above discussions cooperation in the explorative sector of technological innovation can be characterized as rather complex in its information and interest structure and as requiring highly differentiated competencies. Therefore the work describes in the following interfirm coordination mechanisms that are classified by Grandori as "proprietary coordination" (2001: 402) and that are supposed to be viable mechanisms for the particular coordinative needs of cooperative settings in R&D and innovation activities (Grandori, 1997). This kind of network structure is well formalized and usually grounded on a proprietary commitment. It is especially well suited to deal with the high uncertainties and the large threat of opportunistic behavior that are prevalent in these kinds of cooperative settings (Grandori & Soda, 1995). So in the following a short overview is given (3.2.2.2) over network(-like) interorganizational structures in general, their properties and their way of functioning of which the interconnected organizations expect certain profits as well as concrete concepts of

interfirm relationships. This discussion can also support at a later point of this work (3.3) an easier comprehension of the particular design of the organizational think tank concept that is constructed and suggested as an efficient and effective remedy of the exploration vs. exploitation conflict in this work. Note that in the following mainly R&D and in particular exploration networks are considered in order to comply with the focus of this work.

3.2.2.2 *Organizational networks as strategic alliances*

The creation of alliances is not only a phenomenon of the recent past but rather a trend that prevails now for about 20 years. For a definition of what a strategic alliance actually is, the work falls back on Jorde and Teece who provide the following definition:

“A strategic alliance can be defined as a bilateral relationship characterized by the commitment of two or more partner firms to reach a common goal, and which entails the pooling of specialized assets and capabilities. Thus a strategic alliance might include one or more of i) technology swaps, ii) joint R&D or co-development, and iii) the sharing of complementary assets (...)” (Jorde & Teece, 1989: 29-30).

R&D alliances expose some particularities in comparison to “normal” alliances that were explicitly pointed out by e.g. Narula (1999).

First, R&D alliances tend to be of a rather short-term nature whereas non-R&D alliances are usually supposed to last for a longer time.

Second, as R&D requires considerable resources, alliances in this area are more often created by larger companies.

Third, the decision about the right location of the R&D facilities is not determined by factors like trade barriers but rather by considerations concerning particular advantageous national innovation systems¹², supply-related factors, etc..

Fourth, due to the particular nature of the outcomes of R&D alliances such as partly tacitness, partly public good characteristics, newness to the market, etc. there are less organizational options for this kind of alliance.

Fifth, the tacitness of large parts of innovation processes, the continuance of acquired competencies, higher learning potentials through the interconnectedness and control of competitors through joint achievement of technological breakthroughs make R&D alliances advantageous in comparison to hierarchical solutions.

¹² National systems of innovation can be defined as “(...) all interrelated, institutional and structural factors in a nation, which generate, select, and diffuse innovation” (Lundvall, 1992: 39).

R&D alliances can be very valuable not only to large cooperations but also to small and medium sized firms who are able to carry out like this the very resource intensive, risky and uncertain exploration even in high quality and very specialized sectors. Better equipment, more highly skilled researchers and more rapid testing are only some of the advantages that R&D alliances can have (Suarez-Villa, 1998). Through interfirm cooperation it is possible for many companies to overcome scarcities of resources and engage in projects and segments that would have otherwise been not realizable for them (Combs & Ketchen, 1999). The risk sharing aspect and the fact that R&D networks often lead to technological breakthroughs that finally increase the corporate shareholder value can also help solving conflicts concerning the exploration vs. exploitation trade-off and corporate governance. A main reason for this could be that shareholders will be presumably more willing to support exploration if the especially high concentration of risk which occurs in connection with exploration is mitigated (Chan, Kensinger, Keown & Martin, 1997).

Hotz-Hart (2000: 434) suggests the following factors as main advantages of interorganizational networks:

- ⇒ Better access to information, knowledge, skills and experience.
- ⇒ Improved linkages and cooperation between network members.
- ⇒ Improved response capacity.
- ⇒ Reduced risk, moral hazards, information and transaction costs.
- ⇒ Improved trust and social cohesion.

The decision whether entering into an alliance partnership is overall advantageous, is not easy for the respective organizations because it incorporates a multitude of not or only very uncertainly or at prohibitive costs quantifiable factors. So it is often also a matter of trust and confidence if an organization decides to join an alliance partnership. Companies that enter into an interorganizational network relation do so in order to jointly achieve a collective yield which sometimes requires a partly subordination of the assertion of their individual organizational interests (Siebert, 2003). In the case of explorative networks this can for instance embody the yield of developing breakthrough innovations that help the network members to face competition from emerging countries or new market entrants. Strategic intentions can be considered as the main drivers for an organization's decision to enter into an alliance relationship (Todeva & Knoke, 2005). Inside the network structures it is possible for

the interconnected members to exchange or get access to knowledge and other resources that otherwise would have been kept back of them. The networks allow for a resource enhancement through multiple-shift usage, accumulation and new joint creation (Sydow & van Well, 2003). The resources that are underlying to the network relations will usually exhibit properties that are specific for the relation and the network. They are quite valuable for the economic success of the network but outside the network structures they are frequently much less profitably utilizable. In addition, networks yield to a large extent at realizing synergies through the mutual usage and disposition of complementary resources (Dyer & Singh, 1998; Sydow & Möllering, 2004).

Box 8: BMW & Mercedes – a premium alliance

Developer, motor specialists and plant managers of **BMW** and **Mercedes** already practice an intensive mutual exchange of experiences since several years. Although on the board level there has only been a decision for the joint development of hybrid motors yet, the present and future market challenges encourage the two premium car producers even more to take advantage of an alliance relationship for instance in the field of development or production. Although BMW and Mercedes as competitors in nearly exactly the same market segments will always try to maintain their brand image as autonomous as possible, the continuously increasing competition through new entrants into the market segment (especially from Japan) made even the higher management open for an intensification of possible alliance activities.

Source: Wihofski, 2007

Already in 2.1.2.3 the importance of organizational routines was outlined and in actual fact this is not only valid in the individual organization but also at the interorganizational level. Interorganizational routines are crucial to the efficient and effective mutual exchange and utilization of the resources that are essential to the success of the network. Furthermore it is important that the member firms of the interorganizational network exhibit a sufficient level of partner specific absorptive capacity (2.1.2.2) in order to facilitate the mutual understanding and collaboration between the network partners (Sydow & Möllering, 2004).

However, in horizontal network settings the member firms still stay competitors, so competition (and as a result sometimes [reasonable] mistrust) is also not entirely excludable of the network. Therefore some scholars like Brandenburger and Nalebuff (1996) shaped and discuss the notion of “coopetition”. The mutual dependencies, the high risks and ambiguities concerning the future success but also the not guaranteed continuation of the network collaboration and the uncertainty concerning the other’s behavior result in some kind of

gamble that every member of the network has to accept; they simply have to rely on their mutual trustworthiness or they are badly advised to become a member of such an interorganizational network (Gilsing & Noteboom, 2006). However, as network structures are usually multi-period games e.g. partner specific investments that bind the partners for a certain time can help mitigating the threat of opportunistic behavior.

As depicted in Figure 6, the interorganizational network concepts that are discussed in the following can be considered as being situated between hierarchical and market solutions to carry out an organization's R&D activities or to profit of other positive effects of interorganizational cooperation like reduced market entry barriers or economies of scale that are outside the main focus of this work. Therefore they are also referred to as alliances as hybrid organizational forms (e.g. Todeva & Knoke, 2005).

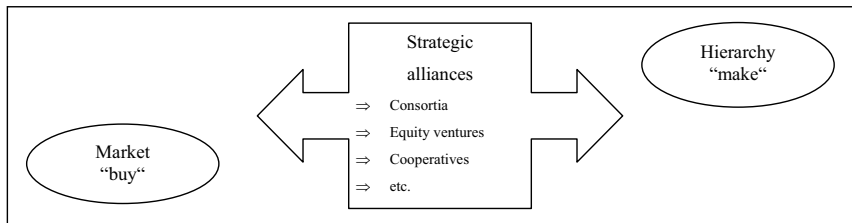


Figure 6: Interorganizational networks – between market and hierarchy

(Source: on the basis of Sydow & Möllering, 2004: 38 & 210)

As a result of the position between market and hierarchy, organizing R&D activities in interorganizational networks implies the application of particular coordinative instruments that are neither entirely attributable to markets (which are mainly coordinated through pricing mechanisms) nor to hierarchies (which are mainly coordinated through directive relations) (Prange, 2003; Siebert, 2003).

Inside the alliance labor can be divided between the respective joining firms according to their particular competencies. The degree of involvement or embeddedness of the members in the alliance may individually vary. The firms remain autonomous although the bilateral dependencies can be considerably strong (Williamson, 1991). Especially alliances which focus on exploration require some kind of focal node inside the alliance network structure that

maintains and assures the trust and equal reciprocity between the alliance partners that can be easily seriously endangered due to the high complexity, ambiguity and uncertainty of the activities (Suarez-Villa, 1998).

The categorization of alliances motivated by a firm's decision to search new opportunities by exploration and leveraging existing capabilities through exploitation alliances was for the first time explicitly introduced by Koza and Lewin (1998). Therefore they propose that exploration alliances are likely to produce learning outcomes by concentrating mainly on the "R" of R&D, while exploitation alliances produce rather performance outcomes of the "D" which are much easier measurable and controllable.

In exploration focused alliances the knowledge of the allied organizations is transferred and absorbed. Therefore Grant and Baden-Fuller (2004: 64) refer to these alliances as "vehicles of learning". Especially incumbent firms tend to enter into an interorganizational relationship in order to overcome inertia and to face radical technological challenges by means of learning from their partners that are frequently new market entrants. The creation of explorative alliances seems to be stronger influenced by the intention of the management to enhance organizational learning while exploitative alliances are a mean of getting access to complementary resources. Rothaermel and Deeds (2004) characterize the creation of exploration and exploitation alliances as interdependent in the new product development process where successful exploration alliances create the potential for fruitful exploitation alliances.

However, the incumbent's management should concentrate on a few but therefore very valuable partnerships and should not become random and underdiversified in their venturing choices because it seems like at some point first the marginal and then the overall gains of additional partnerships start to diminish (Rothaermel, 2001a & b). In addition, the success and likelihood of the creation of an interorganizational partnership seems to be positively related to prior experiences of the respective firm with such cooperations (e.g. Koza & Lewin, 1998).

Todeva and Knoke (2005: 124f.) identify 13 basic forms of strategic alliances that are presently observable. They mainly differ in their degree of integration and the particular formal arrangements: hierarchical relations, joint ventures, equity investments, cooperatives, R&D consortia, strategic cooperative agreements, cartels, franchising, licensing, subcontractor networks, industry standards groups, action sets and market relations. In the

following subsections some of these alliance types that appear to be particularly relevant for the horizontal cooperation in explorative activities are discussed.

Inkpen and Tsang (2005) study inter-firm relationships particularly with regard to the role of social capital. They define social capital as “the aggregate of resources embedded within, available through, and derived from the network of relationships possessed by an individual or organization” (2005: 151). Social capital is an important determinant for the profitability of networks. It enhances for instance the ease of knowledge access and transfer in networks. Social capital can be derived from an individual’s or an organization’s relationship network. In strategic alliances the social network relationships are less dense and stable than in intra-corporate networks. In addition the structures of strategic alliances are usually non-hierarchical. The cognitive dimension of social capital such as shared cultures and goals also differ between the companies to a varying degree. Trust is an important factor of the relational dimension of social capital and also plays a key role for the enhancement and ease of knowledge transfer and sharing.

However, strategic alliances do not always succeed. Larsson, Bengtsson, Henriksson and Sparks (1998) trace this back to the fact that interorganizational learning frequently does not work sufficiently well. They suggest that this happens mainly for reasons of indiscretion and asymmetric knowledge diffusion. These problems can occur due to an insufficiently high level of transparency, strong competitiveness and low partner-specific absorptive capacities. This is in effect a rather concerning aspect because for explorative alliances interorganizational learning is a particularly crucial reason for their very existence; so it has to be carefully figured out by the management how a smooth process of interorganizational learning can be assured. In the particular case of European car manufacturers’ alliances Rosegger (1996) finds that although high cost reductions in the production were achieved by the venturing firms, they ended up in a head-to-head price competition. So sometimes a horizontal cooperation – especially if it also incorporates exploitative activities – can lead to poor margins that offset the beneficial effects of the cooperation. In addition he suggests that especially premium brands are endangered by losing their independent high standard image and therefore their justification for premium prices and comfortable margins. He also reports that high costs of coordination between the partners as well as dissatisfied expectations frequently lead to the failure of alliances. In addition, e.g. Sampson (2007) also suggests that especially knowledge transfer processes and the sharing of knowledge turn out to be

problematic and often dampen the success of a strategic alliance. Rothaermel and Deeds (2004) suggest that exploration as well as exploitation alliances face problems of intellectual property management.

The framework that is proposed in 3.3 might be a viable solution to these problems. However, it is not a matter of three words to specify how exactly interorganizational learning and knowledge transfer processes have to be implemented in the proposed network structure. So in chapter 4 this is treated in a particular subchapter.

Even though the outcomes of exploration are often not transferable via market mechanisms, e.g. Beckman and Haunschild (2002) suggest that inside interfirm networks it is much easier to transfer tacit, complex and diverse knowledge and experiences. Another factor that is essential for the success of such a network is the implementation of adequate governance structures. Especially matters of mutual profit transfer, appropriate distribution of costs and risks, etc. are crucial aspects that have to be explicitly arranged. Furthermore – as already mentioned above – an efficient and effective knowledge governance (including issues like intellectual property management) seems to be crucial.

The former aspects that have to be regulated seem to be to some extent manageable through however natured contractual arrangements and in the following they are not considered to be of major concern for this work because in the end these are rather legal problems that have to be solved.

However, the knowledge governance issues seem to be much more delicate concerning their requirements on organizational or management theory and practice. Usually they are not at all or only at prohibitively high costs ex ante entirely controllable through contracts (e.g. Grandori, 1997). Especially in the case of interorganizational networks that are dedicated to exploring new radical innovations the application of contractual safeguards was found to be problematic (Gilsing & Noteboom, 2006).

However, as an exhaustive discussion of the knowledge governance of interorganizational networks is crucial but departs too much from the context of this subchapter, it is postponed to chapter 4.2. This has the advantage that the specific knowledge governance requirements of the organizational think tank concept (which is introduced in 3.3) can also particularly be addressed.

Interorganizational learning that occurs in these kinds of network structures can enhance also intraorganizational learning. In interorganizational networks that are dedicated to carrying out exploration – as it is the case in the underlying context of this work – the learning outcomes of interorganizational exploration can lead to intraorganizational exploitation. This proposition of Holmqvist (2004) which is also validated e.g. by findings of Suarez-Villa (1998) is in effect an idea which is also implemented in the organizational think tank framework in 3.3.

One instructive conclusion of this section is certainly that apart from the chances and advantages that interorganizational exploration and exploitation network settings provide, they entail very high coordinative requirements. These have to be handled by a capable network management strategy which has to be carried out by experienced and talented managers. The intensive interdependencies that are likely to occur in explorative interfirm networks require much more than simple coordinating, monitoring and control activities. This is due to the fact that the innovation processes that the network firms are jointly working on are far too complex, partly not observable or measurable, very specific and sometimes ambiguous (Gilsing & Noteboom, 2006). Instead of the general bureaucratic coordination and control mechanisms, more flexible and innovative means of coordination are needed and frequently only rather incomplete contractual arrangements can be made. Partner-specific communication, interorganizational routines and absorptive capacity, integrating actors and interfirm authorities, planning or problem solving communities, circles or information systems as well as mechanisms like property-right sharing are some of the major coordinative tools that could be applied to the knowledge intensive explorative interfirm networks (Dyer & Singh, 1998; Grandori, 1997; Mahnke, Pedersen & Venzin, 2005). Density of the interconnected partners also seems to be a mean of reducing the probability of opportunistic behavior (Gilsing & Noteboom, 2006).

So after getting an idea of what strategic alliances actually are and what crucial factors have to be considered in order to assure their success, the following subsections give a rough overview over some forms of strategic alliances that dominate the prevalent interorganizational cooperation practice.

Joint ventures

In this section research joint ventures are the main focus of the work. Caloghirou, Ioannides and Vonortas (2003: 2) define them as follows: “Organizations, jointly controlled by at least two participating entities, whose primary purpose is to engage in cooperative research and development.” So in general research joint ventures carry out explorative as well as exploitative activities but sometimes they also serve only one of these purposes. Joint ventures can imply an equity commitment of the partnering firms which “bring given assets to an independent legal entity and are paid for some or all of their contribution from the profits earned by the entity, or when a firm acquires partial ownership of another firm” (Hennart, 1988: 361) but they can also be formed as non-equity ventures which are usually created through contractual arrangements like e.g. licensing. In an extensive study Caloghirou and Vonortas (2000) find that firms accede research joint ventures for reasons like the creation of new relationships, the achievement of resource and skill access, learning and remaining cutting-edge of new technological developments. Joint ventures often have only a short-term character and are created at a multinational as well as a domestic level between firms that may considerably vary in their size (Wassink & Carbaugh, 1986). This organizational form is also frequently chosen if a small innovative start-up firm searches for capital in order to realize its research outcomes and large companies search for new innovative ideas (e.g. IBM’s engagement with Intel).

Innovation venturing yields at value creation alongside the existing functions and partly induces a participation of the venture capital industry. The GameChanger program which was set up by Royal Dutch/Shell Group is an example of such a research joint venture that yielded especially at exploration by spending 10% of the technical budget on venture investments. Promising ideas of these ventures were financially supported, their progress observed and finally adopted by the company (Campbell, Birkinshaw, Morrison & van Basten Batenburg, 2003).

Rölller, Siebert and Tombak (2007) state that there are certain conditions which promote the creation of research joint ventures, namely free-rider problems through R&D spillovers, avoidance of duplicative R&D efforts, complementarities between the products that are produced by the potential partnering companies, avoidance of a R&D dominance of large companies which extinguishes the firms with less market power, variations between the

potential partners in their respective R&D focuses and higher price reductions through sharing of cost benefits between the asymmetric firms.

An example for a joint venture that served as a mean for exploitative innovation is depicted in Box 9.

<p>Box 9: New United Motor Manufacturing Inc.</p> <p>In 1984 the New United Motor Manufacturing Inc., called "NUMMI", was founded in Fremont California as a joint venture between Toyota and General Motors. Toyota wanted to test the potential of its production system called TPS in an American work environment while General Motors yielded at learning how to improve its productivity and quality. Today 5.000 people work at the NUMMI facilities where the GM Pontiac Vibe and the Toyota Corolla are produced. NUMMI did not only cause a movement along efficiency-flexibility curve but pushed it even outward.</p> <p><i>Source: Madhok, 2002; Teresko, 2006; Wassink & Carbaugh, 1986</i></p>

Albeit several positive impacts and chances which obviously arise from a joint venture for the partnering firms, also this kind of organizational form is not free of problems. Beside the pitfalls that arise within strategic alliances in general, the problem of destabilization of joint ventures is addressed by scholars like Beamish (1985) or Kogut (1988). The relationship between the parental organizations and the joint venture is found to be not always smooth. A troubled relationship between them, which can finally lead to a dissolution of the joint venture or a change in ownership, is frequently induced by issues of a sufficient degree of autonomy for the joint venture vs. a satisfying level of control for the parental firms. The more coordination with their own activities is required by the parents the more likely such problems occur. Joint ventures that are dominated by a parent can be sometimes less susceptible to this problem. In addition the stability of joint ventures seems to be influenced by factors like the condition of the respective industries, the age of the joint venture and strength of cooperative and competitive forces between the partnering firms. Furthermore, if industry characteristics or strategies change, joint ventures might have to change their character or sometimes become even obsolete (Beamish, 1985; Kogut, 1988).

Other pitfalls that are reported in connection with corporate venturing are a lack of focus in selecting the venture investments, believing that a corporate venture can change the entire organizational culture although it would be better to concentrate on changing in a continuous and specialized way and believing that corporate ventures are an easy solution to all strategic problems (Campbell, 2003).

R&D consortia

In holding with the alliance categorization of Todeva and Knoke, that was mentioned above, R&D consortia can be defined as “inter-firm agreements for research and development collaboration, typically formed in fast changing technological fields” (2005: 125). In comparison to joint ventures R&D consortia exhibit more autonomy and less formalization concerning the interorganizational governance structures. In effect other scholars like Mothe and Quelin (2001) or Doz, Olk and Ring (2000) do not draw such a clear line between joint ventures, R&D consortia and other cooperative forms of R&D activities but nevertheless – with regard to the shape of R&D consortia in practice – the categorization by Todeva and Knoke (2005) seems to be viable and reasonable. Frequently R&D consortia focus on precompetitive, explorative research whose outcomes are usually exploited according to explicit contractual agreements.

The activities of a R&D consortium are not conducted in a centralized facility but dispersed over the partnering firms. In contrast to most joint ventures, R&D consortia are often funded by state subsidies (Mothe & Quelin, 2001). Sakakibara (2002) suggests that in more mature, oligopolistic industries the formation of R&D consortia is more likely to occur due to a facilitated consensus building in oligopolistic environments and because of a greater need for new impulses of the longtime established firms.

Box 10: EUV LLC

The **Extreme Ultraviolet Limited Liability Co.** (EUV LLC) is a consortium that was created in 1997 as an interorganizational collaboration between Intel, Advanced Micro Devices, Motorola and three U.S. Department of Energy laboratories (the Virtual National Laboratory). The main reason for the formation of the consortium was the yield of improving computer chips capabilities by jointly carrying out a research project in the field of advanced lithography. The \$250 million project was triggered by the Department of Energy that was assuring trust and fairness between the partners that were originally not very close in their interests and social relations. The project had a three years time horizon and was contractually arranged through a Cooperative Research and Development Agreement. The relationship was entirely contractually regulated in order to protect the intellectual property of the respective partnering firms. So the EUV LLC had an explicitly defined target and schedule.

Source: Ring, Doz & Olk, 2005

In an empirical study Ring, Doz and Olk (2005) find that R&D consortia usually do not contribute to a further rapprochement of the partnering organizations if the interests and social relationships were not very close before. A lack of a joint vision, too dominating partners and

instable consensuses between the partnering firms are examples for pitfalls that can occur and threaten the success of R&D consortia.

Summing up the most important contents of this subchapter is probably done in a viable and reasonable way by emphasizing briefly again the motivations and chances of interorganizational (R&D) networks. This is done in order to outline once more why it can be advantageous to prefer an interorganizational approach for aligning an organization's explorative (and exploitative) activities in comparison to intraorganizational solutions.

- ⇒ Interorganizational network concepts can be considered as being situated between hierarchical and market solutions to carry out an organization's R&D activities or to profit from other positive effects.
- ⇒ (R&D) alliances can help incumbent firms coping with radical technological changes and allow new entrants for taking risks they could not have taken alone.

Furthermore strategic (R&D) alliances provide the following chances and advantages:

- ⇒ Better access to information, knowledge, skills, new markets and experience.
- ⇒ Pooling of core competencies and exploitation of synergies.
- ⇒ Collection of government subsidies.
- ⇒ Control over competitors.
- ⇒ Increased opportunities for organizational learning.
- ⇒ Economies of scale and scope.
- ⇒ Reduced risk, uncertainty, moral hazards, information and transaction costs.
- ⇒ Exploitation of complementarities.
- ⇒ Improved trust and social cohesion lead to easier transfer and internalization of (tacit) knowledge.

After introducing and outlining the properties, advantages, chances, threats and weaknesses of intraorganizational as well as interorganizational concepts of R&D activity alignment, it becomes clear that the application of both concepts is justifiable although there are still many pitfalls. The next subchapter tries to create a concept that solves the exploration vs. exploitation trade-off by sticking to the advantages of the respective concepts and by trying to avoid their weaknesses which had to be clearly identified before being able to eliminate them.

3.3 Organizational think tanks

Creating a strategic momentum for radical innovation in an open model, that allows for an interorganizational innovation flow and which solves the exploration vs. exploitation conflict through implementing an interorganizational ambidextrous concept of R&D alignment, is the main idea that underlies the conceptualization of an organizational think tank. Nevertheless, the framework also exhibits pitfalls and weaknesses that are partly caused by its interorganizational character. Partly they are also caused by reasons that can be found inside the think tank or the partnering organizations. Although it is argued that these critical issues weight less heavily than those of standard inter- and intraorganizational concepts they should not be neglected. In order to discuss them in an adequate way they are treated in separated subchapters (4.1 & 5.1). So in the course of this subchapter the main focus lays (apart from the explanation of the general design) on the strengths and the advantageous features of the organizational think tank approach.

In the first part of this subchapter (3.1) the structures and properties of organizational think tanks are outlined. This is maybe the most critical and delicate part of this work. It has to merge several ideas, propositions and conclusions that were made in the course of this work in order to create a concept that takes advantage of the positive aspects that were found and avoids the pitfalls and problems that were discussed.

After shaping the framework of the organizational think tank approach, it is presumably more intuitively understandable why it can be advantageous for organizations to choose this organizational alternative in comparison to the prevailing concepts. Therefore in 3.3.2 the organizational think tank concept is contrasted to the intraorganizational alignment of exploration and exploitation, followed by a comparison to interorganizational concepts in 3.3.3.

3.3.1 Organizational think tank structures

In 3.1.3 it became clear that the emergence of think tanks is a result of a similar kind of exploration vs. exploitation trade-off as it was identified for organizations. In the case of political think tanks this trade-off seems to exist at the societal level. Think tanks take over the explorative assignments of the political elites because the political leaders do not have enough capacities, skills and capabilities to balance the exploration and exploitation at the societal level. Like a manager of a single organization they are overwhelmed by their daily business and rarely have time for long-term projections of what is needed in the far future. In

addition the complexities which are connected to (societal) exploration make it sometimes even impossible for politicians to explore successfully because they are usually rather generalists (which is in fact also important because they have to decide on several varying issues) than specialists. So think tanks became explorative nodes in a network between political and economical elites as well as other think tanks. Like this societal coevolutionary lock-in and strategic inertia are prevented by means of transferring most explorative societal assignments to think tanks, while an adequate level of exploitation is still maintained by the other network members like political and economical elites. That way, societies also solve pitfalls that are analogous to the strategic inertia and risk aversion of the management and preferred treatment of the already known technologies that individual organizations face (Smith & Tushman, 2005). At a societal level this is expressed by the inability of the political leaders to push forward radical reform processes because they fear a loss of votes, a possible failure of their policies and very often they are simply not able to imagine or figure out a way to solve a country's problems.

Following the concept of societal ambidexterity, organizational think tanks are nodes in a horizontal network between individual organizations. At this, these functions that accrued from developments and requirements in a society have to be transferred to dimensions of individual profit minded organizations and their competitive environments. In an analogous manner to political think tanks, they are assigned to the following critical functions:

- Basic research that should contribute to the development of radical innovations and technological breakthroughs.
- Assurance of research diffusion (4.2).
- Function as agenda-setters or early-warning systems which maintain a long-term view even if the companies are short-term profit oriented. They also enlighten especially the "blind spots" of the organizations through a deliberate way of exploration without pre-set ends.
- Mediating agents between competitors.
- Application of objectivity and professionalism as major principles in all areas of their work.
- Evaluation of present and future activities of the network members.
- Linking-pin function in issue networks.
- Educating function and high potential or expert pool especially for technical domains.

In applying a multi-level ambidextrous approach, (most of) the explorative activities of the alliance partners are assigned to the organizational think tank. The organizational think tank acts at this as a unifying, mediating and connecting focal node in an interorganizational network. Albeit they are small creative worlds for highly talented and skilled technical workers (that are either externally acquired or come from the network members), they step into a mediating function in which they create and promote innovative concepts. So following Frost and Vogel (2007) and Stone (2004), organizational think tanks act as active transformers of knowledge that is developed inside the think tanks and in symbiotic network-like relationships with particular project partners or specialists. This role of the organizational think tank as mediating network node can be essential for the success of the alliance especially in the case of the high complexity of explorative activities or if the number of network members is large (Suarez-Villa, 1998).

Like think tanks in the modern view, the organizational think tanks (members) are not particularly interested in transferring their knowledge to the entire partnering organizations but to certain key employees or managers. They do so in order to get their ideas realized by making those people understand them who are able to transfer them to the right places in the respective organization (Stone, 2007). Because (most of) the explorative activities of the alliance partners are assigned to the organizational think tank (and therefore heavily depending in it) and due to its function as a knowledge creator, accumulator and transmitter, issues of knowledge governance become critical to the success of the approach. Therefore the pitfalls and strengths of the organizational think tank approach that are connected to the governance of knowledge are separately treated in 4.2.

In contrast to individual organizations that frequently tend to carry out R&D activities which aim at (usually short-term profit oriented) pre-set ends, the organizational think tank is usually not subject to research targets that are set up by the network organizations.

The alignment of the exploratory activities in a position which is central from the interorganizational perspective but decentred in terms of the individual's point of view, is supposed to help avoiding the negative impacts of centralization on exploration (Jansen et al., 2006). Additionally because the explorative activities are not outsourced but still part of a dense social network, the positive influences of such networks on learning (Jansen et al., 2006; Miller et al., 2006) can be exploited as well as those of duality and separated specialization on either exploration or exploitation as reported by Miller et al. (2006).

Isolating the explorative activities of organizations from the exploitative ones and implementing them into a focal point of exploration in an interorganizational network, presumably helps avoiding self-reinforcing processes between exploration and exploitation as well as situations of coevolutionary lock-in and strategic inertia; it is designed to enhance an organization's explorative capabilities while leaving enough space for distinctive profiling in exploitation and commercialization for the respective individual organization. In addition situations of organizational lockout as described by Cohen and Levinthal (1990) should be avoided because the continuous mainly undirected explorative activities of the organizational think tank are supposed to assure that the network members do not fall hopelessly backwards in situations of (suddenly) rapidly changing competitive environments.

The proposed structure yields at supporting the performance and reliability enhancing aspect of organizational learning while avoiding its negative side effects. Brown and Eisenhardt (1997) additionally suggest a positive effect of learning and looking into the future on the profitability of an organization's product portfolio. Thus organizational think tanks presumably have the potential to build an effective and efficient framework that allows for interorganizational ambidexterity.¹³

Thereby the orthogonal relationship between exploration and exploitation which Gupta et al. (2006) suggest to be existent at a multi domain level can be used to full capacity. High levels of exploitation within the domain of the individual organizations combined with high levels of exploration at the level of the organizational think tank will possibly finally induce a high long-run performance. So the idea of interorganizational ambidexterity by means of implementing organizational think tanks in interorganizational networks yields at reaching a sufficient isolation of explorative and exploitative activities while simultaneously still maintaining an open structure that allows for smooth knowledge diffusion and mutual profits that is much more effectively boosted by organizational structures than by market solutions (Kogut & Zander, 1996; Quéré, 2004).

It is assumable that the trade-off between the right degree of standardization and heterogeneity which is related to the conflict between exploitation and exploration can be efficiently solved in the organizational think tank approach. The think tank is encouraged to concentrate primarily on knowledge creation what requires more diversity of knowledge and

¹³ Concerning the properties, strengths and weaknesses of interorganizational ambidexterity see chapter 2.3.

experiences while the exploiting firms can rely more heavily on standardization because this is clearly advantageous for their exploitative and production activities (Argote, 1999).

Figure 7, depicts once more the organizational think tank concept. The organizational think tank who carries out (most of) the exploration activities for all network members A-E is in a continuous mutual exchange relationship of knowledge flows with the network members who carry out the exploitative part of the R&D activities. This relationship is illustrated by the arrows. The network organizations are not restricted to have contact with each other. Maybe some of them are joint members of another alliance or they may also have bilateral connections. However, in the case of a network that is created for the implementation of interorganizational ambidexterity, it is not very likely that for the purposes of the network the companies have to have a lot of direct contact. As they are usually direct competitors they will probably also not wish to be too closely and directly connected. Only these senior managers who are assigned with the negotiations, control, administration, etc. concerning the organizational think tank and the interorganizational ambidextrous network will be connected rather intensively with their counterparts. Therefore the connections between the network organizations are only marked as dotted lines.

However, the exchange and transfer of experiential exploitative knowledge that was generated intraorganizationally is also possible between the network members via the interconnecting exploration node.

The differing sizes of the boxes A-E signify that the partnering companies do not have to have the same size, strength and maturity but can be diverse. Suarez-Villa (1998) for instance even suggests that cooperative outsourcing is advantageous especially for small firms that like this are able to stay small and can continue to concentrate independently on their specialized, high quality operations.

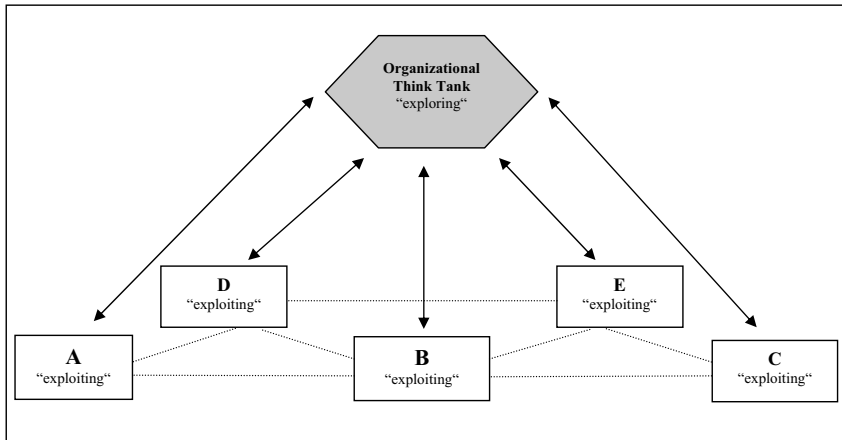


Figure 7: Organizational think tank concept

The network members jointly supply the organizational think tank with resources. In whatever proportion this happens and which contractual arrangements are chosen in order to set up such a network is not considered here because this is rather a question of juridical negotiations and not so much a matter of organizational theory. However, what can be said is that a way of contracting has to be found that leaves enough space for the high uncertainties especially of the explorative outcomes and that the contracts are rather not dealing with contingencies but with resource commitments and regulations concerning the allocation of property rights. If this is assured, the alliance will be provided with governance mechanisms that assure the resource flow and facilitate an open and collaborative interaction of all network partners (Grandori, 2006).

Through the sharing of resource contributions and the pooling of explorative activities, the individual organization can very likely reduce its risk and leverage its explorative as well as exploitative capabilities. Garcia et al. (2003) suggest – considering the individual organizational level – that a successful new product development management implies only a minimal allocation of resources to exploration. This would still prevent the organization of strategic inertia in the long-run and allow for the realization of high short-term profits through a relatively high level of exploitative activities. As explorative research becomes more and more resource intensive in today's world it is strongly questionable if this will really be

advantageous in most of the cases and if it is possible at all for a single organization to maintain explorative activities under such conditions. However, the interorganizational network approach with an exploring organizational think tank as its focal point provides the opportunity to realize this concept because the resource and risk burdens are shared between the network members. Like this the partnering firms can mainly concentrate on exploitation while they are also still profiting of the high level exploration which is carried out in the organizational think tank. So – as already mentioned in 3.2.2.1 – the symbiotic relationships that are created at a horizontal level are a response to the increasing pace of technological change, shortening product life cycles and increasing resource demands of explorative activities which could be depicted as commercial uncertainty (Dickson, Smith & Smith, 1991).

Through risk and resource sharing and the extraction of the explorative activities from the single organization context it could also be possible to mitigate the shareholders' pressure on more exploitation and short-term profits at the expense of long-term oriented sustainable growth.

Research programmes that are “too big” for one company (or even more) can be realized through this cooperation. In addition the think tank is a (at least very likely) not dwindling source of new ideas. The high level of innovativeness which can be realized through this organizational structure is also supported by its diverse and overlapping knowledge structures (Simon, 1985).

The framework also yields at largely relieving senior management of the high coordinative and technical requirements of intraorganizational ambidextrous settings. Senior management's risk aversion and its quite commonly occurring inability to avoid dynamic processes of internal inertia (Smith & Tushman, 2005) presumably could be largely counterbalanced by the implementation of the organizational think tank concept. So in contrast to the intraorganizational ambidextrous concepts like proposed by Tushman and O'Reilly (1996) or Benner and Tushman (2002 & 2003) the advantages of an ongoing simultaneity of exploration and exploitation should be realizable without overburdening senior management and by providing more space and distance to both activities. Nevertheless senior management is still connected and can support the realization of synergies.

As already mentioned in 2.1.1.3 March (1991) finds that a fast learning organizational code and slow socialization of the individuals apart from a certain amount of fast learners would

lead to the highest knowledge equilibrium. This is intended to be realized in the organizational think tank concept where fast learning behavior of the organizational code should be facilitated and enhanced while those individuals that work in the organizations are mostly assigned to tasks that do not require fast learning behavior. On the other hand, inside the organizational think tank there are highly talented and skilled fast learning individuals working. Like this it should also be assured that there is a sufficient level of diversity inside the network that allows for an adequate update of the organizational codes although the negative effects of high variance and diversity are kept out of the individual organization.

Through the implementation of a centre of explorative excellence as focal point that acts as a mediator in an interorganizational network it is possible to merge the advantages of differentiation with those of integration (Grandori & Soda, 1995).

The exploiting organizations should not have to find compromises in their internal organizational structures but choose the one that appears to them as being the best solution for carrying out their exploitative tasks. Therefore matrix structures or process management can be implemented presumably without any efficiency losses due to negative effects on exploration; so the puzzle of the right organizational structure for the individual organization would be solved without having to compromise because of the differing requirements of explorative activities (Van der Panne, van Beers & Kleinknecht, 2003).

The concept of strategic context determination which was applied at Intel (Burgelman, 2002) is considered here to be much more effectively implementable and executable in an organizational setting that concentrates its explorative activities in an organizational think tank inside an interorganizational network. The explorative and exploitative capabilities can become overall leveraged while self-rescinding effects can be effectively blocked. Therefore processes of strategic renewal and efforts to achieve radical breakthroughs would become much easier. In this design exploration is also an institutionalized process which is not interrupted if business is doing well and management thinks that it might be better to allocate all sources to exploitation.

To some extent the functions and purposes of interorganizational networks that are created together with and around organizational think tanks can be compared to national systems of innovation (Lundvall, 1992) but at the level of individual organizations.

In order to outline the properties, advantages and disadvantages of the organizational think tank's the deviation from intraorganizational concepts, the organizational think tank approach and intraorganizational concepts are contrasted in the next subsection.

3.3.2 Organizational think tanks vs. intraorganizational exploration

Proposing the organizational think tank approach as a remedy to the exploration vs. exploitation trade-off is not done with the intention to condemn the prevailing concepts and to create something radically new. It might even appear like the concept does not really contribute anything new at all. This – of course – is not true; there are differences to the other ambidextrous concepts which were deliberately chosen.

Comparing the organizational think tank to skunkworks reveals several parallels. Organizational think tanks are also designed as small creative worlds for highly talented and skilled people who enjoy high degrees of freedom in order to achieve revolutionary breakthroughs.

Although organizations try to isolate their innovating task-forces as much as possible inside the organization, it is not always possible to prevent them of the negative interaction effects of exploitation or myopic pressures on short-term highly profitable incremental innovations inside the organization that may occur towards the exploratory unit.

Another intraorganizational approach, the concept of Bell Labs, induces already an extraction of the explorative unit from the intraorganizational context; nevertheless, the exploring unit still remains subject to the decisions of the senior management of one and the same individual organization and therefore tensions and counterproductive effects of the exploration vs. exploitation conflict still exhibit a serious threat for the organizations explorative activities. In addition today's Bell Labs – which are frequently organized as spin-offs or other venture like organizational forms – are partly forced to create profits which is actually counterproductive for the explorative, long-term oriented and scientific nature of explorative activities.

The organizational think tank, which is based on the idea of interorganizational ambidexterity, appears to be better protected against the tensions and contradictions between exploration and exploitation. The organizational extraction of the explorative activities into the organizational think tank should on the one hand assure relatively clear boundaries between exploration and exploitation so that the explorative researchers will not get restricted and disturbed in their work. On the other hand through the interorganizational contractual arrangements it should be not so easily and fast possible for an organization to allocate resources away from the

exploratory unit; like this a certain level of resource and planning security is presumably assured to the exploratory unit which also really needs this due to the long-term and risky nature of the projects that are carried out.

Through the unification of interorganizational and intraorganizational aspects it is also possible for the organizational think tank approach to profit of the general advantages of network settings; for instance Beckman and Haunschild (2002) suggest that organizations may leverage their learning outcomes by profiting from the experiences of the network partners. This can also lead to decisions that reveal a higher quality. In addition networks may help to manage the transfer of complex information and tacit knowledge – which largely occur in exploration.¹⁴

If explorative activities are carried out by intraorganizational units like skunkworks, senior management has to accomplish an enormous integrating effort in order to assure the right balance concerning the level of exploration and exploitation of the intraorganizational ambidextrous structure. This function is of course not completely extinguished by the organizational think tank approach but nevertheless it can possibly be significantly mitigated due to the presumably more effective isolation, the extra-organizational positioning and the participation of other organizations that also contribute resources, carry risks and support the reintegration efforts of the newly acquired knowledge. In addition experiential learning outcomes can be smoothly transferred via the organizational think tank which could lead also to a significant enhancement of the organizations' exploitation success.

Skunkworks as well as Bell Labs are frequently created in order to solve particular problems. At this the research staff might not be constrained in the means they choose but they will have to reach pre-set ends. This in fact will probably lead to less radical breakthrough innovations because research is too directed. The organizational think tank has by design much more freedom and the undirected nature of its research activities is one important of its characteristics which might make it easier for it to find technological breakthroughs and prevent the network partners of getting stuck inside coevolutionary lock-in or strategic inertia.

¹⁴ For further strengths of interorganizational settings see chapter 3.2.2.

In addition, organizational think tanks also provide talented high skilled researchers with the possibility to advance and reach more (professional and financial) freedom without large managerial obligations. So this approach also incorporates the advantages at which the distinguished engineer concept yields (and it is also not excluded that the position of a distinguished engineer is granted for outstanding achievements to a technical worker of the organizational think tank). Furthermore, the organizational think tank also acts as a high potential or expert pool. Due to its embeddedness in a horizontal network structure the threat that outstanding and heavily replaceable talents get lured away is significantly diminished. In addition, the organizational think tank will usually have a larger pool of human and other resources than individual organization's exploration units and like this it will be easier to compensate the loss of a very valuable person. So it appears like the organizational think tank approach, which is designed to lead to a clear separation of explorative and exploitative activities and an extraction of the uncertain, risky part of R&D away from the individual organization context, provides potentially several strengths in comparison to idea generators which are situated as intraorganizational innovation hubs (cf. 3.2.1.1).

However, in contrast to a complete outsourcing of explorative activities the organizational think tank approach recognizes that certain critical and complex functions like explorative activities need to remain at a certain level of density towards the outsourcing organization in order to facilitate and assure the diffusion of knowledge and ideas (e.g. Beckman & Haunschild, 2002). Therefore the explorative activities remain inside an organizational network. Nevertheless, it is also not a pure network structure because the focal mediating function of the centre of explorative excellence implies more centralization than alliances usually exhibit.

In order to outline why it can be advantageous to propose a structure that deviates of the prevalent concepts, organizational think tanks and interorganizational concepts of exploration activities are contrasted in the following subsection.

3.3.3 Organizational think tanks vs. interorganizational exploration

Although the organizational think tank approach also follows the idea of open innovation and the advantageousness of strategic alliances, it exhibits – as already mentioned above – a higher degree of density and centralization that should make it more advantageous in

comparison to a pure interorganizational approach (e.g. Noteboom & Gilsing, 2006; Sampson, 2007).

Apart from the advantages of interorganizational R&D networks that were already outlined in 3.2.2 the organizational think tank approach is designed to realize also the strengths of intraorganizational solutions (3.2.1). It should even enhance intraorganizational learning through interorganizational spillovers.

In contrast to standard interorganizational settings, the explorative activities are conducted in a centralized facility and they are not dispersed over the partnering firms. Like this, higher transparency through the more centralized structure and the positive effects of the think tank's mediating function should induce less control needs. This should also create more trust between the partnering firms which is positive for the effective creation, transfer and diffusion of knowledge-based capabilities, reduces asymmetric knowledge diffusion and may dampen negative co-opetitive effects (e.g. Bengtsson et al., 1998; Rindfleisch, 2000; Sampson, 2007). In addition the focal mediating network node could balance differing levels of partner-specific absorptive capacities between the partnering firms which therefore do not have to largely build up such capabilities. Similarly even if the partners do not share the same visions and cultures this will presumably not as fast turn out to be a problem as that might happen without a mediating focal point between the companies where the joint activities are carried out.

Overall it appears to be reasonable to state that the high complexity, ambiguity and uncertainty that would otherwise possibly lead to problems in the strategic alliance is presumably effectively mitigated by the organizational think tank (Suarez-Villa, 1998); additionally, the high coordinative requirements of strategic alliances are supposed to be managed in an efficient and effective way which is more flexible than either strict contractual arrangement or bureaucratic structures are. Additionally it is likely that the partner selection becomes less difficult and critical.

Furthermore the organizational think tanks approach is supposed to create more stable alliance structures than standard alliance forms like joint ventures because of the mediating and unifying function of the think tank.

This subchapter (3.3) created a concept that allows for interorganizational ambidexterity as an efficient remedy to the exploration vs. exploitation trade-off through the creation of organizational think tanks. The concept is inspired by the political think tank concepts in the way explorative activities of several organizations are pooled in a centre of explorative

excellence which is implemented as the focal mediating point in the interorganizational network.

In this sense the concept of interorganizational ambidexterity can be understood as a translation of societal ambidexterity onto the individual organization level and vice versa.

On the other hand the organizational think tank approach is not supposed to condemn and extinguish the prevailing concepts of R&D alignments. The framework that is proposed is also the result of an observation and analysis of intra- and interorganizational exploration concepts and of their weaknesses and strengths that were carried out in the course of this chapter. The organizational think tank approach is created in a way that should make it possible to organizations to profit of the numerous strengths of the prevailing intra- and interorganizational concepts and to avoid the weaknesses that were at least partly outlined.

However, also the organizational think tank approach is not free of critical issues that can turn out as having negative effects on the overall success of an organization's (or the network's) R&D activities. Therefore in the following chapter the concept is critically recognized in order to outline possible weaknesses. This follows the idea that if these critical issues are known then it might be possible to find ways to implement specific mechanisms to control their occurrence and individually react on them. At this it is sometimes certainly more advantageous to figure out a tailor-made solution for the respective individual organization or network of organizations because organizations, their structures, properties and activities are so diverse that it is not possible to figure out a general concept which solves all problems of all organizations through one single approach.

4 Critical issues of the organizational think tank approach

In the beginning of chapter 3.3 it was already mentioned that although the organizational think tank approach provides several strengths, which make it likely that this framework can be superior to the existing concepts, there are, nevertheless, critical issues that also have to be discussed and analyzed. Hence, this chapter draws the attention to pitfalls that might be inherent to the organizational think tank approach. In 4.1 the concept is discussed and the most critical remaining issues are outlined. As it was already mentioned in the introductory part, also this concept is no perfect solution to the exploration vs. exploitation trade-off, although it avoids by design several pitfalls that other concepts can not exclude.

Above it was already suggested that knowledge governance seems to be one of the most critical parts of the concept. If the organizational think tank does not fulfill its mediating function and if it is not able to transfer and manage its newly acquired knowledge efficiently and effectively, then it is very likely that the whole framework turns out to be worthless and it does not make much sense to recommend its application and implementation. Therefore, in 4.2, knowledge governance issues are addressed. It becomes clear what the critical points exactly are and which relationships and mechanisms exist that support or prevent smooth knowledge flows.

Finally in 4.3 some recommendations are given that might be helpful for managers who want to create interorganizational ambidextrous structures by creating organizational think tanks. Of course these recommendations can not entirely satisfy the need for advice that might occur in connection with the implementation of a concept that is only roughly specified in order to keep it applicable for a broader range of companies. Nevertheless, they might be some helpful hints that can make the adaptation of the concept to the specific organizational context easier and additionally prevents that through this adaptation critical issues of the concept get extinguished.

4.1 Discussing organizational think tanks

Creating organizational think tanks that are embedded as focal points in interorganizational networks is a potentially viable way of solving the problems that are related to the exploration vs. exploitation trade-off.

However, it may be interpreted as an indication of inferior management if a company has to fall back on organizational solutions that rely on organizational differentiation instead of

internal organic innovation (Schrage, 1999). Especially in intraorganizational settings which induce the creation of isolated “separatist” exploration units this may be a serious argument.

Nevertheless, in the course of this work it became clear that the exploration vs. exploitation trade-off is a result of very complex and ambiguous problem fields. Therefore it seems to be exaggerated to claim that the differentiation of explorative and exploitative units has to be considered as a lack of management ability. The productivity dilemma rather seems to be a phenomenon which is inherent to organizations no matter how great their managers are. In addition it has become clear that today’s innovation challenges are more efficiently solved in interorganizational settings because they create possibilities to benefit of such effects like economies of scale and scope (e.g. Bacholle, 2006). There are several problems which are also not entirely extinguishable by the organizational think tank approach and at which management has to pay close attention. For instance, there are findings which suggest that there might occur a loss of control for smaller firms. This may concern the contents of the explorative activities in the network because the smaller firms might get overruled by (several) larger partners; smaller firms are also more likely to lose significant amounts of strategic autonomy and organizational identity if the dimensions of the alliance and its partners are much larger and rather dominating. This may also lead to less commitment of the employees who might find it difficult under such circumstances to identify themselves with their work anymore (Dickson et al., 1991; Sydow, 2003).

Cultural and organizational discrepancies between the network members may also lead for instance to misunderstandings, disturbed relations, never ending negotiations, less organizational learning, organizational inflexibility, entrenched bureaucracy and conflicting management styles; the more significant and larger these problems are the longer the establishment of the collaboration will take if it will finally be set up and work at all (Dickson et al., 1991). Sometimes it is also argued that joint exploration leads to a dilution of profits. This may be true if management is not able to figure out efficient profit sharing contracts and if collaborations are created where they are actually not really needed. However, it was already exhaustively discussed above that in the underlying context it makes quite often sense to enter such collaborative relations because otherwise the research projects would not be executable, synergies would be realizable or many radical innovations of the high potential pool would not have been made. In such a situation it makes no sense to talk of a possible profit dilution if the alternative would be no profit at all (Dickson et al., 1991; Witzemann et al., 2006). In a network of differing companies there are of course also varying corporate

priorities among the partners. This may also be expressed in different expectations out of the collaboration whereas they are not always obvious and clear to all partners. So this might lead to misunderstandings, increased costs of coordination, difficulties in strategic governance and problems in the network relationships (Dickson et al., 1991; Sydow, 2003; Witzemann et al., 2006).

The so-called “not invented here syndrome” may also become a problem in the organizational think tank approach, as well as in all other approaches which rely on differentiating organizational solutions. The members of the partnering organizations, which are supposed to exploit the findings of the explorative work of the organizational think tank, may reject the innovations. This may not only happen because they fear their newness and possible changes which they may induce in the organization but also because they are suspicious of things which are not “homemade” (Katz & Allen, 1982; Mahnke, 2000). However, this problem seems to be mitigated in the proposed framework in comparison to solutions of complete outsourcing or traditional alliances. One main reason for this might be that exploration is carried out in a central unit which is equally transparent and accessible for all partnering firms. In addition, supposedly every partner will send some of its talents to work in the think tank at least for a certain time so that these employees can act as gatekeepers and mediators that avoid or at least dampen possible rejections of the new ideas and innovations by the employees of their mother firms.

Alam (2003) supports the assertion that interorganizational cooperation is an essential success factor for today’s new product development processes. Nevertheless he doubts (like it is also done in this work) whether the prevailing forms of inter-firm cooperation are sufficient to solve the challenges of the future. He introduces the utilization of consulting engineering firms as a possibility for the companies to maximize their profits of newly developed products. These firms are comparable to the organizational think tank with the difference that they are not embedded in an interorganizational network. They are independent firms that employ highly talented and skilled engineers which aim at finding technological breakthroughs and new product ideas. These ideas and technologies are then sold to individual firms who are stuck in strategic inertia and search for innovative ideas. Alam (2003) finds that firms can significantly leverage their new product development success in comparison to traditional interorganizational approaches by utilizing the services of such consulting engineering firms.

However, it is questionable if this concept is also – overall – more advantageous than the organizational think tank approach. Of course this question is not fully satisfyingly answerable but there are at least some hints which reveal certain tendencies. It is for instance questionable if the utilization of consulting engineering firms enables firms to neglect own exploration efforts and concentrate merely on exploitation. The consulting engineering firms serve several different clients and like this confidential information can be easily transferred to competitors. In addition, it is just a deal if a company buys an idea and the consulting engineering firm usually does not feel especially committed towards a specific firm. So sometimes they can also put them under pressure e.g. that if they do not create the “right” tangible assets they will not be able to guarantee confidentiality. In addition – as will also become more evident in 4.2 – it is very difficult to transfer tacit knowledge via market transactions. But for exploratory activities tacit knowledge is an important success determinant. So in this case it seems to be more advisable to find a solution which allows for a transfer of knowledge via (inter-)organizational governance mechanisms. In addition the consulting engineering concept does not allow for the realization of such advantageous effects like resource pooling, capability enhancement, leveraging of organizational learning potentials etc. that interorganizational networks make possible.

Another competing approach which recently emerged is the assignment of “innovation capitalists”. They “are firms, often with a particular industry expertise, that seek out and evaluate ideas and technologies from the inventor community and other external sources” (Nambisan & Sawhney, 2007: 24). The idea is that these firms continue with the development and refinement of the innovative products or concepts until they reach the stage of readiness for market. They get compensated by participating on the profits that the product finally generates. However, this concept is not likely to provide the strengths that are induced by interorganizational settings. Furthermore the organizational think tank approach does not restrict the supplementary utilization of innovation capitalists, consulting engineering firms or other external sources so in all cases where this appears to be more advantageous to a firm, it is free to use them.

It is also imaginable that one might argue that interorganizational think tanks will not achieve outcomes which are superior to the success of prevalent concepts because the horizontal partners still remain competitors and it would not be very evident that competitors work closely enough together in order to create an alliance which yields at joint exploration in a

think tank which is embedded in a network of exploiting companies. This line of argumentation should not be entirely rejected but – also with regard to already existing horizontal alliances in practice – it does not seem to be very probable that firms do not cooperate so closely in their explorative activities because they fear that they might become too similar in their product ranges. It is not very realistic to believe that one company can very easily substitute another or that such an alliance relationship requires an opening of the respective organization which includes its greatest and deepest secrets (Moore, 2005). And in the end it is up to every single alliance partner how the new idea or technology is exploited which in fact still leaves in most cases large spaces for differences concerning design, pricing, targeting, equipping and other things like that. Sydow (2003) emphasizes also problems of accountability between the partners.

Another concern – which seems to be more significant – is the question whether the extraction of exploration, its implementation at the interorganizational level and a concentration on exploitation by the individual organizations leads in the long-run to underdeveloped absorptive capacities (cf. 2.1.2.2) of the individual organizations concerning the profound understanding of the organizational think tank's exploratory results that should be exploited by the individual organizations. Due to the much more short-term, customer- and profit-oriented nature of exploitation, the researchers that work in an organization's development department become possibly very limited in their absorptive capacities concerning the outcomes of the work of the think tank. If the explorative activities of the network members are centralized in an organizational think tank and the partnering firms build down their corporate explorative units it might become a problem that those researchers in the companies who concentrate nearly exclusively on exploitation do not speak the same language anymore as it is spoken inside the organizational think tank and vice versa (e.g. Cohen & Levinthal, 1990; De Wit, Dankbaar & Vissers, 2007). This may lead to difficulties in the knowledge transfer and diffusion process.

But this is not the only problem that may arise concerning knowledge flows, the transfer and the diffusion of knowledge. If the organizational think tank is not able to carry out its mediating function by solving the problem of knowledge governance in an efficient and effective way, the whole framework is going to fail. Apart from problems of knowledge transfer and diffusion it is frequently reported that alliances suffer serious problems of intellectual property management which also have to be solved in the context of the organizational think tank. The sharing and exploitation of the exploration outcomes as well as

the knowledge input of partnering firms and the experience transfer from one partner to another have to be regulated in order to make the companies trust into this organizational framework (e.g. Fitzpatrick & DiLullo, 2005; Sampson, 2007). Therefore the following subchapter is dedicated to an extensive discussion of knowledge governance issues.

4.2 Knowledge governance

Knowledge is the central dimension of the organizational exploration think tanks. In their situation as nodes in a network of organizations that produce and canalize knowledge flows in the network, an effective and efficient way of knowledge governance is essential for the success of the organizational think tanks. This is a commonality which they have with other knowledge-intensive organizations like consultancies, project development companies, etc. whose main working resource is knowledge (in whatever form). The coordination and organization of the (inter-)organizational processes have to be implemented in such a way that the required knowledge is created, available and applicable in a sufficient magnitude, at reasonable costs, in due time and at the right place (Sydow & van Well, 2003).

Organizational knowledge is incorporated in the employees, the technologies that are applied inside the organization, the organizational structure and its routines, coordination modes and culture (Argote, 1999). Interestingly, Grandori (2001b) finds that the linkage of the network nodes in order to transfer knowledge does not require coordination mechanisms that are significantly different from those which are applied in intraorganizational settings. The results of studies like Dyer (1997) or Dyer and Singh (1999) support this suggestion. So it appears to be possible to conclude that not only intra-firm settings are advantageous environments for knowledge flows (Mahnke, 2000).

The four modes of knowledge generation that were mainly shaped by Nonaka (e.g. 1994 & 2007) and that explain i) socialization (direct sharing of tacit knowledge), ii) the externalization (implicit knowledge is transformed into explicit knowledge), iii) combination (of explicit pieces of knowledge into a new explicit knowledge body) and iv) the internalization (explicit knowledge is transformed into implicit knowledge). These processes are also active in interorganizational networks and can be imagined as a continuously revolving spiral. Especially ii) is of importance for the competitive success of an interorganizational network.

In the case of the organizational think tank approach a smooth knowledge transfer process (e.g. the affection of one network member with the experience of another network unit [Argote & Ingram, 2000]) would assure that the explorative knowledge which is produced inside the think tank is adequately transferred and processed to and by the exploiting network firms. In addition the think tank is to some extent also a mediator which transfers the knowledge which stems from exploitation in the respective partnering firms to all or some other members of the network. Furthermore, the integration of knowledge is central for achieving competitive advantages. Grant (1996) suggests that the efficiency, scope and flexibility of the knowledge integration are important determinants of its successful accomplishment. If knowledge integration is efficient, it utilizes the purposeful parts of individual knowledge to their full extent. Furthermore, the larger the span of utilized organizational capabilities the more difficult it is going to be for competitors to imitate the new knowledge. And finally knowledge integration has to be flexible enough to assure a continuous reconfiguration and renewal of the capabilities in order to achieve sustainable success.

Governing knowledge flows in an efficient and effective way is connected to several challenges which are outlined in the following subsection. Although many of the issues might sound like being self-evident and intuitively manageable, it often turns out in practice that these challenges are more than difficult to solve. Very often they are even not properly recognized by myopic managers. Therefore it seems to be reasonable to have a closer look at them.

4.2.1 Knowledge governance challenges in the organizational think tank approach

Although it is questionable whether disruptions in the knowledge flow occur due to a general knowledge-sharing hostility by the organizational members as it is stated by e.g. Husted and Michailova (2002), it is evident that knowledge flow processes in and between organizations can not be thoroughly considered as smooth and efficient. As already mentioned in 2.1.1.3, organizations are systems that provide a favorable environment for knowledge sharing which is especially relevant in situations of high tacitness of the knowledge involved, ambiguity, complexity, difficult observability and uncertainty. However, the real world of organizations is exposed to the bounded rationality of human beings. Therefore the tacitness of knowledge (cf. 2.1.1.3) and higher degrees of complexity in decision problems lead to difficulties in the knowledge transfer process (e.g. Simonin, 1999). The higher stickiness of tacit knowledge

complicates its transfer even more and especially in the case of an interorganizational knowledge transfer it is the source of significant disruptions (Schulz, 2001).

It is an essential challenge for senior management to find ways of realizing a fit between the characteristics of knowledge and the knowledge transfer mechanisms (Pedersen, Petersen & Sharma, 2003). In order to avoid the negative consequences of a disrupted knowledge transfer, knowledge governance mechanisms such as ownership allocations, implicit and explicit contracts, reward schemes, decision right allocation and other more or less administrative means are implemented by the management. The means of knowledge governance that have to be applied in the case of the organizational think tank approach can in most cases be characterized as hybrid forms between market and hierarchy governance mechanisms (Antonelli, 2006), profiting of the strength of both coordination mechanisms and trying to avoid their shortfalls (Liebeskind, Oliver, Zucker & Brewer, 1996). Like this the costs of creating, sharing and transferring knowledge should get minimized and the coordination of the organizational members' actions should be assured (Heiman & Nickerson, 2002). Contractor and Ra (2002) suggest that the costs of knowledge transfer and the difficulty to evaluate the knowledge rise with the degree of embeddedness of the knowledge while its observability declines. Figure 8 depicts the factors that are related to knowledge governance and which influence it.

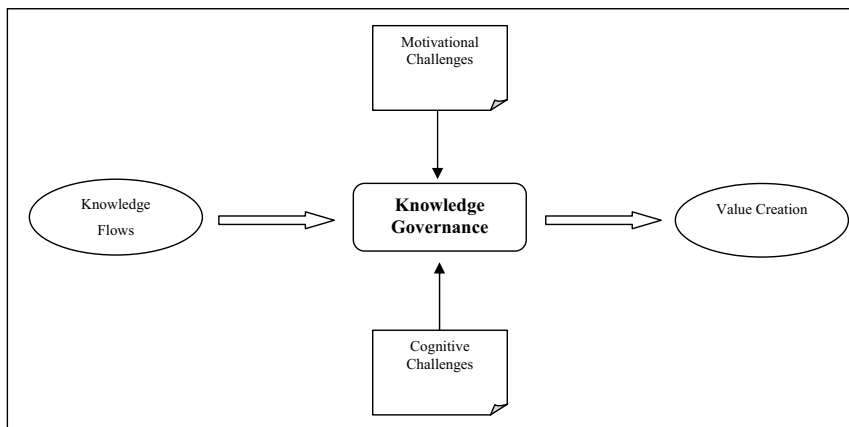


Figure 8: Knowledge governance

(Source: on the basis of Mahnke & Pedersen, 2004)

Cognitive challenges are mainly related to bounded absorptive capacities and lacking dynamic capabilities of the partnering firms. The importance and nature of absorptive capacity was already outlined in 2.1.2.2. So here, it should only be stressed again that concerning the knowledge transfer processes, which take place in the interorganizational network with the organizational think tank as focal mediating node, as well as the mutual understanding and the ability or willingness to transfer and implement new knowledge are essentially dependent on the particular partner and activity specific absorptive capacities (e.g. Cohen & Levinthal, 1990). Thus absorptive capacity can be considered as strongly predictive for the intensity and smoothness of knowledge flows (Mahnke et al., 2005). The mutual relation specific investments that have to be made in order to create relational absorptive capacities, which help transferring particularly tacit knowledge, are a kind of guarantee for the partnering firms for the continuance of the relationship. Freeriders and opportunistically behaving firms would rather not raise considerable amounts of money and resources for such investments (e.g. Mahnke, 2000). In addition the actors do not only have to have the willingness to share knowledge but they also have to be aware of the need to share their knowledge with an individual or an organizational unit. Those who require the particular knowledge also have to be aware of the respective knowledge owing individual or entity (Bouty, 2000). Dynamic capabilities (cf. 2.2.1) are also mentioned by several scholars (e.g. Teece et al. 1997; Zollo & Winter, 2002) as supportive in the process of interorganizational knowledge transfer and learning.

Additionally, there are challenges which are related to questions of an adequate motivation concerning the creation, sharing and transfer of knowledge. These challenges are also relevant in the organizational think tank context because a lot of knowledge that has to be transferred and which results from exploration is complex and ambiguous. This knowledge is frequently embedded in the new technology or product and therefore to a large degree tacit. The transfer of implicit or tacit knowledge is largely dependent on intrinsic motivation while in the case of explicit knowledge this is rather a question of extrinsic motivation.¹⁵ Therefore intrinsic motivation can be considered as one main driver of a successful knowledge transfer in the organizational think tank approach (Osterloh & Frey, 2000).

¹⁵ **Intrinsic motivation** refers to a behavior which is driven by the work or activity content itself as the motivating factor. **Extrinsic motivation** is inducible by incentives which are independent of the work or activity content like pay-for-performance incentive schemes.

In the context of the organizational think tank approach which clearly separates exploitation from exploration inside the network structures the different kinds of knowledge which are required for the respective activity may also cause problems in the knowledge transfer process. Exploration requires mainly specialized knowledge while exploitation applies many kinds of knowledge. Thus the trade-off that has to be solved can be described as the difficulty of the integration of specific knowledge which has to be jointly applied with diverse other kinds of knowledge that should also be utilized to a large extent (Grant & Baden-Fuller, 2004).

Avoiding the unintended and adversarial intended transfer of knowledge are the main aims of an efficient and effective intellectual property management system. It has to be installed because sharing and exploiting the explorative outcomes as well as the knowledge input of the partnering firms and the transfer of experience from one partner to another have to be regulated. Otherwise the firms might not be willing to contribute considerable resources and to cooperate openly (e.g. Sampson, 2007). The jointly developed intellectual property which is mainly situated in the organizational think tank has to be protected and its utilization has to be regulated. This frequently incorporates the conclusion of nondisclosure agreements. In addition agreements of competition suspension are supposed to avoid opportunistic behavior of alliance partners. Initial partnership agreements could help to regulate the adequate and equal knowledge exchange between the think tank and the other network units as well as questions of ownership on the intellectual property. Sometimes it can also be useful to regulate the utilization of the intellectual property in the exploiting units. This could for instance be done by means of licensing or royalty agreements (Fitzpatrick & DiLullo, 2005; Saunders, 2003).

In the face of the problems that were outlined above, it is not very surprising that the organizational think tank approach is also not able to solve these complex challenges in a perfect and all-embracing way. Nevertheless, it has certain features which can facilitate the knowledge governance. These strengths are outlined in the next subsection.

4.2.2 The charm of governing knowledge in an organizational think tank approach

Above, it was outlined that the tacitness of knowledge is a potentially considerably large barrier of knowledge transfer. However in the course of the exploration activities, problems of the transfer of tacit knowledge inside the exploring think tank will be significantly smaller as

it would be the case in alliance settings where each organization contributes a part of the explorative work that is carried out at its sites. The sticky pieces of information are easier transferred inside the think tank. The explorative outcomes which then have to be transferred to the exploiting firms are still going to be to a large extent sticky and tacit but not as much as during exploration. Thus the transfer and sharing of knowledge can be facilitated through the proposed framework (Heiman & Nickerson, 2002).

Apart from the standard knowledge-based theory of the firm (e.g. Kogut & Zander, 1992; Grandori, 2001b) which argues that organizations are superior arrangements for the creation, transfer and integration of new knowledge, Schulz (2001) also finds that organizations or hierarchies serve as clearinghouses concerning new knowledge which first of all seems to have no certain relevance. This clearinghouse function is also existent in the organizational think tank approach. The researchers who work in the think tank are able to explore in an undirected way because the creative outcomes of their work can be exposed to a large and diverse array of existing knowledge of the network organizations. This significantly enhances the probability of finding a way of exploiting the new knowledge. It contributes also significantly to a more flexible knowledge integration (Grant, 1996). However the network elements of the organizational think tank approach are not supposed to create less efficiency or higher costs of knowledge transfer.

As already mentioned above and in contrast to Grant's (1996) claims, the coordination and governance of knowledge integration and sharing is not necessarily better inside firms than in interorganizational settings. Dyer (1997) shows that networks can also provide high asset specificity at simultaneously low transaction costs. Although his findings are related to vertical supplier-producer networks in the automotive industry they seem to be applicable onto the organizational think tank context. Continuous, extensive information sharing activities, the realization of synergetic effects and long-term trust based implicit or explicit contractual arrangements are not only key success factors and reasons for the network advantageousness of the Japanese car producers but potentially also of the organizational think tank approach. In addition the investments in high asset specificity are concentrated in the think tank that is the source of explorative knowledge flows for the network.

This is supported by findings of Powell, Koput and Smith-Doerr (1996) in the biotechnology industry. Firms that formed R&D alliances had advantages in critical information access and the flow of resources which made them grow faster than their non-alliance partner

competitors. Argote (1999) also finds that the embeddedness of organizations in subordinate relationships can significantly enhance the transfer of knowledge.

The interdependencies between the partnering network firms and the organizational think tank are mainly of a pooled and partly of a reciprocal kind. Nevertheless, the social dilemmas which would impend in standard interorganizational networks are presumably mitigated due to the central agent position of the organizational think tank and the more hierarchical structuring of the framework. In addition the mediating node function of the think tank should support the creation of trust between the partnering firms; the extraction of exploration into a network central unit which is equally controllable and accessible to all partners very likely creates already by design a higher degree of trust than standard alliances do. Trust is an important factor that supports a smooth transfer of knowledge and more openness between the network units (Osterloh & Weibel, 2004; Rindfleisch, 2000). The more the partnering firms trust in each other the more intensive their mutual knowledge exchange and their willingness to contribute resources to the organizational think tank will be. The long-term nature of the relationship, more density than in standard alliances and a high behavioral transparency potentially diminishes the suspicion of the partnering firms and increases the willingness to share and transfer knowledge (Inkpen & Tsang, 2005; Kale, Singh & Perlmutter, 2000). Therefore it is important that the senior management of the partnering firms works closely together, communicates intensively and develops jointly fair procedures which are in the end outcomes of shared visions and psychological contracts. The pooling of managerial control at the network level can also be an effective way of gate-keeping and integrating between the partnering organizations and their mediating node. This can be considered as a more efficient and effective knowledge governance tool than believing that everything can be fixed in a so detailed way that all contingencies are included. Safeguards that rely mainly on informal enforcement mechanisms need long-term collaboration perspectives and a rather high level of trust between the partners in order to be effective but if this is given – as it is the case in the organizational think tank approach – they can be more efficient than formal ways of regulating the alliance relations (Dyer & Singh, 1998; Oxley, 2004, McEvily, Perrone & Zaheer, 2003). On the other hand it also avoids transparency problems between the firms. Information withholding and nonreciprocal contributions of the partners are a frequent problem in standard strategic alliances which leads to disrupted interorganizational learning processes. As already mentioned above (3.3.3) this threat is largely excluded by design in the organizational think tank approach and therefore it is possible to avoid dysfunctions in the

interorganizational learning processes (Larsson et al., 1998). Senior management as gate keeper and communicator also fulfills a function which is comparable to the role media plays for political think tanks. Media acts as the gatekeeper to the bigger masses of the society (cf. 3.1.3). Senior management acts in this function towards their organization.

As another gate-keeping and integrating mechanism which can be implemented in order to facilitate the understanding for the explorative outcomes of the think tank it can be helpful if employees of the partnering firms work in the think tank for a considerable amount of time in order to acquire the new knowledge “by doing” and by getting practical demonstrations. Like this it is also possible for the researchers in the think tank to get a direct feedback concerning the perception of their work in the exploitation units and vice versa. The mutual understanding of the culture, structures and way of working in the think tank and the exploiting firms is very important for a successful value creation inside the network (Garvin, 1993; Oxley, 2004).

It also contributes to the creation of more absorptive capacities towards the knowledge inflows which each partnering firm receives from the network. These absorptive capacities are – as already mentioned above – also a very important key factor for the mutual knowledge transfer processes. The individuals that are moved to the think tank or back to their mother organization are vivid transport media of their tacit knowledge which they can transfer to the new context. So individuals are not only bearers of tacit knowledge but also effective knowledge transfer media. Therefore moving organizational members between the partnering firms and the organizational think tank can be considered as being advantageous for the knowledge transfer (Argote, 1999; Argote & Ingram, 2000).

Building up individual and organizational social capital facilitates the knowledge exchange. Previous or other alliance experiences with network partners as well as long-term relationships and repeated transactions facilitate the creation of social capital. Trust and reciprocity are also enhanced and encourage the alliance members to share their knowledge. In contrast to standard interorganizational alliances it is likely that in the organizational think tank approach – like in intra-corporate networks – the horizontal position of the network partners leads to more synergistic benefits due to the similar problems and market situations of the companies than to negative competitive opportunistic behavior like e.g. outlearning (Inkpen & Tsang, 2005).

The organizational think tank approach provides the potential advantage that through the interlinking of knowledge inside the network the knowledge transfer and knowledge creation possibilities are in the first place not stringently vectored and therefore originating sufficiently large creative spaces for the knowledge-worker (Prange, 2003). In addition the organizational think tank depends in its existence largely on the partnering network firms who allocate financial and other resources to it. Therefore costs and efforts of transferring knowledge are not as critical for the organizational think tank as they are for a simple partner firm or an external knowledge source because by design the generation and transfer of knowledge is the very purpose of the organizational think tank's activities. Therefore the reciprocity which is important for knowledge sharing is already assured if the partnering firms contribute their resources (which is mainly contractually controllable) and the think tank creates, shares and transfers knowledge (Ouchi, 1980). If it is possible to implement successfully such a transparent and dense network, the costs of the individual monitoring efforts by the respective partnering firms – which would usually be very high in these networks where the outcomes are so difficult to measure – will presumably get minimized.

Summarizing this rough overview of the challenges, pitfalls and tools of knowledge governance in the context of the organizational think tank approach, it can be suggested that knowledge governance is also for this network type a critical determinant of success. Therefore issues of knowledge governance should be treated deliberately and within intensive continuous but still flexible processes of adjusting the knowledge governance strategy to new requirements and changing conditions. A high involvement of senior management in knowledge governance policies is indispensable. If the challenges that have been outlined in 4.1 and 4.2 are successfully managed, the organizational think tank approach can be a powerful tool to solve the exploration vs. exploitation conflict.

Although every partnering firm and every network has to find its individual explicit solution and structure, there are some factors which should generally be taken into account if a firm plans to implement – together with other firms – a network that follows the idea of the organizational think tank approach. Therefore in the next subchapter some recommendations are given for the practical implementation of the organizational think tank approach.

4.3 Management recommendations

The following recommendations can be considered as a kind of application guide that should facilitate the transfer of the organizational think tank approach into practice. Of course every industry, branch, country, firm size, etc. induces differing and sometimes quite individual needs. So in the following only some important general guidelines are given that might have to be adapted and supplemented in order to fit to the particular case onto which they should be applied.

- ⇒ Individuals as effective repositories for tacit knowledge have to get intrinsically motivated to share their knowledge. This means that the incentive schemes that are chosen have to be deliberately figured out in order to avoid crowding-out effects¹⁶ of the intrinsic motivation (Osterloh & Frey, 2000). This is of special importance for the motivation of the highly skilled and talented knowledge workers in the organizational think tank. Appropriate incentive schemes especially for those employees who are bearers of large amounts of tacit knowledge are important because if they get lured away (although this danger is presumably mitigated in the organizational think tank approach), their knowledge will be lost for the network. Therefore it is also necessary to deliberately and equally embed knowledge in technologies or organizational structures in order to prevent too large dependencies on single actors. Embedding tacit knowledge in technology is also an effective mean of knowledge transfer. In addition the highly experienced and skilled workers always have to feel encouraged to transfer to their knowledge and share it with less experienced individuals (Argote, 1999).
- ⇒ The implementation of positions like distinguished engineers which do not only create an incentive to achieve outstanding results but which are also connected to an institutionalized way of sharing knowledge by creating mentoring programs or knowledge codification requirements that make the outcomes measurable is recommendable. This kind of incentive scheme is supposed to expose a larger informal than control effect on the technical workers and therefore enhances their intrinsic motivation to share also their tacit knowledge (e.g. Osterloh & Frey, 2000). The organizational think tank might build a form

¹⁶ The **crowding-out effect** is based on findings of cognitive evaluation theory which roughly said suggests that if the perceived locus of control of an individual is shifted from inside to outside, it can undermine intrinsic motivation. This can happen e.g. if individuals should get extrinsically rewarded for actions that are mainly driven by intrinsic motivation of the individual. In addition the individual can feel violated in the psychological contracts and the reciprocal appreciation of motives that it will become less intrinsically motivated (Osterloh & Frey, 2000).

of a pool of distinguished engineers while in the exploiting units this position will only partly make sense e.g. for those employees who should act as technical gatekeepers to the think tank.

- ⇒ Moving personnel, sending trainers into the exploiting units, offering seminars which can also be used as meetings and points of exchange with members of the other network partners can be powerful means to facilitate the knowledge flows in the network (Grandori, 2001b). The transfer of individuals leads to a more effective knowledge transfer and creates additional variability which can enhance the overall innovativeness of the network. It also leads to more efficiency of the knowledge transfer through embedded technologies (Argote, 1999; March, 1991).
- ⇒ Generally, intensifying the sharing of knowledge, expectations, commitment, experiences and imaginations between the think tank and the exploiting units can be considered as advantageous. Like this the strategic agenda of the alliance can be continuously renewed and the think tank can better fulfill its mediating function.
- ⇒ Additionally, continuous investments in absorptive capacities can considerably pay off because they enhance smooth and efficient knowledge flows inside the network and make it more difficult for competitors outside the network to imitate the knowledge if they do not possess or have not invested in similar relational absorptive capacities, what should be more expensive and difficult for them. In addition at higher levels of relative absorptive capacities, lower degrees of knowledge codification are needed. This leads to cost savings concerning the complicated codification of tacit knowledge that should be transferred inside the network. The higher the prevailing mutual understanding in a network, the easier the present and future knowledge sharing is going to be (e.g. Cohen & Levinthal, 1990; Kogut & Zander, 1993). Maintaining sufficiently absorptive capacities in the exploiting organizations in order to keep a profound understanding of the think tank's exploratory outcomes (and vice versa) can not only be achieved by moving personnel but e.g. also by creating gate-keeping positions in the peripheral positions of the exploitative firms and the organizational think tank. They can facilitate the mutual understanding as well as carry and translate the new knowledge into the respective organization.
- ⇒ Furthermore the creation of cooperative norms inside the network may help mitigate negative effects of competition and facilitate knowledge transfer (Ingram & Roberts, 2000). The importance of similarities in knowledge processing and the knowledge itself is supported by findings of Lane and Lubatkin (1998) as well as Lane, Salk and Lyles (2001)

who found that these variables explain more than 70% of the relative absorptive capacity. On account of the presumably strongly differing imprinting and mentalities of the members of the exploiting and exploring units the creation of extensive relative absorptive capacities is of particular importance in the organizational think tank approach.

- ⇒ Each networking partner should pay attention to preventing an overdependence of the collaborators. It is always possible that one or several of the partnering firms go bankrupt, sell parts of their business, change their strategic focus, etc. and it would be no comfortable situation for the other firms if they realize that without the leaving collaborator(s) they are not reasonably able to continue the network and end up without any functioning explorative activities. They may be in such a disadvantageous position due to a lack of financial resources or know-how, etc. of the remaining firms. However, it has to be noted that this is rather a worst case scenario which has a significantly smaller probability to occur than e.g. the failure of a research project. Hence it appears to be better to deal with the risk of overdependence of the collaborators than acting and taking the much higher risks of exploration all alone.
- ⇒ It might also happen that one or several partnering firms get a so heavy weight in the network that they are able to dictate its policies. This may not be advantageous for all network members. So it should always be assured that – in relation to the particular financial resources, skills and possibilities of the firms – each firm carries an equal burden and also benefits in the same way. The dominance of large partners over minor companies has to be avoided by deliberate contractual arrangements. The research policy that conducts the think tanks and arranges the relations between the network partners has to be a joint product of all network members in order to profit to a full extent of the network diversity.
- ⇒ Partner screening and the extensive due diligence procedures in order to assess how much a firm can contribute to the alliance, which competitive value it contributes and how large the potential synergies are, is indispensable if the partnering firms want to make sure that they will not have any bad surprises with the joining partners. Additionally, alliances or agreements with other firms have to be checked. A very important but frequently neglected point is the security of the particular intellectual property protection of a firm. Its adequacy has to be checked before the firm may join the network (Fitzpatrick & DiLullo, 2005). Especially in the case of the organizational think tank approach that is about creating a joint center of explorative excellence it is important to figure out how

valuable a partner is going to be for the alliance or if the firm will mainly profit and only partly contribute resources (in whatever form) to the network.

- ⇒ The set up of efficient and effective communication networks in order to establish and enhance knowledge communication flows is also essential. Only if the management is able to cope with the partly strong information asymmetries between the exploring think tank and the exploiting units or among the exploiting partner firms, the knowledge transfer and integration can be really successful (Antonelli, 2006). The knowledge context of the exploration vs. exploitation trade-off can be so differentiated and complex that the organizational members may not be left alone with their communication activities but need assistance and support by means of institutionalizing network communication channels by senior management. This may incorporate the use of special agents of integration who can act as intermediaries (Grandori, 2001b). In addition, all knowledge that can be codified at reasonable costs should be at least written down or provided in alliance wide data bases while tacit knowledge can also be transferred by rich communication media (like face-to-face or informal interaction). Although a codification of knowledge is always connected to a higher risk of uncontrolled dissemination its benefits for the knowledge transfer and integration processes often outweigh possible negative effects (Heiman & Nickerson, 2002; Pedersen et al., 2003).
- ⇒ Management should also try to convey the ideas and vision behind the organizational think tank and the interorganizational network to the employees of the exploiting units and give them the possibility to still propose ideas for research projects or to participate in a project (of course only if it makes any technical sense), in order to prevent negative and inhibiting reactions like the “not invented here syndrome” or fears of changes that may cost jobs or are connected to learning something new and giving up old pattern.
- ⇒ For the management of the think tank it is important that the long-term nature of the project and therefore the entire commitment of the partnering firms are not forgotten. If the senior managers who are assigned with the negotiations, control, administration, etc. concerning the organizational think tank and the interorganizational ambidextrous network are frequently impatient concerning fast progresses and immediate outcomes of the explorative work of the think tank, the idea on which the organizational think tank approach is based would be violated. The need for creating a long-term exploration horizon which leaves large creative spaces for the high skilled technical workers has to be well understood and implemented by senior management if the exploration vs. exploitation trade-off should be successfully managed by means of the organizational

think tank approach. This also has to be conveyed to firm owners like shareholders who are not actively involved in the daily management but who have to decide on the policies of the management and on the managers' jobs. The senior management has to make them understand that this long-term oriented policy is the only way to create a sustainable base for long-term success of the company. If they fail to do so, they will always have trouble with the shareholders concerning e.g. the resource commitments and other contractual arrangements that have to be made in order to join and remain in the network.

Although several more recommendations in an even more detailed way could be added, those made above can be considered as sufficient for giving a few rough guidelines and an idea of important factors that are recommended to be deliberately taken into account, if the organizational think tank approach should be applied in practice.

In the course of chapter 4 it became clear that also the organizational think tank approach reveals several critical issues that have to be deliberately considered if firms want to create a network that follows the propositions of this framework. However, these problems do not appear to be a specific problem of the organizational think tank approach but they rather seem to occur generally in the field of R&D in either intraorganizational or interorganizational settings. Furthermore it was outlined that the organizational think tank approach has the potential to at least mitigate several of the problematic issues.

The efficient and effective governance of knowledge (flows) in and between the networking units was identified as one very important factor for the success of the presented framework. Apart from the challenges that knowledge governance poses to managers who want to apply the organizational think tank approach, it was outlined why and how knowledge governance can be facilitated and could become more efficient in connection with the proposed framework. Especially the transfer of tacit knowledge – which is particularly relevant for exploratory activities – can be carried out more easily. This requires however that management is able to realize a fit between the characteristics of the knowledge involved and the knowledge transfer mechanisms.

In order to give some recommendations to managers that should help avoiding the largest pitfalls, some guidelines were suggested. Of course the concept still has to be adjusted and individualized for every single firm and network but these guidelines may build at least a good basis for doing so because they emphasize the contents and the importance of understanding the idea and vision behind the organizational think tank approach if

management wants to benefit of the potential strengths of the concept in comparison to standard intra- or interorganizational solutions.

The following chapter as the concluding finale of this work is not only supposed to recognize the propositions and suggestions that were made but also to address possible imperfections even if they mainly had to be tolerated or deliberately made in order to be able to draw a first neat picture of the ideas and bases on which the organizational think tank approach is grounded. This, however, opens up various and large possibilities to further research in this context. Hence, some potential future research directions are suggested in the very end of this work.

5 Conclusion

Concluding this work does not mean finishing the discussion on the exploration vs. exploitation trade-off and the organizational think tank approach as a possibly viable way of solving the tensions that result from the conflict. The imperfections of the concept, which was developed and presented above, open up substantial empty spaces that could be filled by future research efforts. This includes opportunities for empirical studies as well as research questions in a large range of scientific disciplines. Beginning with a short concluding overview concerning the most important issues and suggestions of the work in 5.1 it also becomes clear where simplifications had to be made. In 5.2 future research directions are outlined and some possible further research questions are proposed.

5.1 Summary, conclusion & criticism

Today's speed of technological and sometimes revolutionary change and the large environmental shifts that tend to occur in increasingly shorter intervals make an efficient and effective R&D even more important for companies in mostly high competitive markets. The underlying discussion – based on March's 1991 suggestions – about the organizational difficulties to find an adequate design for organizational structures, fitting for both exploration as well as for exploitation, outlines that ambidexterity seems to be a more viable way of solving the productivity dilemma and the related problems (that were introduced through various extensions of the traditional exploration vs. exploitation discussion) than other concepts; albeit there are still several implementation and application problems which occur if an organization is structured in an ambidextrous way. Following a broad community of scholars it is suggested that the self-destructive nature of adaptive processes, failure and success traps cause an imbalance between exploration and exploitation that can result in self-reinforcing processes (e.g. Gupta, Smith & Shalley, 2006; Levinthal & March, 1993).

After an introduction and the assessment of ambidexterity and punctuated equilibrium (e.g. Gersick, 1991) as two competing concepts of the alignment of exploration and exploitation it is proposed that implementing ambidexterity on an interorganizational multi domain level might be a better solution.

The application of the framework is carried out by creating an interorganizational network. This network consists of companies that concentrate on exploitation while simultaneously extracting and merging (most of) their explorative activities into an organizational think tank.

It is designed in a way that should enable it to solve the productivity dilemma in a more efficient and effective manner than the prevailing concepts do. The role of the think tank is derived from political think tank concepts and from prevailing concepts of the alignment of explorative activities on an intraorganizational as well as interorganizational level. It is suggested that political think tanks are a result of the implementation of ambidextrous structures on the level of society, solving the productivity dilemma of the political and economical elites.

This is followed by an overview and assessment of intraorganizational and interorganizational R&D alignment concepts. The organizational think tank is designed as an explorative center of excellence that is situated as a unifying, mediating and connecting focal node in a horizontal network of exploiting companies. At this, the concept tries to utilize the strengths and to avoid the weaknesses of prevailing intra- and interorganizational concepts of aligning exploration and exploitation.

It is also outlined that the governance of knowledge flows in and between the network units plays a central role for the success of the concept. High uncertainty, complexity and risks are identified as typical determinants of the activities that are carried out in the network. In addition the knowledge that has to be transferred and integrated is frequently to a large extent tacit and sticky; as it is outlined, the organizational think tank approach can presumably provide certain advantages that facilitate an efficient and effective way of governing knowledge. In order to enable senior management to apply the concept onto their companies some recommendations are given that can be used as guiding lines and helpful pieces of advice.

As was already mentioned above before introducing the organizational think tank approach and its strengths, there are, however, some imperfections that the work does not adequately treat and solve.

Firstly, although the organizational think tank approach is designed to at least mitigate the problems that occur in intraorganizational as well as interorganizational settings it can not fully extinguish them. In a worst case scenario (which might occur e.g. if management is poor) the organizational think tank approach might lead to an accumulation and mutual enhancement of the problems that occur on the intraorganizational level and those that disturb the relations between organizations. In this case the respective firms would be better off choosing either an intraorganizational solution or an interorganizational approach. However, this concern might appear a little remote and presumably if the management of the partnering

firms follows at least partly the recommendations that were given in 4.3, this very unpleasant situation will not occur in connection with the application of the organizational think tank approach.

Secondly, hoping that management understands the ideas and visions of the concept and successfully individualizes it and makes it explicit for the particular case can, however, be only a temporary solution. In practice the implementation of concepts, ideas and visions in and between concrete companies frequently turns out to be quite delicate and decisive for the effective success of a management approach. For example the negotiations and the contractual arrangements between the networking firms that want to build an exploring think tank while they concentrate on the exploitative part can be quite problematic and the processes of building up trust and relational absorptive capacity might take so long that firms give up and stick to their old concepts. Without finding the contractual arrangements and governance structures that allow for an efficient and effective application of the approach on the particular real cases, the whole concept loses its sense. Here the work provides merely some ideas, visions, broad guidelines and hints but this is certainly not sufficient for an immediate implementation of the concept in practice.

Thirdly, the dynamics which might occur inside the think tank and the partnering firms are also not considered but they might also be decisive for the final success of the approach.

Overall, the largest problem is that the concept yet exists merely on a piece of paper and the positive and negative effects that it might have are to a large extent resulting from speculation. Even though this speculation might be derived from empirical evidence and other scholars' studies that revealed certain parallels to what is proposed here and even though the concept mainly combines several existing and more or less well explored approaches, it is not possible to make any entirely definite suggestions.

However, the guiding questions that were posed in the introductory part seem to be answered as far as possible. The conducted assessment of the concept reveals that the organizational think tank approach provides several strengths in comparison to other approaches. Furthermore it can be suggested that it is not sufficient to draw a monochrome picture of concepts that are viable to find a way out of the trade-off between exploration and exploitation. It is particularly the merger of several advantageous elements of prevailing concepts combined with observations and practices from political sciences that establishes an approach which has large potentials for creating a strategic momentum for radical innovation in an open model, which allows for an interorganizational innovation flow. It is perhaps also a

conceptual expression for the present developments in the reality of many companies that realize that competition might be the only viable way to survive in an environment where most markets are highly mature or fast changing.

Those questions and open issues which still remain are taken on in the next subchapter (5.2) which proposes further research opportunities that can be derived of this work and supplement its ideas and concepts.

5.2 Suggestions for further research

In 5.1 it was already mentioned that the organizational think tank approach, as it was introduced in the course of this work, does not consider the dynamics which might occur inside the think tank and the partnering firms. The work focused firstly on the macro-structures of the framework while considerations of how internal organization, team management, etc. have to be handled were mostly screened out. This was done in order to reduce the complexity of the issue. Like this a first rough framework could be set up which could be refined in future research attempts. This may include considerations of particular requirements of team management inside the think tank and the exploiting network units. Exploration and exploitation demand for differing management styles due to the differing knowledge and skills that are utilized and required.

In addition it was suggested that different organizational structures can have differing effects on exploitation and exploration. Therefore it could be explored which internal organizational structures (e.g. matrix structures or functional structures etc.) are advantageous for governing the exploiting units and what has to be applied with regard to the think tank.

Furthermore the work leaves open which explicit contractual arrangements seem to be most advantageous for the framework. This is in fact an issue which merges management and juridical considerations. The arrangements that are made have to leave enough space for knowledge flows and creative spaces; albeit they have to be restrictive enough to relieve management and company owners of fears concerning e.g. intellectual property rights management, profit dilution, unequal risk and cost sharing, etc. because otherwise it seems to be likely that they will not agree to joining such a network relation.

It would also be instructive to investigate the influence of investors from the alternative investment industry on the innovativeness, learning behavior and long-term success of organizations. In this context, the hypothesis could be challenged that these actors mainly have a negative impact on the sustainable success of an organization because they force too much short-term exploitative success and neglect long-term explorative activities (Schieritz & Atzler, 2007).

In addition it would be interesting to analyze which controlling instruments have to be applied to measure the outcomes of the think tank. This means that on the one hand it is not possible to set up highly restrictive control mechanisms because the kind of outcomes that the think tank has are very often not easy to measure and the think tank can also not produce innovations on demand or at given measures. On the other hand the companies' owners and also the management want to have at least the feeling of having an idea or control about the work of the think tank.

Additionally at the level of the internal controlling of the think tank it would be interesting to figure out a system that does not make the knowledge workers feel so controlled that they lose their motivation but that controls them sufficiently in order to push their efforts and to avoid bad work quality or attitudes.

As it was already mentioned in the introductory part, this work focuses on horizontal network relations. Nevertheless vertical networks are also a common network type and therefore it could be interesting to think about an adaptation of the organizational think tank approach onto vertical alliance relations.

Finally (and this may be presumably firstly realizable when the other open questions are sufficiently solved) it would be desirable if there were some empirical data or evidences on the effects of implementing the organizational think tank approach in the context of real companies. For this purpose there would have to be at least one network which applies the concept or some other concept which comes very close to the organizational think tank approach.

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